Shared book reading intervention for preschoolers on the autism spectrum

Final Report

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REPORT

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The Cooperative Research Centre for Living with Autism (Autism CRC)

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1 Literature review

1.1 INTRODUCTION

Literacy learning commences from birth and this period of literacy development is often referred to as the *emergent* literacy stage (Pullen & Justice, 2003). During those early years, many children engage in a variety of activities that promote early literacy including shared book reading with their parents or caregivers. There is ample empirical evidence with typical populations confirming the importance of these shared home book reading practices in enhancing young children's emergent literacy skills (Fletcher & Reese, 2005; Sénéchal, 1997). Although literacy is not considered a core impairment for children on the autism spectrum, approximately 40% of school-aged children on the autism spectrum struggle with reading (Nation, Clarke, Wright, & Williams, 2006), and results from our recently published study (Westerveld et al., 2017) revealed significant difficulties in emergent literacy in this group of children. The current study aimed to investigate if a shared book reading intervention would help facilitate early functional spoken language and emergent literacy skills in preschoolers on the autism spectrum in a context that is part of most family routines (Marquenie, Rodger, Mangohig, & Cronin, 2011). The small–scale study built on the existing research showing the efficacy of shared book reading with typically developing children (Mol, De Jong, Smeets, & Bus, 2008; Sénéchal, 1997). It is the first of its kind using a block randomised design to investigate the effectiveness of this type of intervention for improving both parent-child book reading behaviours and the spoken language skills of preschool children on the autism spectrum.

1.2 EMERGENT LITERACY AND THE HOME LITERACY ENVIRONMENT

Emergent literacy skills may be viewed as comprising two sets of skills: 1) the print-related skills children will need for accurate word reading; these include letter name knowledge, early phonological awareness (e.g., *pat* starts with the /p/ sound), and more general print concepts, such as reading from left to right and the realisation that printed words may carry meaning; 2) the meaning-related (spoken language) skills children need to understand written texts; these include vocabulary, grammar, and the ability to understand and retell stories. Emergent literacy skills generally develop during the preschool years, prior to formal reading instruction, when children are exposed to literacy rich environments and engaged in literacy-related activities. Within a social-constructivist framework, one may conceptualise that facilitation of children's early language and emergent literacy skills is based on social interactions between the child and the caregiver.

Based on a review of the existing research literature, there seem to be six key shared book reading-related behaviours that are most predictive of children's later literacy skills. These include frequent exposure to 'book language' (i.e., words you may not encounter in daily conversations), joint attention and child interest, adult responsiveness, explicit teaching of meaning-related and print-related skills, and parents' provision of correct language models (Dickinson, Griffith, Michnick Golinkoff, & Hirsh-Pasek, 2012; Whitehurst & Lonigan, 1998). In other words, although frequency of shared book reading and access to children's books in the home are clearly important, the influence of child characteristics (motivation, interest in print-related materials, and oral language skills) (Sawyer et al., 2014) cannot be overlooked. Considering children on the autism spectrum often show challenges in both spoken language development and in engaging in social interaction, shared book reading may not

be the most preferred activity by these children or their parents (Westerveld & van Bysterveldt, 2017). In turn, this means preschoolers on the spectrum potentially miss out on an amazing opportunity to engage in an activity that has been shown to promote language development, social skills and parent-child bonding (Brown, Westerveld, & Gillon, in press; Fletcher & Reese, 2005).

1.3 SHARED BOOK READING PRACTICES WITH PRESCHOOLERS ON THE AUTISM SPECTRUM

Results from our previous study (CRC 2.024RI; Westerveld et al., 2016) into the home literacy practices of families with preschool children on the autism spectrum indicated relatively rich home literacy environments. Most parents (87%) reported they started reading to their child before the age of one; all parents owned at least 20 children's books; and 66% of parents reported reading to their child 'often' or 'very often'. However, our results also revealed that the parents reported lower child interest in books than a comparison group of parents who had children with Down syndrome (Westerveld & van Bysterveldt, 2017), which may potentially affect the duration and the quality of the shared book reading interactions. Previous studies into the shared book reading practices of parents with their preschoolers on the autism spectrum showed similar results. For example, Lanter, Freeman & Dove (2013) noted that parents of preschoolers on the autism spectrum reported their children were less likely to show enjoyment during shared book reading when compared to their typically developing peers, matched for language age. In contrast, no group differences were found in frequency of shared book reading, nor in the number of children's books available in the home.

1.4 SHARED BOOK READING INTERVENTION

Shared book reading interventions generally target one or a combination of six key shared book reading-related parent behaviours we discussed earlier: increase use of 'book language', fostering joint attention and child interest; ensuring adult responsiveness, enhancing explicit teaching of meaning-related and/or print-related skills, and improving parents' ability to provide correct language models (Dickinson et al., 2012). The key child outcomes of these shared book reading interventions are to enhance children's spoken language and emergent literacy skills. Studies into the effects of relatively brief shared book reading interventions for typically developing children have yielded promising results. Studies found changes in parent behaviours, such as changes in the types of questions parents asked and improvements in parents' ability to provide correct language models during shared book reading (Whitehurst et al., 1988). Furthermore, improvements were found across children's print-related and meaning-related emergent literacy skills, dependent on the focus of the intervention program. For example, improvements were found in children's meaning-related spoken language skills of vocabulary (Whitehurst et al., 1988), and parents' and children's mentions of the book's plot (Aram, Fine, & Ziv, 2013); and in print-related skills, including parents' use of print-referencing (Justice & Ezell, 2000), children's print- and word-awareness (Justice & Ezell, 2000), and children's early phonological awareness skills (Sim, Nicholson, Walker, Berthelsen, & Fielding-Barnsley, 2014). Surprisingly, few studies have been published investigating the effects of parental shared book reading intervention for preschoolers on the autism spectrum (Bellon, Ogletree, & Harn, 2000; Fleury, Miramontez, Hudson, & Schwartz, 2014; Whalon, Martinez, Shannon, Butcher, & Hanline, 2015).

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We located only a handful of studies, all of which employed single subject designs. Results from these studies indicated an increase in the duration of shared book reading, as well as an increase in the children's verbal participation. As with all studies using a single-case subject design, larger follow up studies are needed to determine if the results are generalisable to the broader group of preschoolers on the autism spectrum. The current study aimed to address this gap in the research by conducting a small-scale randomised control group design study. The study specifically aimed to enhance meaning-related emergent literacy skills based on the results from our previous research (Westerveld et al., 2017).

1.5 RESEARCH QUESTIONS

1) Does an eight week shared book reading intervention change the following parent behaviours observed during shared book reading:
   • use of book-related vocabulary?
   • instances of explicit teaching of meaning-related skills related to the overall story?
2) Does the intervention affect the following child behaviours / verbal participation during shared book reading:
   • number of child utterances?
   • the number of different words the child used (expressive vocabulary)?
3) Does the intervention result in an improvement in children's receptive vocabulary skills:
   • book specific vocabulary?
   • receptive vocabulary performance on a standardized test?
4) Are the results maintained at follow-up, eight weeks after the intervention ceased?

2 Research Methods

2.1 DESIGN

This research involved a pre-test post-test randomised control group design to investigate the effects of an intensive, parent-child shared book reading intervention for children on the autism spectrum. Table 1 shows the assessment and intervention schedule.

TABLE I. GROUP ASSESSMENT AND INTERVENTION SCHEDULE

Group	Assessment 1	Intervention A	Assessment 2	Intervention B	Assessment 3
Intervention	✓	✓	✓	Wait	✓
Waitlist	✓	Wait	✓	✓	✓

Ethics permission was granted by the Griffith University Human Ethics Committee (AHS/13/14/HREC) with gatekeeper approval provided by the AEIOU Foundation.

2.2 RECRUITMENT

Inclusion criteria were as follows (a) children had received a written clinical diagnosis of autism spectrum disorder in the community, sighted by the research team, (b) children were less than 6 years of age and had not yet started formal schooling, (c) children were able to attend to a book for approximately 5 minutes, (d) children regularly engaged in shared book reading with their parents, and (e) children were not currently attending any other book reading programs. A total of 24 parents expressed an interest in the study and started the assessment process.

2.2.1 Autism Diagnosis

To verify autism diagnosis, we used the Autism Diagnostic Observation Schedule (ADOS-2). Fourteen children had completed the ADOS prior to commencing the study and met criteria for autism diagnosis. Administration of the ADOS was offered to the remaining children, with consent received from parents of 5 children; one parent declined. In addition, we asked parents to complete the Social Communication Questionnaire (Rutter, Bailey, & Lord, 2003) and used a cut-off of 11 following Lee et al.'s (2007) guidelines. As a result, no children were excluded from this study on the basis of their autism diagnosis resulting in a total of 24 children, aged between 3 years, 3 months, and 6 years 3 months (mean age 55.2 months; SD = 8.5 months) completing the initial assessment phase. All families resided in the greater Brisbane and Gold Coast areas. Participants were recruited through AEIOU early childhood services for children with autism ($n = 18$), private speech pathology clinics ($n = 5$), and Applied Behavioural Analysis Services ($n = 1$).

2.2.2 Attrition

One child did not complete the initial assessment phase and withdrew before random allocation took place. Of the remaining 23 children, 12 were randomly selected to start the intervention, with 10 completing it in its entirety. Of the 11 children allocated to the waitlist

group, 7 completed the second assessment and 4 withdrew. Reasons for withdrawal were mostly timing issues related to current commitments and parent workload.

2.2.3 Participants

Table II gives an overview of the participant characteristics, including age, autism symptom severity, nonverbal cognition and receptive vocabulary skills. Mothers' level of education was used as an indicator of socioeconomic status (SES). Parent report indicated that 17% of mothers had completed year 12 (highest level of school education in Australia) and the remaining 83% of mothers had gone beyond year 12 to complete tertiary studies. Of the primary caregivers 82% spoke English as their first language, other primary languages included Arabic, Tagalog and Japanese.

As shown in Table II there were no significant group differences in age, nonverbal intelligence, autism characteristics as measured by the Social Communication Questionnaire, or receptive vocabulary at Time 1, prior to intervention.

TABLE II. PARTICIPANT CHARACTERISTICS

	Intervention (n = 10)		Wait List (n = 7)		Group comparison p values
	Mean (SD)	Range	Mean (SD)	Range	
Age (months)	55.4 (5.3)	45-63	52.7(7.3	39-61	$p = .39$
SCQ (n = 16)	19.7(7.3)	5-27	17.0 (7.2)	10 - 30	$p = .46$
DQ	55.7(18.8)	39-92	64.7(23.5)	40-102	$p = .39$
Gender (M/F)	(8/2)		(6/1)		
PPVT (SS)	69.5(12.8)	54-90	74.3(19.9)	43-102	$p = .55$
PPVT (Age Equivalent)	33.9 (8.1)	24 - 34	36.1 (11.9)	24 - 57	$p = .65$

Note: SCQ = Social Communication Questionnaire; DQ = Developmental Quotient; PPVT = Peabody Picture Vocabulary Test.

2.3 PROCEDURE

Prior to the intervention (Time 1), children were seen on two or three separate occasions by one of two research assistants, a qualified speech-language pathologist and a psychology PhD candidate. Initial assessment sessions lasted approximately one hour and comprised of a set number of tasks assessing oral language ability and emergent literacy skills. Two subtests of the *Mullen Scales of Early Learning* were also completed with children who did not have assessment scores available from within the previous 12 months. Finally, parents completed a family history questionnaire, a home literacy survey, and the SCQ Current version (see below).

As shown in Table I, a second assessment (Time 2) was conducted for children in both groups following the eight week period of intervention or waiting. To ensure fidelity of the assessment results, a research assistant blind to the group allocation was employed to complete the follow-up assessments. Participants in the waitlist group were then offered the intervention over the next eight weeks with a final assessment (Time 3) completed with

participants in both groups after this time if they were interested. All 10 participants in the intervention group completed this final assessment (although one participant did not return the video), allowing the researchers to determine whether results were maintained once intervention support was removed. Of the seven participants in the waitlist group, three completed the final assessment. A set number of tasks from the initial assessment battery were repeated in each of the follow-up assessments to determine whether the intervention resulted in an improvement in the children's receptive vocabulary skills (an overview of the assessment schedule is provided in appendix 2). Parents were also asked to complete a video recording of a shared reading session with their child, reading the story of *Pip and Posy, the Big Balloon* (Scheffler, 2012) after every assessment.

All assessments took place at the AEIOU centres, or in the children's home depending on parent preference. The order of the tasks varied depending on the children's behaviour and ability to attend to the tasks. Verbal instructions of the tasks that were not validated for use with children on the autism spectrum were adapted and simplified; the most salient information was highlighted in the manual and care was taken that these adaptations were the same for all participants. All sessions were voice-recorded and referred to when needed for scoring.

2.4 ASSESSMENT TASKS TIME 1

2.4.1 Home literacy questionnaire

All parents completed an adapted version of Boudreau's (Boudreau, 2005) home literacy questionnaire. As reported by Boudreau (2005), the questionnaire involves questions related to five constructs of early literacy knowledge: a) interactions around books; b) response to print in the environment; c) alphabet knowledge; d) phonological awareness; and e) writing, as well as f) children's orientation towards literacy (p. 36). For the current study, we investigated parents' answers to the questions, *on a scale from 1 (never) to 5 (very often), Does your child ask you to read to him/her? 2) How often do you read to your child? 3) Does your child ask questions about characters or events during story reading? 4) Do you attempt to teach the names of the letters in the alphabet and/or letter sounds when reading? And 5) At what age did you begin reading to your child?* Table III shows the results.

Table III. PARENT RESPONSES TO THE HOME LITERACY QUESTIONS

	Intervention Group (n = 10)		Waitlist Group (n = 7)	
Survey Questions	**Mean (SD)**	**Range**	**Mean (SD)**	**Range**
Does your child ask you to read to him/her?[a]	3.4 (1.3)	1-5	2.4 (0.5)	2-3
How often do you read to your child?[a]	4 (0.7)	3-5	3(1)	2-5
Does your child ask questions about characters or events during story reading?[a]	1.9(1.1)	1-4	2 (0.8)	1-3
Do you attempt to teach the names of the letters in the alphabet and/or letter sounds when reading?[a]	3.3 (1.2)	1-5	2.9 (1.7)	1-5
At what age did you begin reading to your child?[b]	3 (2)	1-6	3.2(2.5)	1-6

[a] scale of 1 (never) to 5 (very often). [b]scale of 1(birth – 3mths) to 6 (over 24mths)

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2.4.2 Direct Child Assessments

Mullen Scales of Early Learning
To determine the participants' level of nonverbal ability, two subscales from the *Mullen Scales of Early Learning* (MSEL; Mullen, 1995) were administered: Visual Reception and Fine Motor. Consistent with previous studies with children with autism, a developmental quotient (DQ = Ratio IQ) was calculated (Davidson & Ellis Weismer, 2014; Yang, Paynter, & Gilmore, 2016).

Letter Name Knowledge
This test requires the children to name the 26 letters of the alphabet which are presented in random order on a white sheet of paper. The maximum score for this test is 26.

Peabody Picture Vocabulary Test – Fourth Edition
The *Peabody Picture Vocabulary Test – Fourth Edition* (PPVT-4; (Dunn & Dunn, 2007) was used as a measure of receptive vocabulary at all three assessment time points. This test requires the child to point to the picture (from a choice of four) that matches the spoken word provided by the examiner. The PPVT is a norm-referenced instrument suitable for use with children and adults from 2;6 years. It allows for the calculation of standardized scores and age equivalent scores and has been used extensively in previous research examining the examining language skills of children with autism (e.g., (Condouris, Meyer, & Tager-Flusberg, 2003).

Experimental Task - Book Specific Vocabulary
The Book Specific Vocabulary Task is a test of receptive vocabulary developed by the research team to evaluate the child's knowledge of target words extracted from the eight books used during the intervention program. This test contained 15 tier one (basic) vocabulary words, and 15 tier two (more advanced) vocabulary words, with 2-3 words selected from each book. In this task the child is asked to select a picture (from a choice of four) which best matches the spoken word provided by the examiner. The tier one words were considered by the researchers to be basic, frequently encountered nouns, verbs and adjectives (such as balloon and walk). In contrast, the tier two words were less frequently encountered or more mature descriptors of basic tier one words (e.g., otter and crept). This task was completed at all three assessment time points, with a comparison of both the total score (out of 30) and scores for each tier provided.

2.4.3 Shared Book Reading Observation

Parent-child Shared Book Reading Video
All parents were asked to video themselves reading *Pip and Posy, the Big Balloon* (Scheffler, 2012) to their child, prior to the intervention. This book contains 25 pages with illustrations, simple text and a narrative structure. Parents were provided with the simple instruction of reading to their child 'as they normally would' and asked to complete a short form indicating the time of day they read the book to their child, whether it was a typical reading session, and whether the child had seen the book before. All video-recorded sessions were transcribed verbatim and entered into SALT (Systematic Analysis of Language Transcripts; Miller, Andriacchi, Nockerts, Westerveld, & Gillon, 2016). Video recordings were also coded using time-interval coding (e.g. Pentimonti et al., 2012), using aspects of a clinical observation scale that was developed and piloted for a previous study based on an extensive review of the literature. For interval coding, coders observed a video for 15 seconds, and at the end of the interval paused the video to record all behaviours that were observed within that timeframe. Coders were allowed to watch the 15 second intervals a number of times if needed. It should be noted that once a behaviour is observed during a 15 second interval, it receives a score of 1,

even if this behaviour happens more than once during that particular 15 second clip. Therefore scores should be interpreted as follows: the number of intervals that contained a certain behaviour. Find a copy of the observation scale in appendix 10. In addition, time taken to share the book was recorded.

Measures
The following elements of the clinical observation scale were analysed for the present study:

Parent Behaviours
A. Exposure to book language (total score) comprised the following four behaviours:
1. Labelling/describing pictures using words or gestures,
2. Linking words to another object or event related to the child's own experience,
3. Explaining word meanings and associations in a way the child can understand,
4. Emphasising low frequency words, not encountered in everyday discourse.

B. Explicit teaching of code-related skills (total score) comprised the following four behaviours:
1. Pointing to a specific word in the text while reading,
2. Talking about print features,
3. Talking about letter names and sounds,
4. Talking about sounds in words.

C. Explicit teaching of meaning-related skills (total score) comprised the following three behaviours:
1. Talking about the main character/s outside of the text,
2. Asking questions and/or making comments about what happens next in the story,
3. Commenting or summarising the story, referring to the characters, setting, problem, events, and ending.

Child Behaviours
The following child behaviours were calculated automatically using SALT:
1. Total number of child utterances,
2. Number of different words.

2.5 ASSESSMENT TASKS – TIME 2 AND 3

At assessment times 2 and 3, the following assessments were re-administered: PPVT-4, Book Specific Vocabulary Test; Letter Name Knowledge, and Shared Book Reading Observation (parent behaviours, child behaviours, time taken).

2.6 INTERVENTION

2.6.1 Intervention Structure and Format

All children were seen for an initial assessment prior to random allocation into either the intervention or waitlist groups. Parents of children allocated to the waitlist group were asked to continue reading to their child as they typically would over an eight week period and document instances of shared book reading on the log books provided. During this time no formal training was provided.

Intervention was provided over an eight week period and consisted of one 45 minute training session and four fortnightly follow-up visits, with phone calls completed on alternative weeks

(see appendix 3 for an overview of the intervention schedule). Parents were asked to record videos of shared reading sessions with their child each week with individualised feedback provided in follow-up visits with the research assistant.

The intervention focused on the following three topics:

1) **Words, words, words.** Using a dialogic reading approach (Sim et al., 2014; Whitehurst, 1994; Whitehurst et al., 1988), parents were encouraged to introduce their child to new vocabulary depicted in the books. Strategies such as pointing out and labelling new pictures; providing word definitions; using facial expressions and gestures to demonstrate word meanings; and relating words, pictures and events to the child's own life experiences were key approaches within this topic.
2) **What's in the Story?** These strategies aimed at increasing children's awareness of story structure. Parents were encouraged to introduce their child to story components through modelling of language and use of questions related to the characters, setting, problem, actions and resolution. A narrative visual aid (see appendix 6) was provided for use as needed. Discussing the story prior to reading and summarising the story once complete were promoted in order to provide continual modelling of the narrative structure, sequence of events and key details. Where possible, parents encouraged their child to attempt to retell the story themselves, with scaffolding provided to ensure essential features were included.
3) **Fun.** Considering existing research highlighting the lower levels of interest in shared book reading in children with autism (Westerveld & van Bysterveld, 2017), and the importance of social interaction for shared book reading success, strategies were put in place to promote having fun during the book reading sessions.

2.6.2 Intervention Materials

Materials included shared book reading strategy sheets, audio recording equipment, training videos, log books, story structure visuals, and commercially available children's books. Assessment videos and weekly home reading videos were completed in the home. Parents were offered the opportunity to borrow a Panasonic VHS video camera, however many opted to use their own devices (e.g. smart phones). Tripods were provided to parents who required them. Parents were instructed to position the camera so that the child, parent and book were visible.

During the initial training session parents were provided with a two-sided, laminated A4 sheet outlining shared book reading strategies for use in the intervention. These strategies were selected based on Whitehurst's (1988) dialogic reading approach and other relevant current literature (e.g. Sim et al., 2014). A total of three strategy sheets were designed to allow for variation in the children's oral language abilities and understanding of story structure, thus ensuring that the strategies provided were appropriate for the child's level of development:
1) Level one strategy sheets were simplified for use for children with no, or very little, verbal language;
2) Level two was designed for children with emerging oral language or those able to communicate in short phrases but with a receptive language age equivalence of less than 36 months;
3) Level three was aimed at children able to communicate in short phrases or sentences with a receptive language age equivalence of 36 months or more.

Parents who were taught Level three strategies were also provided with a story structure visual to assist in narrative discussions. Appendix 5 provides an example of a strategy sheet for children with an emerging verbal vocabulary (Level 2).

A total of eight children's books were used during the eight-week intervention, with an additional book included for the pre- and post-intervention reading sessions. A full list of the books can be found in Appendix 4. Books were selected for inclusion into the study if they contained a narrative structure, attractive pictures, medium- to large- sized print, and the potential for teaching new vocabulary. The titles selected were judged by the authors to be suitable for preschool aged children across a range of developmental levels.

2.6.3 Social Validity

Upon completion of the book reading intervention, parents were asked to complete an on-line feedback form (see Appendix 9) and asked to provide their perceived effectiveness of the study and overall experiences with the resources that were used. This anonymous feedback form was generated through Survey Monkey, with the corresponding web link emailed to parents following the final meeting.

3 Findings

3.1 OVERVIEW OF DATA ANALYSIS

Data were screened for meeting assumptions of parametric testing and no violations were detected. To answer our research questions, we used two-way mixed ANOVAs, with Group (intervention vs control) as the between subjects variable, and Time (pre- and post-intervention) as the within subjects variable. The following dependent variables were evaluated:

1. Parent behaviours: Exposure to book language (Words total score); explicit teaching of code-related skills (EC total score); explicit teaching of meaning related skills (EM total score).
2. Child behaviours: total number of child utterances; number of different words
3. Child performance on vocabulary tests: PPVT-4; Book-Specific Vocabulary test.

3.2 PARENT BOOK READING BEHAVIOURS

Pre-intervention there were no significant group differences on any of the dependent variables (all p's > .05). Post intervention, parents in the intervention group increased their performance on exposure to book language (Words), and showed higher use of explicit teaching of meaning related skills. No significant changes were observed on any of the parent book reading behaviours in the waitlist control group.

As shown in Table IV, a significant increase in time spent sharing the book was observed in the intervention group. To determine if an increase in time was associated with an increase in parent behaviours, additional variables were computed that took time into consideration by dividing the total score by the number of intervals. Again, parents in the intervention group showed a significant increase in book reading behaviours per observation interval, whereas parents in the waitlist control group did not.

Finally, as expected, no changes in parent book reading behaviours were found in explicit teaching of code related skills. This skill was not targeted in intervention.

TABLE IV: PARENT BOOK READING BEHAVIOURS BY GROUP AT TIME 1 AND TIME 2

Variable	Intervention group		Pre-Post	Waitlist group		Pre-Post
	Pre (T1)	Post (T2)	p value	Pre (T1)	Post (T2)	p value
Duration of book reading	272.9 (119.5)	449.9 (141.6)	.01	217 (90.7)	178.1 (43.6)	.222
Words total score	9.1 (7.9)	20.4 (7.9)	.002	7.1 (7.1)	7.4 (5.3)	.897
Words total / interval#	0.4 (0.3)	0.7 (0.2)	.05	0.4 (0.3)	0.6 (0.4)	.294
EC total score	0.7 (1.9)	1.8 (2.9)	.214	0.9 (1.5)	0.4 (0.8)	.200
EM total score	1.6 (2.0)	7.7 (5.0)	.001	0.7 (1.5)	1.0 (2.2)	.457
EM total / interval#	0.07 (0.08)	0.4 (0.3)	.002	0.03 (0.06)	0.04 (0.09)	.450

variables created to control for the increase in duration following intervention

3.3 CHILD BEHAVIOURS

Pre-intervention there were no significant group differences on any of the dependent variables (all p's > .05). As shown in Table IV above, a significant increase in time spent sharing the book was observed in the intervention group. To determine if an increase in time was associated with an increase in parent behaviours, additional variables were computed that took time into consideration by dividing the total score by the total time (in seconds). As shown in Table V, there was a significant increase in child utterances and in the number of different words the child used for the intervention group only, including when duration of book reading was taken into consideration.

TABLE V. CHILD BEHAVIOURS BY GROUP AT TIME 1 AND TIME 2

Variable	Intervention group		Pre-Post	Waitlist group		Pre-Post
	Pre (T1)	**Post (T2)**	**p value**	**Pre (T1)**	**Post (T2)**	**p value**
Duration of book reading	272.9 (119.5)	449.9 (141.6)	.01	217 (90.7)	178.1 (43.6)	.222
Number of child utterances	18.5 (16.6)	49.3 (32.1)	.003	17.4 (12.7)	12.0 (10.0)	.335
Utterances/time#	0.07 (0.05)	0.1 (0.05)	.020	0.08 (0.06)	0.06 (0.05)	.672
Number of different words (NDW)	22.6 (13.5)	52.2 (32.4)	.016	24.4 (23.1)	15.1 (11.6)	.138
NDW/time #	0.08 (0.04)	0.11 (0.05)	.035	0.10 (0.07)	0.09(0.06)	.561

\# variables created to control for the increase in duration following intervention

3.4 CHILD PERFORMANCE ON VOCABULARY TESTS

Pre-intervention there were no significant group differences on PPVT-4 (see Table II) or on the Book Specific Vocabulary Task (p = .844). As shown there were no significant improvements observed in vocabulary performance on either task.

TABLE VI. GROUP PERFORMANCE ON THE VOCABULARY TASKS PRE- AND POST-INTERVENTION (TIME 1 AND TIME 2)

Variable	Intervention group		Pre-Post	Waitlist group		Pre-Post
	Pre	**Post**	**p value**	**Pre**	**Post**	**p value**
PPVT-4 Age Equivalent Score	33.9 (8.1)	37.6 (9.6)	.069	36.1 (11.9)	40.3 (11.7)	.169
Book Specific Vocabulary – raw score	15.9 (6.6)	18.5 (7.7)	.152	16.6 (7.2)	18.9 (6.5)	.188

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3.5 PERFORMANCE AT TIME 3 FOLLOW-UP

As outlined previously, although all 10 intervention participants completed the final assessment (one parent did not return the video), only three of the seven waitlist participants agreed to the final assessment. We therefore report the results from the intervention group (n = 9) at the final follow up assessment (Time 3) to determine if the gains observed immediately following intervention were maintained. This time, all our data were obtained by coding the transcribed parent-child book reading sessions and extracting the data using SALT. Once again, we accounted for the increase in duration of book reading by dividing the total number of observations by time spent.

Table VII shows the intervention group's performance over time on parent behaviours, child behaviours, and vocabulary performance. As shown, all gains were at least maintained eight weeks following intervention, and child utterances and PPVT-IV increased from Time 2 to Time 3.

TABLE VII. INTERVENTION GROUP PERFORMANCE AT ALL THREE TIME POINTS (N = 9)

Variable	Time 1	Time 2	**Time 3**	T2 – T3 p values
Duration of book reading	278.2 (125.5)	443.1 (148.4)	434.6 (175.7)	.778
Words total	16.6 (19.0)	37.2 (20.2)	45.7 (28.8)	.094
Words total / minute	3.2 (2.8)	5.1 (2.3)	6.1 (2.1)	.084
EC total score	0.11 (0.33)	1.3 (2.7)	2.7 (3.2)	.169
EC total / minute	0.03 (.08)	0.16 (.30)	0.34 (0.3)	.071
EM total score	1.11 (2.26)	13.8 (10.8)	11.0 (9.1)	.300
EM total / minute	0.16 (0.31)	1.71 (1.22)	1.5 (1.4)	.539
Number of child utterances	19.2 (17.8)	44.1 (34.4)	53.8 (37.4)	.033
Utterances/minute	4.1 (3.1)	5.4 (2.8)	6.8 (2.7)	.062
Number of different words (NDW)	23.2 (14.8)	46.8 (31.3)	49.6 (28.4)	.462
NDW/minute	5.0 (2.9)	5.7 (2.8)	6.5 (2.2)	.138
PPVT-4 Age Equivalent Score	32.8 (7.7)	36.8 (9.8)	41.8 (11.2)	.009
Book Specific Vocabulary (RS)	15.6 (6.9)	17.4 (7.4)	20.0 (5.4)	.071

3.6 SOCIAL VALIDITY

Results of the survey indicated that all parents reported feeling satisfied or extremely satisfied with the book reading strategies and overall experience of the intervention. All parents also reported that the intervention changed the way they shared books with their child, consistent with observational data.

3.7 SUMMARY OF FINDINGS

In summary, the eight week intervention resulted in significant changes in parent-child book reading behaviour. Our most prominent finding was that parents and children engaged significantly longer with the books following intervention. Moreover, parents increased their use of book specific language and showed more explicit use of meaning-related language, such as discussing the characters of the story. In turn, the children became more talkative and used a wider variety of words. All improvements were maintained eight weeks following the intervention and indeed children showed continued improvements in their word variety and vocabulary (PPVT-4 only).

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4 Limitations

This study investigated the effect of an intensive, parent-child shared book reading intervention for preschool children on the autism spectrum. The generalisability of the findings may be limited by several factors. Firstly, given the highly heterogeneous nature of the group, the ability to generalise these findings to all preschool children on the autism spectrum is limited. Furthermore, to increase the external validity of these results, a larger sample size may be required. However, as this was designed as a pilot study as an avenue to further research, an initial sample size of 20 families was considered acceptable. A review of the current research in shared-book reading interventions for children with autism reveals that low sample sizes are common, and the target sample size for this study is higher than most studies reported in recent literature (Bellon, Ogletree, & Harn, 2000; Fleury et al., 2014; Fleury & Schwartz, 2016; Whalon et al., 2015). A poor participant retention rate further hindered the sample size, however, particularly of those in the control group. It could be surmised that perhaps families either lost interest in the study or established new commitments during the eight week waiting period. This was also a time intensive intervention design which may have contributed to a poor participant retention rate, with families potentially unable to commit to the intervention demands given their current schedules.

At each assessment time point parents were asked to provide a video of a shared reading session with their child using the same book *Pip and Posy: the big balloon* (Scheffler, 2012). This provided the researchers with a measure of parent and child book reading behaviours across the three assessments. However, use of the same book for these measures may have resulted in increased child familiarity with the story. As a consequence child interest may have been impacted. For example, a study by Goodsitt, Raitan, and Perlmutter (1988) found that child labelling decreased with book familiarity whilst discussions about story content increased. Although child utterances were not coded based on content in this study, results from the current study suggest an improvement in children's expressive vocabulary as measured by the number of different words, which, when compared to the control group, cannot be accounted for by familiarity alone.

This study was designed to focus on enhancing the meaning-related emergent literacy skills of young children on the autism spectrum. Although, as a group, preschoolers on the autism spectrum show strengths in print-related skills, such as letter knowledge and phonological awareness (Westerveld et al., 2017), in clinical practice we need to ensure both print- and meaning-related skills are taken into consideration when providing shared book reading intervention to ensure a balanced approach to literacy instruction.

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5 Summary and Future Research

The aims of this study addressing the effectiveness of a shared book reading intervention for young children on the autism spectrum were threefold. First, we wanted to investigate if the intervention would be effective in changing parent book reading behaviours that are known to enhance preschool children's early meaning-related emergent literacy skills: vocabulary and story structure knowledge. Our results clearly showed an increase in parents' use of book-related language as well as an increase in their use of meaning-related strategies. Furthermore, parents and children spent significantly longer sharing the book following intervention. Second, we wanted to explore if a change in parent behaviour would result in a change in children's language behaviours during shared book reading. Even after controlling for the increase in time spent sharing the books, we found that the children became more talkative and used a wider range of words. Third, we investigated if changes in parent and/or child behaviours following the intervention were maintained. Results from our 8-week follow up assessments showed this was the case. Finally, we explored the social validity of the intervention and parents reported satisfaction with the book reading strategies and overall experience of the intervention. The outcomes of this feedback will be valuable in designing and implementing future shared reading intervention practices for autism service providers, families, and education and health professionals.

Despite these positive findings, this study was relatively time-intensive. Although the responses from the parents who completed the intervention were overwhelmingly positive, a percentage of families withdrew from the study, perhaps because of the intensive nature of the intervention. Future research needs to explore how best to integrate this type of intervention into existing intervention models, for example speech pathology intervention or early childhood curricula for children with autism or other developmental disorders. One promising avenue is dissemination via community libraries that provide accessible, affordable (free) services to the community and share a common focus on emergent literacy. In future research we hope to harness this avenue and work with libraries to provide greater opportunities for training in an ecologically valid setting that may be accessible to a wider proportion of the community. Greater focus on emergent literacy in children with autism will address a key area for learning for up to 40% (Nation et al, 2006) of children and has the potential for early intervention to support academic success for this population into the future.

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Appendix 1
RECRUITMENT FLYER

Shared Book Reading Intervention for Preschool children with ASD

Expressions of Interest

The team: we are a team of speech pathologists, teachers, health professionals and service providers who are interested in observing the effectiveness of shared book reading intervention in improving children's oral language and pre-literacy skills. The results may potentially influence future education practices.

Participation: we are looking for preschool-age children who have been diagnosed with autism, who:
• Can attend to a book for approximately 5 minutes
• Regularly engage in shared book reading with their parent/s
• Do not attend another book-reading intervention.
If you are unsure about meeting these requirements, please feel free to contact us ☎

What's involved: participation will involve one pre-intervention assessment session with a qualified speech pathologist, eight weeks of intervention , and two post-intervention assessment sessions at a place convenient to you and your child. You will receive a detailed report and recommendations upon completion of the study. Participation is free of charge.

If you are interested in participating or would like to obtain more information, please contact us:
☎ Kate O'Leary, Speech Pathologist / Research Assistant: 07 5678 0159
✆ Dr Marleen Westerveld, Speech Pathology, Griffith University: m.westerveld@griffith.edu.au

The project is funded by the Federal Government as part of the 'Living with Autism' Cooperative Research Centre. The project has received Ethics Approval from the Griffith University Human Ethics Committee (AHS/34/15/HREC)
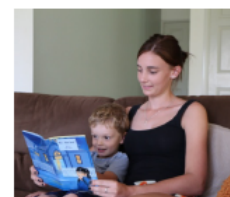
Appendix 2
ASSESSMENT SCHEDULE

Assessments	Time 1	Time 2	Time 3
Social Communication Questionnaire (SCQ)	✓		
Family History Questionnaire	✓		
Home Literacy Questionnaire	✓		
Mullen Scales of Early Learning	✓		
Parent-child shared book reading video	✓	✓	✓
Peabody Picture Vocabulary Test-4th Edition	✓	✓	✓
Story comprehension and retell	✓	✓	✓
Letter Name Knowledge	✓	✓	✓
Book Specific Vocabulary Test	✓	✓	✓

Appendix 3
SHARED READING INTERVENTION OVERVIEW

Parents of children allocated to the intervention group received an initial training session and ongoing support throughout the intervention period by a trained research assistant (qualified speech pathologist). The intervention was run over eight weeks, during which parents were asked to read books provided by the researchers to their children, using the strategies provided in the training session.

Training session
The training session was completed and the first two books provided for the following fortnight. This training session lasted approximately 45 minutes and comprised of parent education and modelling of book reading practices through videos and direct demonstrations. Training sessions were completed one-on-one with the parent in the family home or at AEIOU centres. The intervention was then run over eight weeks, during which parents were asked to read books provided by the researchers to their children, using the strategies provided in the training session.

Weeks 1,3,5,7
Phone calls were completed on alternative weeks in order to discuss progress with the new book, problem solve any reported difficulties and to schedule the next meeting.

Weeks 2,4,6
Fortnightly meetings were completed with parents in order to provide individualised feedback on their progress with the book reading strategies. These visits consisted of viewing the latest home reading videos, providing guidance based on the child's level of development and the book reading strategies, resolving any reported problems, supplying new books for the next fortnight, and modelling of shared reading techniques with these new stories.

Week 8
Week 8 was the final follow-up meeting for the intervention. In addition to the typical meeting structure (as described above) the next stage of the study was discussed. This included setting a date and time for the follow-up assessment, revising the plan for the eight week break (for the intervention group), and requesting the completion of the parent satisfaction survey.

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Appendix 4
LIST OF STORY BOOKS

Week	Title	Author	Publisher (year)
Pre and Post Assessments	Pip and Posy, The Big Balloon	Axel Scheffler	Nosy Crow (2012)
1	The Very Hungry Bear	Nick Bland	Scholastic Press (2012)
2	The Three Little Pigs	Maggie Moore	Franklin Watts Australia (2014)
3	Wombat Stew	Marcia K. Vaughan	Scholastic Press (1984)
4	Jack and the Beanstalk	Maggie Moore	Franklin Watts Australia (2014)
5	Possum Magic	Mem Fox	Omnibus Books (1983)
6	Frog is a Hero	Max Velthuijs	Andersen Press (1995)
7	The Snail and the Whale	Julia Donaldson	Macmillan (2003)
8	Hurry Up Franklin	Paulette Bourgeois	Kids Can Press (1989)

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Appendix 5
SHARED BOOK READING STRATEGY SHEET LEVEL 2

Let's read together!

Approaches for shared book reading for young children with ASD
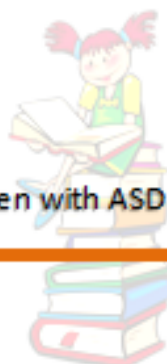
Words Words Words!

- **Point out new words** in the pictures.
- **Use facial expressions** or gestures to demonstrate the meaning of the word.
- **Relate** the new word to your child's own life experiences.
- **Repeat, repeat, repeat.** Use the word later in the book, at the end of the book, and try to integrate it into your everyday routine.
- **Copy what your child says** so that he/she knows that you have understood.

What's in the Story?

- **Discuss the story** before you start reading by looking at the front cover together, commenting on the pictures and thinking about what might happen.
- **Summarise the story** once you've finished reading and discuss your child's favourite parts.
- **Ask simple questions** that your child can answer in 1-2 words or by pointing to the pictures.

Fun Times!

- **REMEMBER TO HAVE FUN!** Book reading should be an enjoyable experience for both you and your child. The more fun you are having the more engaged your child is and the more he/she will learn
- **Follow your child's lead:** Encourage him/her to turn the pages, lift the flaps, name objects, ask questions, have a conversation or go back to his/her favourite pictures.

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Examples!

Approaches for shared book reading for young children with ASD

Words Words Words!

- **Point out a variety of word types** including names (dinosaur), descriptions (scaly, swiftly) and action words (chomped).
- **Start with everyday words** (dog, wet, rain, big) and then build up to more sophisticated and less frequently encountered words (soggy, drenched, poured, enormous).
- **Relate:** *You have a dinosaur. He looks like your grandpa. Remember when you went to the circus? You had a cake with candles at your birthday.*

What's in the Story?

- **Discuss the story** before you start reading: *This story is called...I can see... I wonder what will happen... Look, a... He has a balloon, I wonder if he's going to a party. I can see balloons and cake, where could Spot be? He's at a...*
- **Summarise:** *This story was about...I liked... Show me your favourite...I thought ... was funny. That caterpillar ate A LOT of food! Can you eat that much?*
- **Ask simple questions:** *Can you see the... Find one like this... What size/shape/colour is ... What happened when... Who is this? How many? Where is he hiding? Show me the... Find something red.*

Fun Times!

- **Make fun noises:** *vroom. BANG! Pop! Splash!*
- **Praise Praise Praise:** *Great talking. Beautiful sitting. Thanks for helping. I love how you're listening! Good Pointing. Nice trying.*
- **Use silly voices!**
- Make **eye contact** with your child.
- **Laugh** and smile together.
- Use **big gestures** and expressions.

Appendix 6

Characters

Who is the story about?

Setting

What happens at the start of the story?

Problem

What went wrong?

Action

What did they do?

Ending

How did it finish?

Appendix 7
STORY STRUCTURE VISUAL 2

Characters

Setting

1. First

2. Next

3. Last

Appendix 8
EXAMPLE STORY BOOK MARKS

Level 1 & 2:

Level 3:

The Very Hungry Bear

Easy words: hungry, fish, strong, catching, smile, trees, cave, hot, fire, ice, small, nest, sneeze, snow.

Harder words: grumpy, yanked, flicked, waved, shrinking, sinking, resist, melting, cooler, squinted, hook, wound, allergic.

Characters: Brown bear, Polar Bear.

Setting: Brown Bear is out fishing, because he is hungry, and meets Polar Bear.

Problem: The polar bear needs somewhere to live.

Action: Brown Bear and Polar Bear go looking for a home, but none are quite right.

Ending: Brown Bear takes polar bear to the snowy mountain. They build him an igloo to live in. Everyone is happy.

Fun times: Talk about the pictures and events. Make fun sounds (*Grr. Snap! Splosh. Splish. Drip*). Act out the characters actions and key words (*smile, sneeze, grumpy*).

The Three Little Pigs

Easy words: waved, laughed, pig, house, carry, build, wolf, blow, watched, shouted, roof, pot, water, tail

Harder words: straw, bundled, cosy, crept, grinned, growled, squealed, scrambled, galloping, bellowed, furious, tumbled, wailed.

Who is the story about? 3 little pigs and the wolf. Pause to allow your child to indicate using words or gestures, then model the correct response if necessary.

Fun times: Act out the characters actions e.g. *huff and puff*. Give each character a different voice. Act out the story to other members of the family.

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Appendix 9
PARENT SATISFACTION SURVEY

Thank you for participating in the Shared Book Reading intervention Study. Please take a minute to consider your experiences with this intervention over the last 8 weeks. Please feel free to provide comments and/or feedback on the items listed. This survey is anonymous, however, if you would like to discuss your thoughts further please do not hesitate to contact the researchers or to leave your name in the comments at the end of the survey.

1) On a scale from 1 (extremely unsatisfied) to 5 (extremely satisfied), please rate your experience with the books provided.
   a. The very hungry bear
   b. The three little pigs
   c. Wombat stew
   d. Jack and the beanstalk
   e. Frog is a hero
   f. Snail and the whale
   g. Hurry up Franklin
2) Please rate your experience with:
   a. The training session
   b. Follow-up meetings and phone calls
   c. Usefulness of book reading strategies
   d. Overall experience
3) Has the intervention changed the way you share books with your child? (No, A little, Yes)
   a. Can you tell us a little more?
4) Are there any books that you would recommend for a child of your son's /daughter's age and abilities?
5) Do you have any other comments?

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Appendix 10
SHARED BOOK READING CLINICAL RATING SCALE - PAGE 1

Child ID: _____ Child age: _____	Book Title: _____	Book genre: ☐Narrative ☐Picture-book ☐Other
Date of reading: ___/___/___	Has the book been read before? ☐Yes ☐No	Book features:
Time of reading: ____:____ am/pm	Location/seating arrangement: _____	_____
Coder ID: _____ Date of coding: ___/___/___	Duration of book reading session: ___:___ (min:sec)	

TIME INTERVALS: 0.15, 0.30, 0.45, 1.00, 1.15, 1.30, 1.45, 2.00, 2.15, 2.30, 2.45, 3.00, 3.15, 3.30, 3.45, 4.00, 4.15, 4.30, 4.45, 5.00, 5.15, 5.30, 5.45, 6.00

ELEMENTS	STORYBOOK READING BEHAVIOURS
	Start Time: When the book-related discussion began. *End Time*: When the book-related discussion ceased.
Words Words Words! *Exposure to book language*	*How often does the parent display the following behaviours?*
	W1. Labels/describes pictures using words or gestures. E.g. *look! A big, red, round balloon. (Parent gestures for "round")*
	W2. Links words to another object or event related to the child's own experiences (*e.g. you have a ball, that looks like your dog, you know round*).
	W3. Explains word meanings and associations in a way the child can understand. Definition: *An aquarium is a glass box that we fill with water to keep fish in.* Association: *A Cheetah is like your pet kitten, but it is bigger, faster, has spots, and lives in the wild. A pony is like a small horse.*
	W4. Emphasizes low frequency words (may/may not be those written in the book), not encountered in everyday conversational discourse. Provide examples: *e.g., aquarium, ferocious, author, illustrator, miserable, grinned, scrambled....*
Child Interest – Shared Book Focus	*How often does the child establish/maintain joint attention with the parent and book through the following behaviours?*
	C1. Verbally responds to questions, comments, and text (includes echolalia).
	C2. Spontaneously points, comments, and/or verbalizes (adding new information to the story) i.e. not in response to a parent question or comment
Explicit Teaching of Code-Related Skills	*How often does the parent make direct references to print-related concepts through the following behaviours?*
	EC1. Points to a specific word in the text while reading (often to highlight). (*Note: does NOT refer to scanning of the text while reading*) E.g. *This (word) says ...*
	EC2. Talks about print features. Comments, questions, requests about directionality, length etc. E.g. *The title of this book is..., The author's name is..., It was illustrated by..., where do I start reading?* (note: count the words "title", "author", and "illustrator" as low frequency words (F4)).
	EC3. Talks about letter names and sounds. E.g., parent identifies a letter on the page, and makes link to the letter sound: *that's the letter S, it makes a 'sss' sound, it's the same sound at the beginning of your name, SSSam"). What letter? What sound does this letter make?*
	EC4. Talks about sounds in words. E.g., rhyming words, words that start with the same sound etc. E.g. *Sam and ham are rhyming words, duck starts with... This starts with the letter S just like in your name!*