Running Head: ORAL NARRIVE SKILLS OF PRESCHOOLERS WITH AUTISM

The Oral Narrative Comprehension and Production Abilities of Verbal Pre-schoolers on the Autism Spectrum

Marleen F. Westerveld, PhD, CPSP

School of Allied Health Sciences

Griffith University, Queensland, Australia

Cooperative Research Centre for Living with Autism Spectrum Disorders (Autism CRC),

Long Pocket, Brisbane, Queensland, Australia.

Jacqueline M. A. Roberts, PhD

School of Education and Professional Studies

Autism Centre of Excellence

Griffith University, Mt Gravatt, Queensland, Australia

Cooperative Research Centre for Living with Autism Spectrum Disorders (Autism CRC),

Long Pocket, Brisbane, Queensland, Australia.

Correspondence to:

Marleen F. Westerveld, PhD
Email: m.westerveld@griffith.edu.au
Phone: +61 7 56787658

This article has been published: Westerveld, M. F., & Roberts, J. M. A. (2017). The oral narrative comprehension and production abilities of verbal preschoolers on the autism spectrum. *Language, Speech, and Hearing Services in Schools*(48), 260-272. doi: 10.1044/2017_LSHSS-17-0003

Abstract

Purpose: This study described the oral narrative comprehension and production skills of verbal pre-school children on the autism spectrum and investigated correlations between oral narrative ability and norm-referenced language test performance.

Method: 29 preschool-age children (ages 4;0 – 5;9) with autism, who obtained an age-equivalent score of at least 36 months on the expressive communication subscale of the Vineland Adaptive Behavior Scales (VABS-II) participated. Children listened to an unfamiliar fictional narrative and answered comprehension questions afterwards. After listening to the narrative a second time, children were asked to retell the narrative without picture support. Narratives were transcribed and analyzed for length, semantic diversity, grammatical complexity and accuracy, intelligibility, inclusion of critical events, and narrative stage.

Results: all children participated in the comprehension task and 19 children produced an analyzable narrative retell. Compared to published data on typically developing children, significant difficulties were observed in narrative comprehension, intelligibility and grammatical accuracy. The majority of the children told descriptive or action sequences, with only one child producing an abbreviated episode. Significant positive correlations were found a) between performance on the Peabody Picture Vocabulary Test (PPVT-4) and semantic diversity and narrative comprehension; and b) between parent-reported receptive communication competence (VABS-II) and narrative comprehension.

Conclusions: This study provides preliminary evidence of specific difficulties in oral narrative comprehension and production skills in verbal pre-schoolers on the autism spectrum.

The Oral Narrative Comprehension and Production Abilities of Verbal Pre-schoolers on the Autism Spectrum

The importance of oral narrative proficiency during the preschool years has been well established, both in typically developing children and in children with developmental language disorders. In a landmark study, Bishop and Edmundson (1987) found that four-year-old children with identified language impairment who retold more coherent, well-sequenced narratives, showed better language skills 18 months later. Furthermore, narrative ability during the preschool years is linked to better academic performance, particularly reading comprehension (Bishop & Adams, 1990; Griffin, Hemphill, Camp, & Wolf, 2004; Paul & Smith, 1993). One group of children who are known to struggle with language acquisition and development are children on the autism spectrum (see Williams & Roberts, 2015). Surprisingly, previous research has not investigated the oral narrative production abilities of pre-school children with autism (Baixauli, Colomer, Roselló, & Miranda, 2016). In fact, research into the spontaneous language skills of preschoolers with autism has primarily focused on language during free play (Eigsti, Bennetto, & Dadlani, 2007; Tek, Mesite, Fein, & Naigles, 2014). One likely reason is that oral narrative tasks may be regarded as too difficult for this population, due to the often concomitant cognitive challenges. However, a narrative production task provides an ideal opportunity to examine these children's ability to demonstrate structural language skills in a context that is relevant to future academic success. Moreover, adding a narrative comprehension component will yield important information regarding children's language comprehension beyond the sentence-level, including for example the ability to infer causal relationships between narrative events (Nuske & Bavin, 2011). This study thus aims to address an important gap in the current research literature by

providing detailed descriptive information about the oral narrative retelling and comprehension abilities of a group of pre-schoolers on the autism spectrum.

Narrative Development in Typically Developing Children

Narrative Macrostructure

At macrostructure level, narratives may be conceptualized as a sequence of goal-directed attempts or actions that serve to address the goal (or solve the problem) (Trabasso & Nickels, 1992). Previous research into the development of oral narrative ability at macrostructure level in typically developing children has shown that the development of narratives is a gradual process, with the largest developmental gains made between the ages of three and five (Trabasso & Nickels, 1992). Trabasso and Nickels analyzed the oral narrative performance of four groups of children (ages 3-4, 4-5, 5-6, and 9-10) and found that three-year-olds tended to use descriptive statements that were not related to the overall goal or problem in the narrative or story. By four years of age, children included a higher number of goal-directed attempts, interpreted by the authors as an increasing awareness of goal-directed behaviour, but tended to sequence them temporally rather than causally. By five years of age, however, there was a clear shift to organizing the narrative around a goal and plan. This narrative development continued beyond the preschool years, with the nine-year-olds in their study producing well-structured goal-oriented narratives across multiple episodes (Trabasso & Nickels, 1992). These developmental *organizational* changes to the narratives also reflect a change in the degree in which the narrator orients the listener to ensure the narrative is cohesive and understandable (Trabasso & Nickels, 1992). In fact, telling or retelling of narratives may be regarded as a social activity in which the speaker needs to maintain the listener's attention through the use of linguistic devices (Norbury, Gemmel, & Paul, 2014).

Narrative Microstructure

To construct an oral narrative requires the child to draw on structural language skills across the domains of semantics, syntax, morphology, and phonology (Hughes, McGillivray, & Schmidek, 1997). Also referred to as narrative *microstructure*, previous studies have found a clear developmental progression with age on measures of vocabulary (e.g., number of different words) and grammar (MLU, clausal density) (Heilmann, Miller, Nockerts, & Dunaway, 2010; Justice et al., 2006; Westerveld, Gillon, & Miller, 2004; Westerveld & Vidler, 2016). Although narrative macrostructure and microstructure may be conceptually distinct, past research has clearly shown a robust relationship between aspects of narrative microstructure (particularly vocabulary) and the overall organization of a narrative (Heilmann et al., 2010; Westerveld, Gillon, & Boyd, 2012; Westerveld & Heilmann, 2012), highlighting the importance of analyzing narratives at both macrostructure and microstructure levels when evaluating children's oral narrative abilities.

Narrative Comprehension

To fully appraise children's oral narrative skills, however, children's performance should not only be assessed using a production task, but should also contain a comprehension component (Boudreau, 2008; Skarakis-Doyle & Dempsey, 2008). Theoretical models support the links between oral narrative comprehension and production. Consistent with the Construction-Integration model (Kintsch, 2005), it can be hypothesized that adequate oral narrative comprehension relies on the activation of *mental models* or schemas of stories in long term memory. These schemas then assist in explaining the actions of characters as well as appreciating the logical sequence of events in stories and facilitate story recall. Despite the hypothesized links between oral narrative comprehension and production skills, there is some evidence to suggest a dissociation between these skills dependent on the task condition (Wagner, Sahlen, & Nettelbladt, 1999). To illustrate, Wagner et al. (1999) found no correlation between oral narrative comprehension and production skills in a group of

preschool children with language impairment, if children were allowed to refer to pictures using a narrative generation task. The authors hypothesized that providing the children with access to the pictures may have influenced their findings as this condition may have resulted in the children simply describing each picture without fully comprehending the narrative. From a clinical perspective, a comprehension task may yield a better response rate in preschool-age children than a production task (Westerveld et al., 2012). Taken together and considering this is the first study to investigate oral narrative skills in pre-school children on the autism spectrum, it was decided to assess both oral narrative comprehension and production skills.

Spoken Language Abilities of Children on the Autism Spectrum

Autism spectrum disorders are characterized by impairments in communication and social interaction, combined with repetitive and restricted behaviors and interests (American Psychiatric Association, 2013). Previous research has shown the wide variability in spoken language skills in young children on the autism spectrum, with a subgroup of children failing to develop spoken language skills and others showing spoken language performance within normal limits, based on norm-referenced testing of language (Boucher, 2012). Given the significant difficulties children with autism demonstrate in using language for social communication, previous research into the language acquisition of preschoolers on the autism spectrum has predominantly focused on the development of pragmatics or the social use of language (Eigsti, de Marchena, Schuh, & Kelley, 2011). Overall, children with autism show persistent difficulties in pragmatics at both linguistic (turn-taking, perspective taking) (see Landa, 2000) and non-linguistic levels (eye contact, facial expressions), which affects their ability to interact successfully with others, including their peers (Kim, Paul, Tager - Flusberg, & Lord, 2014).

Less attention has been given to other domains of early language development in children with autism, including semantics, syntax and morphology, and phonology (see Eigsti, 2011, for a review). Generally speaking, late onset of spoken language development is one of the early clinical signs of autism, with first words appearing around 38 months (Howlin, 2003). Although relative strengths have been found in receptive vocabulary as measured by the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 2007), most preschoolers with autism struggle with higher level semantic processing tasks (see Boucher, 2012, for a review). With respect to syntactic development, Eigsti (2011) concluded that although there was some conflicting evidence, the majority of studies reviewed indicated syntactic difficulties in young children with autism, including syntactically less complex sentences (Eigsti et al., 2007) and difficulties marking tense (Roberts & Neal, 2004). Phonology seems to be relatively spared and early difficulties seem to resolve, especially in children with autism who score within normal limits on norm-referenced tests of language (Boucher, 2012). However, recent research suggests that 12% of school-age children on the autism spectrum show clinically significant speech production impairments (Cleland, Gibbon, Peppé, O'Hare, & Rutherford, 2010), and one of the few studies investigating expressive phonological development in toddlers (18 – 36 months) with autism revealed atypical vocalizations (Schoen, Paul, & Chawarska, 2011).

Narrative Abilities of Children on the Autism Spectrum

Most of the existing research into the oral narrative abilities of children on the autism spectrum has focused on children aged 6.5 years and over (Baixauli et al., 2016). In a recent systematic review of the literature Baixauli et al. (2016) located 24 papers that compared the oral narrative skills of children and adolescents on the autism spectrum, with IQ mean scores above 70, to a comparison group of participants with typically developing language skills. Overall, the participants on the autism spectrum showed significant difficulties in oral

narrative production (as indicated by medium to large effect sizes after controlling for heterogeneity) at microstructure level on measures of semantics (number of different words) and syntax (MLU and syntactic complexity) compared to their age-matched peers with typical development. In contrast, smaller group differences (with a small effect size) were found for the number of utterances used to re/tell a story. These microstructure difficulties in oral narrative ability are not surprising, considering many children with autism have challenges developing structural oral language skills at word- and sentence-level, as discussed previously (Williams, Botting, & Boucher, 2008). In support, when controlling for language ability, Diehl, Bennetto, and Young (2006) found no differences at microstructure level of narrative ability between school-age children with autism and their typically developing peers.

At macrostructure level, Baixauli et al. (2016) reported significant differences with moderate to high effect sizes between children and adolescents with autism and their age-matched peers with typical development on measures of coherence (the overall structure of the story) as well as cohesive adequacy (e.g., use of referencing). Consistent with the weak central coherence theory, children on the autism spectrum may have difficulties seeing the bigger picture and focus on the details (Happé & Frith, 2006). This focus on detail may result in descriptive statements that are not related to the overall goal or problem in the story (Diehl et al., 2006), and may hinder the overall development of goal-oriented narratives that is typically observed from around four to five years of age (Trabasso & Nickels, 1992).

Baixauli et al. (2016) also found significant differences with small to moderate effect sizes in the use of internal state language (referring to characters' emotions, intentions, and beliefs) with the participants with typical development outperforming their peers on the autism spectrum. A large body of research has reported on the difficulties children on the autism spectrum may have with theory of mind (Kimhi, Shoam-Kugelmas, Agam Ben-Artzi,

Ben-Moshe, & Bauminger-Zviely, 2014), that is difficulty comprehending other individuals' mental states. Considering narratives are typically goal-oriented and thus report characters' mental states, theory of mind may affect both oral narrative production as well as oral narrative comprehension, for example when answering questions regarding the character's goals and motivations.

Fewer research studies have addressed oral narrative comprehension in young children with autism (Norbury & Bishop, 2002; Young, Diehl, Morris, Hyman, & Bennetto, 2005). Results from Young et al.'s (2005) study indicated significant challenges answering inferential questions, as opposed to factual questions in high-functioning children with autism (ages 6;0 – 14;0) compared to peers with typical development matched for chronological age, verbal IQ and language ability. These results were consistent with those from Norbury and Bishop (2002) who divided the inference questions into text-connecting questions (linking explicitly mentioned ideas in two sentences) and gap-filling questions, which require the child to incorporate their background knowledge with information provided in the story. Four groups of children, aged between 6 and 10 years participated (specific language impairment, pragmatic language impairment, high-functioning autism, and typical peers). Analysis of the results showed significant correlations between children's receptive vocabulary and grammar performance on norm-referenced language tests and their overall story comprehension performance, highlighting the importance of intact language comprehension at word- and sentence-level to support text-level comprehension. However, follow-up error analyses indicated a tendency for children with autism to show specific difficulties answering gap-filling questions which were often answered inappropriately to the story context. These findings confirmed Norbury and Bishop's (2002) hypothesis that the children with autism showed a tendency to cognitively process information at the local rather than the global level, consistent with the 'weak central coherence' theory. More recently, Nuske and Bavin (2011)

built on these research findings and found that children on the autism spectrum (mean age 6;7) showed specific difficulties with narrative comprehension involving the integration of contextual clues in the text with knowledge of typical scripts, such as birthdays and family routines, compared to their peers with typical development matched on receptive vocabulary.

Task Conditions

Both narrative generation and narrative retell tasks have been used in the research literature to elicit oral narratives in young children. It goes beyond the scope of the current paper to provide a detailed discussion regarding the advantages and disadvantages of differing elicitation methods. However, based on previous research that found that oral narrative retells are generally longer, contain more story components than generations, and are easier to score (Merritt & Liles, 1989), we have utilized oral narrative retell tasks in our previous research studies addressing oral narrative abilities of preschool-age children (Westerveld, 2014; Westerveld et al., 2012). To ensure consistency across studies, we decided to use the same task in the current investigation.

Another consideration when assessing oral narrative skills in pre-school children is the way the task is administered and whether children are allowed to refer to pictures when retelling the story. Considering the potential challenges implicit in taking away the pictures during a story retell task, one may hypothesize that high levels of 'non-compliance' may occur. As observed by Westerveld et al. (2012), approximately 12% of their four-year-old participants with typical development either refused to retell a story or provided too few utterances for analysis in a task that required them to retell the story without pictures. Because this group of 'non-compliant' children did not perform significantly below their peers who attempted the story retell on a norm-referenced language test (PPVT-4; Dunn & Dunn, 2007), Westerveld et al. (2012) hypothesized that the complexity of the task itself, rather than the children's language ability could have contributed to the children's non-

compliance. Although it is well-known that visual supports may be effective in facilitating understanding in children with autism (Odom et al., 2003), asking children to retell a story using pictures may mask difficulties in providing story propositions in the correct sequence (see Wagner et al., 1999), and may explain why some previous studies failed to find differences between children on the autism spectrum and their peers with typical development on measures of cohesion or story grammar (Norbury & Bishop, 2003). For the present study, we decided to administer a story retelling task in which the children were exposed to the story twice, but did not have access to the story pictures during retell. This method would allow us to find out if the children would produce temporally or causally sequenced utterances without picture support.

Associations between Narrative Performance and Norm-Referenced Test Results

The main aim of the current study was to describe the oral narrative production and comprehension skills of a group of pre-school children on the autism spectrum. In addition, we wanted to determine if the children's oral narrative performance was related to their performance on norm-referenced language tests. The important link between receptive vocabulary, as measured for example with the PPVT (Dunn & Dunn, 2007), and oral narrative proficiency has been well established. To illustrate, previous research has clearly shown significant correlations between receptive vocabulary skills and oral narrative production and comprehension performance in typically developing preschool-age children (Westerveld et al., 2012), in young school-age children with identified language disorders (Ebert & Scott, 2014), and in 6- to 10-year-old children with autism (Norbury & Bishop, 2002). To the authors' knowledge the association between vocabulary and oral narrative ability has not yet been explored in preschool-age children with autism. However, after controlling for age and nonverbal IQ, Condouris, Meyer, and Tager-Flusberg (2003), found significant correlations between performance on the PPVT-III (Dunn & Dunn, 1997) and the

number of different words produced during *play* ($r = .33$, $p < .05$) in a group of children with autism, aged between 4 and 14 years of age. Based on previous research, we thus expect to find significant correlations between a norm-referenced measure of receptive vocabulary and children's oral narrative comprehension and production skills in the current study.

It is less clear whether the participants' oral narrative skills will be related to a norm-referenced parent-report measure of the children's communication skills. Although clinician-administered norm-referenced assessments are frequently used by clinicians to describe children's performance relative to their peers, they lack ecological validity, may not be suitable for young children with diagnosed disabilities, and may in fact show floor effects (Charman, 2004; Volden et al., 2011). Parent report measures may be more representative of the child's everyday of communication competence. Although previous research has shown good agreement between parental report and norm-referenced testing of children's language skills (Charman, 2004; Luyster, Kadlec, Carter, & Tager-Flusberg, 2008), it should be noted that a percentage of children in the Charman (2004) study were unable to complete the norm-referenced task and were thus excluded from analysis. One parent report tool that may be particularly suitable for determining communicative competence in pre-schoolers on the autism spectrum is the Vineland Adaptive Behavior Scales (VABS-II; Sparrow, Cicchetti, & Balla, 2005). It has been used extensively in previous research and shows good correlations with direct measures of language functioning in very young children on the autism spectrum (Luyster et al., 2008). A better understanding of the relationship between different language assessment tools for young children with autism may influence clinicians' choice of language measures for diagnostic purposes as well as intervention planning (Charman, 2004; Condouris et al., 2003; Park, Yelland, Taffe, & Gray, 2012).

The Current Study

To better understand the oral narrative abilities of preschool-age children on the autism spectrum, we recruited a group of verbal preschoolers (ages 4 and 5) on the autism spectrum and selected a subsample of children on the basis of their expressive communication skills as reported by parents completing the VABS-II (Sparrow et al., 2005). Previous studies investigating oral narrative abilities in children on the autism spectrum have predominantly compared the performance of children with autism to a control group, matched on age, language, and/or nonverbal ability. However, matching pre-school children on the autism spectrum and comparison children for language ability brings a number of significant challenges as described by Charman (2004). These challenges include the generally low levels of language performance and the difficulty administering formal language tests in this population. Furthermore, researchers have argued against the use of a control group and have called for investigating behaviors within groups of children with autism, taking the heterogeneity of the disorder into consideration (Ricketts, Jones, Happé, & Charman, 2013; Tager-Flusberg, 2004).

In summary, the following questions were asked:

1. How do pre-school children on the autism spectrum perform on a narrative retell and comprehension task?
2. Is the children's performance on the oral narrative comprehension and production task related to their performance on norm-referenced language tasks?

Considering the importance of oral narrative skills for future academic performance, the results from this study may yield important clinical information regarding the usefulness of an oral narrative comprehension and production task for assessment and diagnostic purposes with young verbal pre-schoolers on the autism spectrum. Based on previous research with young typically developing children and children with identified language impairment, we anticipated that pre-school children on the autism spectrum would show

difficulties comprehending oral narratives, particularly on inferential questions (Nuske & Bavin, 2011; Young et al., 2005). Furthermore, we expected the participants to show difficulties in oral narrative production, particularly at macrostructure level. We anticipated that the children's performance on norm-referenced language tests would be related to oral narrative comprehension as well as to narrative microstructure measures including semantic diversity (Condouris et al., 2003; Norbury & Bishop, 2002). However, we expected the participants to show significant oral narrative difficulties at macrostructure level as measured by the inclusion of critical events that was not related to their performance on norm-referenced language measures.

Method

The study was approved by the University ethics committee (AHS/13/14/HREC) and the relevant hospitals network ethics committee (HREC/14/SCHN/270).

Participants

The participants in this study were selected from a larger longitudinal investigation into the emergent literacy skills of preschoolers with autism (Westerveld et al., 2017). These children were recruited through a range of service providers and by distributing flyers via professional networks. The following inclusion criteria were used, based on parent report: a) confirmed diagnosis of autism; b) be at least 4 years of age, but prior to school-entry; c) speak in short sentences; d) ability to participate in typical preschool-type activities, such as pointing to pictures on request; and e) obtain at least an age equivalent score of 36 months on the expressive communication subscale of the VABS- II (Sparrow et al., 2005). A total of 29 children met these inclusion criteria. Autism diagnosis was confirmed by obtaining written documentation from parents, which included letters from pediatricians, Autism Diagnostic Observation Schedule (ADOS) reports (Lord et al., 2012), and/or Social Communication Questionnaire (SCQ) – Lifetime version questionnaire (Rutter, Bailey, & Lord, 2003) results.

Procedure and Tasks

As described in Westerveld et al. (2017), the participants were seen on two occasions, generally one week apart, by a certified practicing speech pathologist. Children were assessed on a range of emergent literacy tasks with each session lasting approximately 90 minutes. The oral narrative task described in the current study was administered during session one.

Mullen Scales of Early Learning (MSEL). Two subscales from the MSEL (Mullen, 1995) were administered to determine the participants' level of nonverbal ability: Visual Reception and Fine Motor. In line with previous studies reporting nonverbal IQ of young children with autism, a development quotient (nonverbal ratio IQ score) was calculated by dividing the child's average age-equivalent performance on these two subtests, by the child's age in months, multiplied by 100. This ratio IQ score has good convergent validity for young children with ASD, relative to the *Differential Abilities Scale* (Bishop, Guthrie, Coffing, & Lord, 2011) and has been used in previous research involving young children with ASD (Davidson & Ellis Weismer, 2014).

Vineland Adaptive Behavior Scales – II (VABS-II). The participants' communication skills were appraised using the communication domain of the VABS-II (Sparrow et al., 2005). The VABS-II communication domain is based on parent report and yields a standard score for the overall communication domain as well as age-equivalent scores across three communication subdomains, receptive, expressive, and written. The VABS-II was standardized using a representative sample of more than 3,600 individuals, which included a clinical sample of children with autism spectrum disorders. The test shows excellent test-retest reliability (ranging from .84 to .90) for ages 3-6 across all communication subdomains (Sparrow et al., 2005). Furthermore, as reported in the manual, the VABS-II successfully differentiates clinical groups of verbal children on the autism spectrum from nonclinical groups, based on their performance on the communication domain ($p < .001$). For

the current study we used the Communication Standard Score for descriptive purposes. Previous research revealed, however, that young children with autism show floor effects on standard scores of the VABS-II (see Yang, Paynter, & Gilmore, 2016), thus restricting variance when investigating correlations. As recommended by Yang et al. (2016), we therefore used receptive and expressive communication age equivalents for correlational analyses.

Peabody Picture Vocabulary Test – 4 (PPVT-4). Receptive vocabulary skills were assessed using the PPVT-4 (Dunn & Dunn, 2007). In this test, the child is asked to point to a picture (from four choices on a page) that matches the word spoken by the examiner. The PPVT-4 has been normed for children (from 2;6 years) and adults and provides a standard score. It has excellent reliability (test-retest = .93; split-half = .94), and is reported to have an average concurrent correlation of .82 with the *Expressive Vocabulary Test, Second Edition* (Williams, 2007). The PPVT-4 was standardized on a large sample that included children from a range of ability levels and has been used extensively in previous research examining language skills of children with autism (e.g., Condouris et al., 2003). For the current study we used Standard Scores both for descriptive purposes and to investigate correlations between performance on the PPVT-4 and oral narrative production and comprehension performance.

Oral narrative production and comprehension task. For this task, we used the standard guidelines for administering the *Profile of Oral Narrative Ability* task, as described in Westerveld and Gillon (2010) and Westerveld et al. (2012). In summary, the participants listened twice to an audio-recording of *Ana gets Lost* (Swan, 1992), while looking at the pictures from the book on a computer screen. Following the first exposure, eight comprehension questions were asked. If the participants did not provide an answer or if their answer was clearly incorrect, they were given the correct answer by the examiner. After the second exposure, participants were asked to retell the story without the use of pictures.

Participants were only provided with neutral prompts when necessary to encourage them to start and/or continue retelling the story.

This task has been used successfully in the past with four-year-old children (Westerveld et al., 2012). Westerveld et al. administered the narrative retell and comprehension task to 92 four-year-old preschoolers (54 girls, 38 boys) with typical development with the aim of obtaining local norms for clinical purposes. Children were aged between 4;0 and 4;11, spoke English as their first language, and had no history of speech and/or language difficulties. Results from this study showed that performance on the task was sensitive to age (p <.05). The task showed adequate criterion-related validity with the PPVT-4 (Dunn & Dunn, 2007) at age 4 on oral narrative comprehension (r = .54, p < .001), and with the *Understanding Spoken Paragraphs* subtest of the Clinical Evaluations of Language Fundamentals – Fourth Edition (CELF-4; Semel, Wiig, & Secord, 2006) at age 5 (r = .39, p < .001). Predictive validity was adequate with performance at age 4 on the narrative comprehension aspect of the task showing moderate-to-large correlations with performance on the Understanding Spoken Paragraphs subtest 12 months later (r = .44, p < .001)).

Transcription and Analysis

All stories were recorded and transcribed verbatim, using standard Systematic Analysis of Language Transcripts – New Zealand / Australia conventions (Miller, Andriacchi, Nockerts, Westerveld, & Gillon, 2016), by a speech pathology assistant experienced in language sample transcription. Utterances were segmented into communication units and all reformulations, repetitions, and filled pauses were considered mazes and put in brackets. Unintelligible words were transcribed as an X. Each utterance was appraised for overall grammatical accuracy, following the procedure described by Fey, Catts, Proctor-Williams, Tomblin, and Zhang (2004). Only complete and intelligible utterances were included in the analysis. The first author subsequently checked all transcripts by

listening to the sound files and checking for errors. There were no disagreements regarding utterance segmentation, coding of mazing behavior, or coding of unintelligible segments. A consensus process was used to determine grammatical accuracy.

Oral narrative comprehension was evaluated based on children's answers to the story comprehension questions. All answers to the comprehension questions were transcribed verbatim and scored using a scoring guide (see Westerveld et al., 2012). A second examiner independently scored all 28 children's responses using the same guide. A Krippendorff alpha coefficient was calculated to document agreement between scorers (Krippendorff, 1980). Krippendorff alpha was .97, indicating excellent agreement.

For this study, the questions were divided into factual (i.e., the information was stated explicitly in the text) and inferential questions as described in Norbury and Bishop (2002). The inferential questions were further divided into: 1) text-connecting in which children had to combine information provided across more than one sentence to answer the question; and 2) emotional state questions. The questions are listed in Table 2.

Microstructure measures. The following measures were calculated automatically using SALT-NZ/AU (Miller, Gillon, & Westerveld, 2015): a) total number of utterances as a measure of verbal productivity; b) number of different words (NDW) as a measure of semantic diversity; c) mean length of utterance in morphemes (MLU-M) as a measure of syntactic ability; d) percentage of grammatically accurate utterances as a measure of grammatical accuracy (Fey et al., 2004); e) percent maze words as a measure of verbal fluency; and f) percent intelligible utterances as a measure of overall intelligibility.

Macrostructure measures. To evaluate the narratives at macrostructure level, all stories were scored for inclusion of the following 10 critical events: 1) Ana is at home; 2) Parents have gone out; 3) Ana asks her brother to play, he says no; AND Nothing to do; OR she gets bored; 4) Her brother falls asleep; 5) Ana leaves the house to look for mum and dad;

6) She gets lost OR does not know what to do and cries OR Ana is scared; 7) A policeman finds her; 8) The policeman takes her home; 9) Parents are happy to see her; 10) The policeman drives away OR tells Ana not to get lost again. We also determined the type of oral narrative the child produced, using the story grammar decision tree created by Westby (2005, p. 181): a) descriptive sequence if the story simply described events; b) action sequence, if the story included temporally related events; c) reactive sequence, if the story included a causally related sequence of events; d) abbreviated episode, if the story implied goal-directed behaviour; or e) complete episode, if the story contained planning or intentional behavior. All stories were scored for inclusion of critical events and for the type of narrative by two speech pathology researchers, using a consensus process until 100% agreement was reached.

Results

Initial Analysis

First, we inspected the data for outliers and found one outlier for inclusion of critical events. This child included eight critical events when retelling the story (#26). As the performance of this child significantly influenced the results, we excluded this child's performance from all further analyses.

Of the remaining 28 participants, 23 children attempted to retell the story; 19 of those produced a story that was based on the model story *Ana gets Lost;* 4 children produced an unrelated 'story'. Five children did not produce a story retell. To investigate whether the children's ability to retell the original story was related to age, developmental quotient, communication skills, or their score on the Social Communication Questionnaire (SCQ), we compared the three groups on these measures. Results from Independent samples Kruskall Wallis tests showed there were no significant group differences on age (p = .885), PPVT-4 SS (p = .438), Developmental Quotient derived from the MSEL (p = .172), VABS-II

Communication SS (p = .962), or SCQ total score (p = .498). Furthermore, there were no obvious group differences in SES (as measured by the mother's highest level of education) or home literacy environment (based on parent reported frequency of story book reading in the home). We also compared the groups' performance on oral narrative comprehension, but again no significant group differences were found (p = .472). Table 1 shows the demographic details for the overall group of children (n = 28) as well as the children who retold the original story (n = 19) or did not retell the original story (n = 9).

When answering the research questions in the sections below, we based our oral narrative comprehension analyses on all children (n = 28), and focused on the subgroup of children who attempted to retell the Ana story (n = 19) when analyzing the oral narrative production data.

Insert Table 1

Participant Performance on the Narrative Retell and Comprehension Task

To answer research question one, we first analyzed children's (n = 28) narrative comprehension performance. Overall, group performance was poor with the mean performance of 1.75 questions answered correctly (out of 8). We subsequently determined which questions were answered correctly. As shown in Table 2, our results indicated that at group level, the children performed better on the factual questions (Q1, 7, and 8) and had difficulty answering inferential questions that required text-connecting skills (e.g., why did Ana have to stay at home?) or that referred to the emotional state of being bored.

Insert Table 2

Next, we analyzed the children's stories (n = 19) at microstructure level on measures of verbal productivity, syntactic complexity, grammatical accuracy, semantic diversity, and verbal fluency. When comparing the preschool-age participants with autism to the database of four-year-old children (Westerveld et al., 2012), we found that the children with autism as

a group performed within the age-expected range for measures of verbal productivity (z-score = .07) and semantic diversity (z-score = -.03), and in the low average range for MLU-M (z-score = -.75). However, grammatical accuracy of the children on the autism spectrum was below the level expected from four-year-olds (z-score = -1.24) (Westerveld et al., 2012). When comparing the participants' intelligibility and verbal fluency to the four-year-old database of language samples integrated into SALT-NZAU (Miller et al., 2015), it was found that verbal fluency was within normal limits (z-score = -.70), but intelligibility was more than two standard deviations below the database mean of 97.48% (z-score = -2.67). Table 3 shows the results.

Insert Table 3 here

Next, we appraised the children's performance at macrostructure level on the inclusion of critical events. As shown in Table 3, on average the participants only included 1.95 critical events (range 0 – 4). Further inspection (see Table 4) showed that few children included setting information; over 70% of the children mentioned the problem (Ana gets lost); 44.4% of children mentioned a solution to the problem (i.e., the policeman finding her and/or bringing her home). When analyzing participants' narrative organization using Westby's (2005) decision tree, we found that two children's narratives could not be scored; eight children used a descriptive sequence; six children used an action sequence; two a reactive sequence; and one child produced an abbreviated episode.

Insert Table 4 here

Correlations between Oral Narrative Performance and Norm-referenced Language Measures

To investigate whether children's performance on norm-referenced measures of language was related to their oral narrative abilities, we first calculated partial correlations (correcting for age) between performance on the PPVT-4 (standard scores) and performance

on microstructure and macrostructure measures of oral narrative ability (utterances, NDW, MLU-M, GA, critical events, comprehension). Significant positive correlations were found between PPVT-4 standard scores and NDW (r = .629) and oral narrative comprehension (r = .609). Next, we calculated correlations between VABS-II receptive and expressive communication age-equivalence scores and oral narrative performance measures. Significant correlations were found between VABS-II receptive communication age-equivalence and grammatical accuracy (r = - .485), and between VABS-II receptive communication age-equivalence and oral narrative comprehension (r = .482); VABS-II expressive age-equivalence showed no significant correlations with any of the oral narrative measures. Table 5 shows the results.

Insert Table 5 here

Discussion

This study evaluated the oral narrative comprehension and production skills of a group of 29 preschoolers on the autism spectrum who obtained at least an age equivalence of 36 months on the expressive communication subscale of the Vineland Adaptive Behavior Scales (VABS-II). All children participated in the fictional narrative retell and comprehension task *Ana gets Lost* that has been used successfully in previous research with preschool-age children (Westerveld, 2014; Westerveld et al., 2012). Once removing one outlier from analysis, our results showed that 82% (n = 23) of the participants attempted to retell a story; however, only 19 children produced an analyzable oral narrative that was based on the model story. Inspection of the children's age, nonverbal cognition, receptive language and communication profiles did not explain why some children were able or willing to produce a narrative retell and others were not. These results suggest that other factors may have played a role, such as general interest or motivation. Future research into the oral

narrative abilities of preschool-age children on the autism spectrum should incorporate behavioral observations to further explore these explanations.

Our first research question was aimed at describing the children's oral narrative comprehension and production performance. When investigating the children's performance on the oral narrative questions, we divided them into factual and inferential questions. As shown in Table 2, more children were able to answer factual questions than inferential questions. Although this pattern of performance may potentially indicate a focus on detail consistent with the weak central coherence account (Happé & Frith, 2006), it should be noted that the four-year-old children with typical development whose data were incorporated into SALT-NZAU (Miller et al., 2015) also performed better on factual vs inferential questions. However, closer inspection of the results shows that very few children with autism were able to answer inferential questions, particularly the question, 'Why did Ana get bored', which only one child answered correctly (as opposed to 39% of the children in the SALT-NZAU dataset). Furthermore, only 21.4% of our participants on the autism spectrum correctly answered question 5 ('Why did Ana get scared?'), as compared to 76.1% of children in this same dataset. Another explanation for these oral narrative comprehension difficulties for children with autism pertains to their challenges with theory of mind tasks (Kimhi et al., 2014).

We next examined children's oral narrative production skills at microstructure level and compared their performance to our dataset of four-year-old children with typically developing language (Westerveld et al., 2012). As shown in Table 3, there was wide variability in performance on all measures, which is consistent with previous research into the spoken language skills of preschoolers on the autism spectrum (Boucher, 2012; Ellis Weismer & Kover, 2015). Results indicated relative strengths in productivity, semantic diversity, and grammatical complexity (MLU-M). These results were perhaps not surprising,

considering the participants in this study were all verbal and as a group scored in the (low) average range on norm-referenced measures of communication and receptive vocabulary (Diehl et al., 2006). In contrast, relative weaknesses were observed on measures of grammatical accuracy and intelligibility. The participants' intelligibility ranged from 50 to 100% (average 79%), which is significantly lower than expected in four-year-old children and seems to contradict the common notion that speech production appears to be relatively spared in children with autism (Boucher, 2012). Unfortunately, we did not specifically assess children's speech production skills, so it is not clear if the low intelligibility is related to phonological delays / articulation errors or inclusion of non-English consonant combinations (Schoen et al., 2011), or due to the added prosodic demands of the oral narrative task (Peppé, McCann, Gibbon, O'Hare, & Rutherford, 2007). Alternatively, it seems likely that the complexity of the task may have influenced children's grammatical accuracy and intelligibility. Consistent with a limited capacity working memory model, there may have been a trade-off between linguistic processes involved in producing an oral narrative (see Crystal, 1987).

At macrostructure level, we found that, on average, the children only included two of the 10 critical events when retelling the story after two exposures. These results extend the findings from previous studies into the oral narrative skills of school-age children with autism as reviewed in recent systematic reviews (Baixauli et al., 2016; Stirling, Douglas, Leekam, & Carey, 2014) to a younger age-group. Furthermore, the results highlight the significant challenges children with autism have in producing a coherent narrative at macrostructure level, despite relative strengths at microstructure level. Further analysis of our findings, as shown in Table 4, showed that 68% of the children were able to include the theme of the story (Ana getting lost), and 40% of the children referred to one of the resolutions (policeman finding Ana or taking her home). When evaluating the narratives using Westby's (2005) story

grammar decision tree, we noted that the majority of the children (78%) simply produced descriptive or action sequences, implying a lack of understanding of goal-directed behavior. Overall, these results seem to confirm the notion of the weak central coherence theory, according to which children with autism focus on detail rather than the bigger picture (Happé & Frith, 2006). Alternatively, a subgroup of these children may show a delay in oral narrative ability as their narratives resembled those of three-year-old children (Trabasso & Nickels, 1992). Following these children longitudinally may help clarify this issue of delay versus disorder.

Our second research question asked if children's performance on norm-referenced language tasks was related to their oral narrative comprehension and/or production abilities. As shown in Table 5, children's performance on the PPVT-4 was significantly correlated with oral narrative production (number of different words) and oral narrative comprehension, confirming the important role vocabulary plays in understanding and retelling oral narratives, not only for typically developing preschool-age children (Westerveld et al., 2012), but also for preschool-age children on the autism spectrum. Parent report of their children's receptive language skills (VABS-II) showed significant, but moderate positive correlations with oral narrative comprehension, indicating both tests tap into the same oral language construct. The moderate strong, but negative correlation between VABS-II receptive language and children's grammatical accuracy was unexpected and difficult to explain. Perhaps low grammatical accuracy of their child's spontaneous language influenced parents' perception of their child's ability to understand spoken language. In contrast, parent report of their children's expressive communication skills using the VABS-II did not correlate significantly to any of the oral narrative measures. The most reasonable explanation for this finding is that the oral narrative task requires more complex (text-level) expressive language skills that are not captured in the questions of the VABS-II expressive communication subtest.

Alternatively, the limited range in scores on the VABS-II expressive communication subtest due to the fact that only children who scored at least an age equivalence of 36 months were included in the study, may have resulted in a weak correlation between this VABS-II subtest and any of the oral narrative measures. Furthermore, the children's low intelligibility may have influenced these findings by masking children's performance on some of the oral narrative production measures.

Limitation and Future Directions

Despite the fact that this study was designed to address some of the limitations observed in previous studies investigating the oral narrative skills of children on the autism spectrum, including age range, sample size, and control group (see, for example Stirling et al., 2014, for a discussion), several shortcomings should be addressed in future research. The fact that a number of children did not retell a narrative was somewhat concerning and was not easily explained by the children's overall language or cognitive performance. Future research should investigate adapting the oral narrative elicitation methods to better meet the needs or interests of preschool children with autism. The low intelligibility in our group of children on the autism spectrum was also concerning and may have masked some of the potential correlations between oral narrative production skills and norm-referenced language measures. Future investigations should utilize video-recordings when evaluating oral narrative proficiency in pre-schoolers on the autism spectrum.

Future research may also consider using a more comprehensive battery of oral language abilities, including a more objective measure of broader language skills (Park et al., 2012). Regardless, the VABS-II has allowed us to investigate the links between the children's functional spoken communication skills in everyday environments and their oral narrative comprehension and production abilities. Finally, future research may want to consider other

factors that influence oral narrative proficiency, such as executive functioning skills or whether the children received oral narrative intervention in the past.

Conclusions and Clinical Implications

This study provides preliminary evidence of specific difficulties in oral narrative production and comprehension in pre-school children on the autism spectrum. Consistent with previous research involving older children with autism, as a group the preschool-age participants showed difficulties in oral narrative comprehension, particularly answering inferential questions tapping emotional states. Although the children showed relative strengths in narrative microstructure measures of vocabulary and syntax, weaknesses were observed at macrostructure level. Most children produced descriptive or action sequences involving only two or three critical events, demonstrating little or no evidence of goal-directed behavior. Taken together these results confirm early signs of a detail-focused cognitive style of processing, consistent with a weak central coherence account (Happé & Frith, 2006).

The results from this study showed that oral narrative assessment is doable for many young, verbal children on the autism spectrum. In this study, all 28 children participated in the oral narrative comprehension task and 19 of those children attempted to retell the original story. Importantly, the relatively quick oral narrative comprehension and production task yielded information beyond the word- and sentence-level that most norm-referenced language tests assess. Narrative analysis at macrostructure level may be particularly useful, not only to better understand the child's level of narrative development, but also to determine which specific critical events are included to help direct early intervention practices. Considering the importance of oral narrative ability to future language and literacy performance, we strongly recommend routine inclusion of an oral narrative task in the assessment battery for young verbal children on the autism spectrum.

Acknowledgments

We would like to thank the families and children for participating in this study. We are also grateful to our research assistants for collecting the data. The authors acknowledge the financial support of the Cooperative Research Centre for Living with Autism, established and supported under the Australian Government's Cooperative Research Centres Program.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Baixauli, I., Colomer, C., Roselló, B., & Miranda, A. (2016). Narratives of children with high-functioning autism spectrum disorder: A meta-analysis. *Research in Developmental Disabilities, 59*, 234-254. doi: 10.1016/j.ridd.2016.09.007

Bishop, D. V. M., & Adams, C. (1990). A prospective study of the relationship between specific language impairment, phonological disorders, and reading retardation. *Journal of Child Psychology and Psychiatry, 31*, 1027-1050. doi: 10.1111/j.1469-7610.1990.tb00844.x/pdf

Bishop, D. V. M., & Edmundson, A. (1987). Language-impaired 4-year-olds: Distinguishing transient form persistent impairment. *Journal of Speech and Hearing Disorders, 52*, 156-173.

Bishop, S. L., Guthrie, W., Coffing, M., & Lord, C. (2011). Convergent validity of the Mullen Scales of Early Learning and the Differential Ability Scales in children with autism spectrum disorders. *American Journal on Intellectual and Developmental Disabilities, 116*(5), 331-343. doi: 10.1352/1944-7558-116.5.331

Boucher, J. (2012). Research Review: Structural language in autistic spectrum disorder – characteristics and causes. *Journal of Child Psychology and Psychiatry, 53*(3), 219-233. doi: 10.1111/j.1469-7610.2011.02508.x

Boudreau, D. (2008). Narrative abilities - Advances in research and implications for clinical practice. *Topics in Language Disorders, 28*(2), 99-114.

Charman, T. (2004). Matching preschool children with autism spectrum disorders and comparison children for language ability: Methodological challenges. *Journal of Autism and Developmental Disorders, 34*(1), 59-64. doi: 10.1023/B:JADD.0000018075.77941.60

Cleland, J., Gibbon, F. E., Peppé, S. J. E., O'Hare, A., & Rutherford, M. (2010). Phonetic and phonological errors in children with high functioning autism and Asperger syndrome. *International Journal of Speech-Language Pathology, 12*(1), 69-76. doi: 10.3109/17549500903469980

Condouris, K., Meyer, E., & Tager-Flusberg, H. (2003). The relationship between standardized measures of language and measures of spontaneous speech in children with autism. *American Journal of Speech - Language Pathology, 12*(3), 349-358.

Crystal, D. (1987). Towards a "bucket" theory of language disability: Taking account of interaction between linguistic levels. *Clinical Linguistics and Phonetics, 1,* 7-22.

Davidson, M. M., & Ellis Weismer, S. (2014). Characterization and prediction of early reading abilities in children on the autism spectrum. *Journal of Autism and Developmental Disorders, 24*(4), 828-845. doi: 10.1007/s10803-013-1936-2

Diehl, J. J., Bennetto, L., & Young, E. C. (2006). Story recall and narrative coherence of high-functioning children with autism spectrum disorders. *Journal of Abnormal Child Psychology, 34*(1), 83-98. doi: 10.1007/s10802-005-9003-x

Dunn, L. M., & Dunn, D. M. (1997). *Peabody Picture Vocabulary Test - III*. Circle Pines, MN: American Guidance Service.

Dunn, L. M., & Dunn, D. M. (2007). *Peabody Picture Vocabulary Test - 4*. Circle Pines, MN: American Guidance Service.

Ebert, K. D., & Scott, C. M. (2014). Relationships between narrative language samples and norm-referenced test scores in language assessments of school-age children. *Language, Speech, and Hearing Services in Schools, 45*(4), 337-350. doi: 10.1044/2014_LSHSS-14-0034

Eigsti, I. M., Bennetto, L., & Dadlani, M. B. (2007). Beyond pragmatics: Morphosyntactic development in autism. *Journal of Autism and Developmental Disorders, 37*(6), 1007-1023. doi: 10.1007/s10803-006-0239-2

Eigsti, I. M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language acquisition in autism spectrum disorders: A developmental review. *Research in Autism Spectrum Disorders, 5*(2), 681-691. doi: 10.1016/j.rasd.2010.09.001

Ellis Weismer, S., & Kover, S. T. (2015). Preschool language variation, growth, and predictors in children on the autism spectrum. *Journal of Child Psychology and Psychiatry, 56*(12), 1327-1337.

Fey, M. E., Catts, H. W., Proctor-Williams, K., Tomblin, J. B., & Zhang, X. (2004). Oral and written story composition skills of children with language impairment. *Journal of Speech, Language, and Hearing Research, 47*(6), 1301-1318.

Griffin, T. M., Hemphill, L., Camp, L., & Wolf, D. P. (2004). Oral discourse in the preschool years and later literacy skills. *First Language, 24*, 123-127.

Happé, F., & Frith, U. (2006). The weak coherence account: Detail-focused cognitive style in autism spectrum disorders. *Journal of Autism and Developmental Disorders, 36*(1), 5-25. doi: 10.1007/s10803-005-0039-0

Heilmann, J., Miller, J. F., Nockerts, A., & Dunaway, C. (2010). Properties of the Narrative Scoring Scheme using narrative retells in young school-age children. *American Journal of Speech - Language Pathology, 19*(2), 154-166. doi: 10.1044/1058-0360(2009/08-0024)

Howlin, P. (2003). Outcome in high-functioning adults with autism with and without early language delays: Implications for the differentiation between autism and Asperger syndrome. *Journal of Autism and Developmental Disorders, 33*(1), 3-13. doi: 10.1023/A:1022270118899

Hughes, D., McGillivray, L., & Schmidek, M. (1997). *Guide to narrative language: Procedures for assessment*. Eau Claire, WI: Thinking Publications.

Justice, L. M., Bowles, R. P., Kaderavek, J. N., Ukrainetz, T. A., Eisenberg, S. L., & Gillam, R. B. (2006). The index of narrative microstructure: A clinical tool for analyzing school-age children's narrative performances. *American Journal of Speech-Language Pathology, 15*(2), 177-191.

Kim, S. H., Paul, R., Tager - Flusberg, H., & Lord, C. (2014). Language and Communication in Autism. In F. R. Volkmar, S. J. Rogers, R. Paul & K. A. Pelphrey (Eds.), *Diagnosis, Development and Brain Mechanisms* (4 ed., Vol. 1, pp. 230 - 262). Hoboken, NJ: Wiley

Kimhi, Y., Shoam-Kugelmas, D., Agam Ben-Artzi, G., Ben-Moshe, I., & Bauminger-Zviely, N. (2014). Theory of Mind and executive function in preschoolers with typical development versus intellectually able preschoolers with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 44*(9), 2341-2354. doi: 10.1007/s10803-014-2104-z

Kintsch, W. (2005). An overview of top-down and bottom-up effects in comprehension: The CI perspective. *Discourse processes, 39*(2-3), 125-128. doi: 10.1080/0163853X.2005.9651676

Krippendorff, K. (1980). *Content analysis: An introduction to its methodology*. Newbury Park, CA: Sage.

Landa, R. (2000). Social language use in Asperger syndrome and high-functioning autism. In A. Klin, F. R. Volkmar & S. S. Sparrow (Eds.), *Asperger syndrome* (pp. 125-155). New York: The Guilford Press.

Lord, C., Rutter, M., DiLavore, P. C., Risi, S., Gotham, K., & Bishop, S. (2012). *Autism Diagnostic Observation Schedule - second edition: ADOS-2*. Torrance, CA: Western Psychological Services.

Luyster, R. J., Kadlec, M. B., Carter, A., & Tager-Flusberg, H. (2008). Language assessment and development in toddlers with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 38*(8), 1426-1438. doi: 10.1007/s10803-007-0510-1

Merritt, D. D., & Liles, B. Z. (1989). Narrative analysis: Clinical applications of story generation and story retelling. *Journal of Speech and Hearing Disorders, 54*, 429-438.

Miller, J. F., Andriacchi, K., Nockerts, A., Westerveld, M., & Gillon, G. (2016). *Assessing Language Production using SALT Software. A Clinician's Guide to Language Sample Analysis. New Zealand - Australia version* (2 ed.). Middleton, WI: SALT Software.

Miller, J. F., Gillon, G. T., & Westerveld, M. F. (2015). *Systematic Analysis of Language Transcripts (SALT), New Zealand / Australia Version 16 [computer software]*. Madison, WI: SALT Software LLC.

Mullen, E. M. (1995). *Mullen Scales of Early Learning* Circle Pines, MN: American Guidance Service.

Norbury, C. F., & Bishop, D. V. (2002). Inferential processing and story recall in children with communication problems: A comparison of specific language impairment, pragmatic language impairment and high-functioning autism. *International Journal of Language and Communication Disorders, 37*(3), 227-251.

Norbury, C. F., & Bishop, D. V. M. (2003). Narrative skills of children with communication impairments. *International Journal of Language & Communication Disorders, 38*(3), 287-313. doi: 10.1080/136820310000108133

Norbury, C. F., Gemmel, T., & Paul, R. (2014). Pragmatics abilities in narrative production: A cross-disorder comparison. *Journal of Child Language, 41*(3), 485-510. doi: doi:10.1017/S030500091300007X

Nuske, H. J., & Bavin, E. L. (2011). Narrative comprehension in 4-7-year-old children with autism: Testing the Weak Central Coherence account. *International Journal of Language & Communication Disorders, 46*(1), 108-119. doi: 10.3109/13682822.2010.484847

Odom, S. L., Brown, W. H., Frey, T., Karasu, N., Smith-Canter, L. L., & Strain, P. S. (2003). Evidence-based practices for young children with autism contributions for single-subject design research. *Focus on Autism and Other Developmental Disabilities, 18*(3), 166-175.

Park, C. J., Yelland, G. W., Taffe, J. R., & Gray, K. M. (2012). Brief report: The relationship between language skills, adaptive behavior, and emotional and behavior problems in

pre-schoolers with autism. *Journal of Autism and Developmental Disorders, 42*(12), 2761-2766. doi: 10.1007/s10803-012-1534-8

Paul, R., & Smith, R. L. (1993). Narrative skills in 4-year-olds with normal, impaired, and late-developing language. *Journal of Speech and Hearing Research, 36*, 592-598.

Peppé, S., McCann, J., Gibbon, F., O'Hare, A., & Rutherford, M. (2007). Receptive and expressive prosodic ability in children with high-functioning autism. *Journal of Speech, Language, and Hearing Research, 50*(4), 1015-1028. doi: 10.1044/1092-4388(2007/071)

Ricketts, J., Jones, C. G., Happé, F., & Charman, T. (2013). Reading comprehension in Autism Spectrum Disorders: The role of oral Language and social functioning. *Journal of Autism and Developmental Disorders, 43*(4), 807-816. doi: 10.1007/s10803-012-1619-4

Roberts, T., & Neal, H. (2004). Relationships among preschool English language learner's oral proficiency in English, instructional experience and literacy development. *Contemporary Educational Psychology, 29*(3), 283-311.

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

Schoen, E., Paul, R., & Chawarska, K. (2011). Phonology and vocal behavior in toddlers with autism spectrum disorders. *Autism Research, 4*(3), 177-188. doi: 10.1002/aur.183

Semel, E., Wiig, E. H., & Secord, W. A. (2006). *Clinical Evaluation of Language Fundamentals - Fourth Edition - Australian Standardised Edition*. Marrickville: Harcourt Assessment.

Skarakis-Doyle, E., & Dempsey, L. (2008). Assessing story comprehension in preschool children. *Topics in Language Disorders, 28*(2), 131-148.

Sparrow, S. S., Cicchetti, D. V., & Balla, D. A. (2005). *Vineland II: Vineland Adaptive Behavior Scales*. Bloomington, MN: Pearson.

Stirling, L., Douglas, S., Leekam, S., & Carey, L. (2014). The use of narrative in studying communication in Autism Spectrum Disorders: A review of methodologies and findings. In J. Arciuli & J. Brock (Eds.), *Communication in Autism, Trends in Language Acquisition Research* (pp. 171-215). Amsterdam: John Benjamins.

Swan, E. (1992). *Ko au na galo (Ana gets lost)*. Wellington, NZ: Learning Media, Ministry of Education.

Tager-Flusberg, H. (2004). Strategies for conducting research on language in autism. *Journal of Autism and Developmental Disorders, 34*(1), 75-80. doi: 10.1023/B:JADD.0000018077.64617.5a

Tek, S., Mesite, L., Fein, D., & Naigles, L. (2014). Longitudinal Analyses of Expressive Language Development Reveal Two Distinct Language Profiles Among Young Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders, 44*(1), 75-89. doi: 10.1007/s10803-013-1853-4

Trabasso, T., & Nickels, M. (1992). The development of goal plans of action in the narration of a picture story. *Discourse processes, 15*(3), 249-275. doi: 10.1080/01638539209544812

Volden, J., Smith, I. M., Szatmari, P., Bryson, S., Fombonne, E., Mirenda, P., et al. (2011). Using the Preschool Language Scale, fourth edition to characterize language in preschoolers with autism spectrum disorders. *American Journal of Speech-Language Pathology, 20*(3), 200-208. doi: 10.1044/1058-0360(2011/10-0035)

Wagner, C. R., Sahlen, B., & Nettelbladt, U. (1999). What's the story? Narration and comprehension in Swedish preschool children with language impairment. *Child Language Teaching & Therapy, 15*(2), 113-137.

Westby, C. E. (2005). Assessing and remediating text comprehension problems. In H. W. Catts & A. G. Kamhi (Eds.), *Language and reading disabilities* (2nd ed., pp. 157-232). Boston, MA: Pearson Education.

Westerveld, M. F. (2014). Emergent literacy performance across two languages: Assessing four-year-old bilingual children. *International Journal of Bilingual Education and Bilingualism, 17*(5), 526-543. doi: 10.1080/13670050.2013.835302

Westerveld, M. F., & Gillon, G. T. (2010). Profiling oral narrative ability in young school-aged children. *International Journal of Speech-Language Pathology, 12*(3), 178-189. doi: 10.3109/17549500903194125

Westerveld, M. F., Gillon, G. T., & Boyd, L. (2012). Evaluating the clinical utility of the Profile of Oral Narrative Ability in 4-year-old children. *International Journal of Speech-Language Pathology, 14*(2), 130-140. doi: 10.3109/17549507.2011.632025

Westerveld, M. F., Gillon, G. T., & Miller, J. F. (2004). Spoken language samples of New Zealand children in conversation and narration. *Advances in Speech-Language Pathology, 6*(4), 195-208. doi: 10.1080/14417040400010140

Westerveld, M. F., & Heilmann, J. J. (2012). The Effects of Geographic Location and Picture Support on Children's Story Retelling Performance. *Asia Pacific Journal of Speech, Language and Hearing, 15*(2), 129-143. doi: 10.1179/jslh.2012.15.2.129

Westerveld, M. F., Paynter, J., Trembath, D., Webster, A. A., Hodge, A. M., & Roberts, J. (2017). The emergent literacy skills of preschool children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 47*(2), 424-438. doi: 10.1007/s10803-016-2964-5

Westerveld, M. F., & Vidler, K. (2016). Spoken language samples of Australian children in conversation, narration and exposition. *International Journal of Speech-Language Pathology, 18*(3), 288-298. doi: 10.3109/17549507.2016.1159332

Williams, D., Botting, N., & Boucher, J. (2008). Language in autism and specific language impairment: Where are the links? *Psychological Bulletin, 134*, 944-963.

Williams, K., & Roberts, J. (2015). *Understanding Autism: The essential guide for parents*. Australia: Exisle Publishing.

Williams, K. T. (2007). *Expressive Vocabulary Test, Second Edition*. Bloomington, MN: Pearson Assessments.

Yang, S., Paynter, J., & Gilmore, L. (2016). Vineland Adaptive Behavior Scales: II profile of young children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 46*(1), 64-73. doi: 10.1007/s10803-015-2543-1

Young, E. C., Diehl, J. J., Morris, D., Hyman, S. L., & Bennetto, L. (2005). The use of two language tests to identify pragmatic language problems in children with autism spectrum disorders. *Language, Speech, and Hearing Services in Schools, 36*(1), 62-72. doi: 10.1044/0161-1461(2005/006)

Table 1. Participant data

Variable	**Full sample**	**Produced a story retell**	**Did not produce story retell**
N	28	19	9
Age in months	57.32 (5.74)	57.11 (5.91)	57.78 (5.70)
Range	48 – 69	48 – 69	50 – 68
Mother's highest level of education: secondary/ tertiary	8 / 20	7 / 12	1 / 8
Frequency of book reading: Sometimes/often/very often	8 / 5 / 15	5 / 2 / 12	3 / 3 / 3
VABS-II Comm SS	89.0 (8.96)	88.53 (7.76)	90.0 (11.58)
	76 – 110	76 – 102	78 – 110
PPVT-4 SS	97.25 (15.10)	95.68 (14.24)	100.56 (17.18)
	73 – 124	73 – 119	81 – 124
Nonverbal cognition	85.64 (18.37)	82.46 (19.22)	92.34 (15.28)
	44.0 – 119.23	44.0 – 119.23	64.91 – 110.53
SCQ total score	16.29 (6.31)	16.89 (6.52)	15.00 (6.00)

Note. VABS-II Comm: Vineland Adaptive Behavior Scales, Communication subdomain; PPVT-4: Peabody Picture Vocabulary Test; SS: Standard score; SCQ: Social Communication Questionnaire.

Table 2. Performance on the narrative comprehension questions (*n* = 28)

No.	**Question**	**Type of Question**	**n / %**	**Database# %correct**
1	Who was the story about?	Factual	7 / 25	70.6%
2	Why did Ana have to stay at home?	Inferential: text-connecting	5 / 17.9	52.3%
3	Why did Ana get bored?	Inferential: emotional state	1 / 3.6	39.4%
4	Where did she go to find her parents?	Inferential: text connecting	2 / 7.1	37.6%
5	Why did she get scared?	Inferential: emotional state	6 / 21.4	76.1%
6	Who found Ana?	Factual	15 / 50	95.4%
7	What did the policeman do?	Factual	10 / 35.7	88.1%
8	Why were Ana's parents happy to see her?	Inferential – emotional state / other	4 / 14.3	21.1%

Note. Number of participants who answered the questions correctly. # compared to a normative sample of four-year-old children (Westerveld et al., 2012).

Table 3. Participants' performance on the narrative retell and comprehension task (*n* = 19)

Measures	**Mean (SD)**	**Range**	**Database[a] Mean (SD)**	**Z-score[b]**
Utterances	8.42 (3.89)	3 – 15	8.1 (4.6)	0.07
NDW	23.00 (9.26)	9 – 40	28 (15.2)	- 0.03
MLU-M	4.70 (1.22)	2.77 – 7.86	5.9 (1.6)	- 0.75
GA	48.16 (24.23)	0 – 85.71	76.6 (23)	- 1.24
Verbal fluency	3.85 (3.52)	0 – 11.00	10.29 (9.2)	- 0.70
Intelligibility	78.79 (16.47)	50 – 100	97.48 (7.01)	- 2.67
Critical events[c]	1.95 (1.13)	0 – 4	--	
Comprehension[d]	1.75 (1.82)	0 – 6	4.6 (1.6)	- 1.78

Note. NDW: number of different words; MLU-M: Mean Length of Utterance in Morphemes; GA: grammatical accuracy; Verbal fluency: percent maze words; Intelligibility: percent intelligible utterances.

[a] see Westerveld et al. (2012)

[b] Participant mean compared to the database

[c] No database information available

[d] *n* = 28

Table 4. Participants' inclusion of critical events when retelling the story (*n* = 19)

No.	**Events**	**Component**	**n / %**
1	Ana is home	Setting	1 / 5.3
2	Parents have gone out	Setting	0 / 0
3	Ana asks her brother to play-he says no, OR she gets bored	Problem	2 / 10.5
4	Her brother falls asleep	Setting	1/ 5.3
5	Ana leaves the house to look for her mum and dad	Plan	1 / 5.3
6	Ana gets lost OR does not know what to do OR is scared	Problem /Theme	13 / 68.4
7	A policeman finds her	Resolution	8 / 42.1
8	The policeman takes her home	Resolution	6 / 31.6
9	Parents are happy to see her	Ending	1 / 5.3
10	The policeman drives away OR tells Ana not to get lost again	Ending	4 / 21.1

Table 5. Correlations between norm-referenced oral language measures and oral narrative performance (n = 19)

Tests	**Utterances**	**NDW**	**MLU-M**	**GA**	**Critical events**	**ONC**
PPVT-4 SS[#]	.173	.629**	.227	-.071	.349	.609**
VABS-II R_AE	-.201	-.125	-.110	-.485*	.439	.482*
VABS-II E_AE	.169	.035	-.354	-.366	.429	.154

Note. PPVT-4: Peabody Picture Vocabulary Test – 4th Edition; SS: Standard Score; VABS-II: Vineland Adaptive Behavior Scales, Communication subscale; R: receptive; E: Expressive; AE: Age-Equivalence score; NDW: number of different words; MLU-M: mean length of utterance in morphemes; GA: grammatical accuracy in percent grammatically accurate utterances; ONC: oral narrative comprehension.

[#]partial correlations, correcting for age.

[*] $p < .05$; ** $p < .01$