Read Writ (2016) 29:731–743
DOI 10.1007/s11145-016-9624-1

The link between text difficulty, reading speed and exploration of printed text during shared book reading

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Published online: 11 January 2016

Abstract In the current study the reading speed of the narration and the difficulty of the text was manipulated and links were explored with children's attention to the printed text in shared book reading. Thirty-nine children (24 grade 1 and 15 grade 2) were presented easy and difficult books at slow (syllable by syllable) or fast (adult reading speed) pace while their eye movements were monitored. Results revealed an interaction between speed and difficulty. For the easy and difficult books, children spent more time and made more fixations on the printed text when it was presented at slow speed than at fast speed. However, at fast speed, children spend more time and made more fixations on the text of the easy rather than the difficult books, but at slow speed no difference was observed. In addition, at slow speed positive correlations were observed between attention to print and letter knowledge and word reading skills. Results provide important information for the practice of shared book reading suggesting that to increase attention to print, speed should be reduced. Future research should investigate the role of reading speed on reading related outcomes such as discourse comprehension and children's interest in reading activities.

Keywords Shared-reading · Eye-movements · Speed · Difficulty

Introduction

Shared book reading is a common childhood reading activity that involves a parent or another skilled reader such as a teacher, an older student or sibling, reading a book aloud to a child (Levy, Gong, Hessels, Evans, & Jared, 2006; Roy-Charland,

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Saint-Aubin, & Evans, 2007; van Kleeck, Stahl, & Bauer, 2003). This reading can include a number of variations in style, practice, and environment—from a parent reading to their child at bedtime; to a teacher reading to a group of students according to a prescribed structure in the classroom; to a peer "Reading Buddy" sitting on the hallway floor at recess, reading to another child. One of the most frequently practiced literacy-related activities with preschoolers and children in the early school years, shared book reading has been shown to contribute positively towards the development of pre-literacy and literacy skills (Bus, van Ijzendoorn, & Pellegrini, 1995), and is often a favoured learning activity for children. The enjoyment of shared book reading may also motivate children towards choosing shared or independent reading and reading-related activities for pleasure (Baker, Mackler, Sonnenschein, & Serpell, 2001).

There have been numerous studies conducted with the goal of determining the underlying nature of the impact of shared reading on various aspects of acquired literacy skills (see Bus et al., 1995's meta-analysis). However, the specific nature of the literacy-related gains has been disputed, with some studies indicating that children benefit in terms of print awareness, increased knowledge of phoneme–grapheme correspondence, and phonetic reading skills (Bus et al., 1995; Pick, Unze, Brownell, Drozdal, & Hopmann, 1978), while other studies do not support this, finding that the benefits of shared book reading may be better related to language development and comprehension (Evans & Saint-Aubin, 2005; Roy-Charland et al., 2007). Shared book reading has been shown in both a meta-analysis and an extensive literature review to be linked to children's familiarization with grammatical structures and syntax, as well as enhancing their vocabulary and oral language (Bus et al., 1995; Evans, Roy-Charland, & Saint-Aubin, 2009; Scarborough & Dobrich, 1994). Shared book reading has also been found to account for approximately 8 % of the total variance in such broad outcomes as literacy skills, reading achievement, and the development of oral language (Bus et al., 1995). Regardless of the specificity of the benefits, the gains in literacy development derived from shared book reading do not cease in the early school years, but continue to be observed in older children, albeit to a lesser degree once children become more independent readers (Bus et al., 1995; Scarborough & Dobrich, 1994). While it is well established that shared book reading contributed to improved oral language skills, some specific shared book reading activities have the objective of attracting children's attention to the printed text in order to improve written language skills (see e.g., Roy-Charland, Perron, Boulard, Chamberland, & Hoffman, 2015). Nevertheless, the role of such specific strategies require further empirical support.

Having established the significance of shared book reading throughout multiple studies, the focus of much research has evolved into trying to determine and understand which specific elements and practices of shared reading are most efficacious in terms of improving reading outcomes; many of these studies have focused on the frequency of shared book reading rather than other qualitative factors (Bus et al., 1995). However, variations in shared reading practices, other than frequency, may contribute to the potential benefits of shared reading (Roy-Charland et al., 2015). In regard to variations of the books themselves, research utilizing eye-

tracking technology has shown that changing the books, including manipulation of location the text within the illustrations or on a separate page; print salience; and the attractiveness, including the colour or lack thereof of the illustrations, does not seem to make a difference in the amount of attention children pay to the text or the illustrations (Evans & Saint-Aubin, 2005; Justice, Skibbe, Canning, & Lankford, 2005). Therefore, it may be presumed that it is the qualities of the experience, rather than the qualities of the book itself that matter most in shared book reading.

On the one hand, a study by Roy-Charland et al. (2007) has examined characteristics of the child in the shared book reading experience in relation to the difficulty of the read material. Specifically, the eye-movements of school-aged children from kindergarten to grade 4 were monitored with eye-tracking technology while they were read three books of varying text difficulty, presented on a computer monitor. The results revealed that children spend more time focused on the printed text during shared reading when the book was within their reading capability compared to when the text exceeded their reading skills. If the difficulty of the text was too challenging, children looked at the illustrations and essentially did not focus on the print at all, reverting to the eye-movement patterns of pre-literate children (Roy-Charland et al., 2007). These results suggest that the attention to the printed text can be manipulated by choosing books that are within a child's reading skills.

On the other hand, researchers have also investigated if the reader's characteristics might also impact the child's experience during shared reading. For example, Piasta, Justice, McGinty, and Kaderavek (2012) found that when preschool children are exposed to a broad shared book reading program in class where the teacher used verbal and nonverbal strategies to refer to printed text, greater literacy achievements were observed 3 years later. When examining specific strategies, for example, Roy-Charland et al. (2015), observed that pointing and highlighting the printed text were associated to children spending more time on the printed text and, when children were readers, the fixations were more often coherent with the narration, than when no intervention was implemented. While promising, the extents to which those strategies contribute to the increase attention to print remain modest. Nevertheless, these results suggest that the reader's behaviour might have a significant role on children's experience during shared book reading. In effect, there might be other variables that could contribute significantly to the increase in attention to the printed text. One factor that inherently varies in the practice of shared book reading is reading speed. In effect, amongst adults, reading speed is a common individual difference (Jackson & McClelland, 1975, 1979). Thus, it is surprising that this factor has yet to be systematically examined as a potential contributor to the shared book reading experience and, more specifically, its role on children's attention to the printed text as yet to be explored.

While to the best of our knowledge, the link between reading speed and text exploration in shared book reading has not been explored, it has been proposed as an important factor in teaching methods such as paired-reading (Topping, 1987). In paired-reading, a skilled reader supports a child through the reading of texts that may otherwise have been above the child's current reading ability through modelling aloud (Topping, 1987). More precisely, the child reads aloud simultaneously with a skilled reader, thereby gaining in reading fluency at a text difficulty

level that is higher than the child could tackle on his/her own (Topping, 1987). Furthermore, it is suggested that the pair reads aloud together at the tutee's pace. Having the tutor adjust his or her reading speed to that of the tutee is an important recommendation in regard to allowing the latter to follow a more difficult text with eventual gains in fluidity and speed (Topping, 2006). Related to this literature, it could be stipulated that in shared book reading, reducing the speed of reading might be linked to increased attention to the printed text as measured by the amount of time spent and the number of fixations on the text. In the same vein, based on assumptions in paired-reading, it might allow children to pay more attention to more difficult texts.

The goal of the current study is to provide empirical evidence in regard to the effectiveness of the deliberate manipulation of reading speed and text difficulty on children's attention to the printed text during shared book reading. The current study was conducted using storybooks recorded at two speeds: one an adult reading speed (fast), and the other the speed of a child just beginning to read (slow), syllable by syllable. The text and illustrations were presented on a computer screen and eye-tracking technology was used to measure the effect of reading speed and text difficulty on children's visual attention to the printed text.

Methods

Participants

Thirty-nine francophone children from a bilingual community and attending French school took part in this study. The sample was composed of 24 children from Grade 1 (10 boys, 14 girls, mean age: 82 months) and 15 children from Grade 2 (8 boys, 7 girls, mean age: 94 months). Demographic questionnaires were received for 37 of the 39 families. Of those 37 questionnaires, 31 children came from two-parent families and 6 from single-mother families. They were mostly high SES families: 90 % had an annual income higher than $55,000 (CAD) and 59 % had an annual income higher than $100,000 (CAD). Furthermore, all parents had completed high school, 31 % of mothers and 42 % of fathers had a college diploma, 46 % of mothers and 24 % of fathers had a Bachelor's degree while 15 % of mothers and 19 % of fathers had a Master's or a Doctoral degree. Most of the families (92 %) reported owning between 75 and 150 children's books. None of the parents reported that they read to the child daily. However, 41 % of the parents reported that they did read with their child 6 days per week. Finally, 90 % of the parents reported that they read at least 10–20 min and 33 % at least 20–30 min.

Materials

Questionnaire

A French translation of the *Home Literacy Experiences Questionnaire* (Levy et al., 2006; Roy-Charland et al., 2007) was sent to the parents prior to the

experimentation session. This questionnaire was used to gather demographic information and reading related activities in which the child was engaged at home as well as reading materials available in the household. The parent that was most familiar with the child's reading activities was invited to complete the questionnaire.

Books

Four French books were used in this study; two were originally written in French and two were published translations. Two of the books were the *easy* and *difficult* books previously used by Roy-Charland et al. (2007) and these books were also used in Roy-Charland et al. (2015). The books were slightly modified from the original versions to achieve the same level of difficulty for both books as defined by the SATO calibration program (Daoust, Laroche, & Ouellet, 1996). SATO Calibration uses different properties of the written materials (e.g., word frequency, average number of letters per word, average number of words per sentences, etc.) to produce the grade-level equivalence. Equivalence indices and the description of each book are presented subsequently.

For each of the two easy books, 15 pages including the title page and a page read by the child were used in this study. The font was Times New Roman 26 points. The SATO index for the selected pages of each book was a level 1.0 corresponding to the beginning of Grade 1. *Je veux aider!* (Wilhelm, 2003a) is the story of a dog who wants to help around the house but keeps getting in trouble. The selected pages contained 86 words, an average of 6.1 words per page and an average of 3.9 letters per word. They included 18 sentences with an average of 4.8 words. *Je n'ai pas peur!* (Wilhelm, 2003b) is the story of the same dog who wants to dress up for Halloween. The selected pages comprised 85 words, an average of 6.1 words per page and an average of 4.1 letters per word. They contained 16 sentences with an average of 5.3 words.

For the two difficult books, seven pages including the title page and the page read by the child were presented in this study. The font was Times New Roman 14 points. The SATO index for the selected pages of these books was a level 3.7 corresponding to the second half of Grade 3. *Alex et son chien Touli* (Tibo & Germain, 2000) is the story of a boy and his dog that play hockey. The dog breaks his leg during the game. The selected pages have 374 words, an average of 74.8 words per page and an average of 4.9 letters per word. They contained 70 sentences with an average of 5.3 words. *Alex et le mystérieux Numéro Sept!* (Tibo & Germain, 2008) is the story of the same boy who is no longer the best hockey player because of the mysterious number seven. This book has 547 words, an average of 109.4 words per page and an average of 4.0 letters per word. It contains 75 sentences with an average of 7.3 words.

Audio narration

Each book was accompanied by an audio narration recorded for the purpose of this study by a professional radio announcer. The expressiveness and the voice tone

were similar for all the books. For each book, two presentation speeds were produced: one intended to be regular reading speed for an adult narrator and the other corresponding to the speed of a child beginning to read (syllable by syllable; Topping, 1987). These conditions will be referred to hereafter as *fast speed* and *slow speed* respectively. For each book level (easy and difficult), a child was exposed to both conditions. In other words, one of the books for each level was presented at fast speed and the other at slow speed. Children were randomly assigned to these conditions.

Complementary measures

The French version of the Peabody Picture Vocabulary Test (*Échelle de vocabulaire en images Peabody, EVIP*; Dunn, Theriault-Whalen, & Dunn, 1993) was administered to assess the receptive vocabulary of participants. As per standard administration, children were presented a word aloud and were asked to choose one of four pictures corresponding to the word said. The task was interrupted when the participant made six errors out of eight consecutive words. Furthermore, children's letter knowledge and reading abilities were assessed using scales from the *Échelle de Compétences en Lecture* (Desrochers, 2008). More precisely, for the letter naming scale, children were required to name the 26 uppercase letters of the alphabet presented in a random order, three or four letters per page. Children also completed the word reading scale in which they were presented with 44 words, four words per page, in ascending order of difficulty. Administration was interrupted after four mistakes out of six consecutive words.

Eye movement apparatus

Eye movements were recorded with the SR Research Eyelink II system. This apparatus allows precise eye movement observations (<0.5°) and a high sampling rate (500 Hz). The apparatus' headband has two cameras located underneath the eyes. An infrared sensor located on the forehead allows eye movements to be recorded without head restraints by compensating for head movement. In the current study, only the pupil (without corneal reflection) of the eye with the best calibration was recorded. The pages were presented on two screens, one for the child and the other for the experimenter. The system uses an Ethernet link between the eye-tracker and the display computer that allows real-time measures of saccades and eye positions. Saccades and eye positions are shown as a 1° cursor that allows the experimenter to evaluate calibration and initiate a re-calibration if necessary. A speaker linked to the display computer allowed the child to listen to the narration.

Procedure

Each child took part in two individual sessions lasting approximately 1 h each. The first 10 min of the first session was dedicated to familiarisation with the eye-tracking equipment. The children took part in a game consisting of following the experimenter's finger with their eyes without moving their heads. This task was a

practice for the calibration of the apparatus (Evans et al., 2009). After the familiarisation period, the child was seated in front of the computer screen at an approximate distance of 60 cm. A five-point calibration procedure was used (Evans et al., 2009; Roy-Charland et al., 2007, 2015). The child had to fixate on the face of a famous cartoon character measuring 1° in visual angle. The face appeared at the center of the screen, the top center, the bottom center, the center left and center right of the computer screen. This procedure was completed twice and the total deviation between the two measures had to be 1° in visual angle or less for the calibration to be considered adequate. Between the presentations of each page, the character's face was presented at the center of the screen in order to readjust the calibration. Furthermore, between the presentations of each book, the full five-point calibration procedure was redone. After the calibration, the experimenter instructed the child that he or she would be presented with four storybooks accompanied by an audio narration. After the presentation of the books, the children were asked to read, in paper format, one page previously taken from each of the books. The pages were presented with the easy books first, followed by the difficult books in order to not discourage children who were not able to read the pages (see Roy-Charland et al., 2007, 2015, for similar procedure).

In the second session, children were administered the EVIP, letter naming and word reading scales as per standard administration. Once the session was completed, the child received two stickers for his or her participation and a picture of his or herself wearing the eye-tracking equipment.

Results

Eye movement measures were coded using the Eyelink Data viewer software. This program presents the pages of the book and superimposes the position of all fixations. Eye movement measures of interests for the present study are the proportion of time spent on the text and the proportion of fixations on the text (Roy-Charland et al., 2007, 2015). For each book and each child, the proportion of time spent on the text was computed by dividing the sum of all fixation durations on the text by the sum of all fixation durations on the screen (illustration and text). For the proportion of fixations, the number of fixations on the text was divided by the sum of all fixations on the screen. For all analyses, an alpha level of 0.05 was used, unless otherwise indicated.

A series of analyses was planned as a function of the ability to read the books. Children were considered able to read the books if they could decode the two pages of the books from a same difficulty level. However, in the current sample, only one first grader was unable to read the two pages from the easy books and only six children (five from grade 1) were unable to read the two pages from the difficult books. Thus, analyses could not be computed as a function of ability to read the books.

Table 1 presents the means and standard deviations for the proportion of time and the proportion of fixations on the text as a function of reading difficulty (easy and difficult), presentation speed (slow and fast) and grade level (1 and 2). First, a

Table 1 Means and standard deviations for proportions of time and proportion of fixations on the printed text as a function of text difficulty, reading speed and grade level

	Grade 1		Grade 2	
	Slow	Fast	Slow	Fast
Proportion of viewing times				
Easy	0.47 (0.13)	0.33 (0.17)	0.48 (0.16)	0.40 (0.14)
Difficult	0.48 (0.21)	0.22 (0.17)	0.57 (0.19)	0.37 (0.27)
Proportion of fixations				
Easy	0.45 (0.12)	0.22 (0.17)	0.47 (0.13)	0.42 (0.14)
Difficult	0.45 (0.20)	0.33 (0.17)	0.56 (0.18)	0.36 (0.26)

$2 \times 2 \times 2$ ANOVA with reading difficulty (easy and difficult) and presentation speed (slow and fast) as within-subjects variables and grade level (1 and 2) as a between-subjects variable was computed on proportion of time. Results revealed a main effect of presentation speed, $F(1, 37) = 114.57$, $\eta_p^2 = 0.76$, $p = .001$. Neither the main effect of difficulty, $F < 1$, nor of grade level, $F(1, 37) = 2.63$, $p = .11$, were significant. However, there was a significant interaction between difficulty and presentation speed, $F(1, 37) = 10.73$, $\eta_p^2 = 0.23$, $p = .002$. None of the other interactions were significant, all Fs <3.21, $p > .08$. Simple main effects tests were computed to decompose the significant interaction. More precisely, results revealed that, both for the difficult and easy books respectively, children spent more time on the printed text at slow speed than at fast speed, $F(1, 74) = 100.38$, $\eta_p^2 = 0.58$, $p < .001$; $F(1, 74) = 24.54$, $\eta_p^2 = 0.25$, $p < .001$. Furthermore, at fast speed, children spent more time on the printed text of the easy books than of the difficult books, $F(1, 74) = 7.63$, $\eta_p^2 = 0.09$, $p = .007$. However, at slow speed, there was no difference in the time spend on the printed text of the easy and difficult books, $F = 2.70$, $p = .10$.

Second, a $2 \times 2 \times 2$ ANOVA with reading difficulty (easy and difficult) and presentation speed (slow and fast) as within-subjects variables and grade level (1 and 2) as a between-subjects variable was computed on proportion of fixations. All patterns of results are identical to those for proportion of time. In effect, results revealed a main effect of presentation speed, $F(1, 37) = 90.66$, $\eta_p^2 = 0.71$, $p = .001$. Neither the main effect of difficulty, $F < 1$, nor of grade level, $F(1, 37) = 3.45$, $p = .07$, were significant. However, there was a significant interaction between difficulty and presentation speed, $F(1, 37) = 13.64$, $\eta_p^2 = 0.27$, $p = .001$. None of the other interactions were significant, all Fs <2.78, $p > .10$. Simple main effects tests were computed to decompose the significant interaction. More precisely, results revealed that, both for the difficult and easy books respectively, children made more fixations on the printed text at slow speed than at fast speed, $F(1, 74) = 91.90$, $\eta_p^2 = 0.55$, $p < .001$; $F(1, 74) = 16.50$, $\eta_p^2 = 0.18$, $p < .001$. Furthermore, at fast speed, children made more fixations on the printed text of the easy books than of the difficult books, $F(1, 74) = 11.42$, $\eta_p^2 = 0.13$, $p = .001$. However, at slow speed, there was no difference in the number of fixations on the printed text of the easy and difficult books, $F = 1.83$, $p = .18$.

Correlations were also computed between the proportion of time and the proportion of fixations as a function of book difficulty (easy and difficult) and

presentation speed (slow and fast) and the proportion of accurate responses for the letter naming task, the proportion of accurate responses for the word reading task, the raw scores for the EVIP and the normalized scores for the EVIP. The correlation matrix as well as the means and standard deviations are presented in Table 2. Results revealed significant positive correlations between the letter naming scores and the proportion of time and the proportion of fixations for both difficult and easy books but only at the slow reading speed not for the fast reading speed. There was also a positive correlation between the word reading scores and the proportion of fixations on the text for the difficult book only and for the slow reading speed only. The correlation was marginally significant between the word reading scores and the proportion of time on the text for the easy book and for the slow reading speed only ($p = .05$). None of the correlations were significant between the proportion of time and the proportion of fixations on the text and either the raw scores or the normalized scores for the EVIP.

Discussion

The aim of the current study was to examine the role of reading speed and text difficulty on children's attention to the printed text during shared book reading. More precisely, attention to the print was explored using eye movement monitoring while children were presented with an easy and difficult book at both a slow and fast pace. Based on research in paired-reading, it was hypothesized that reducing reading speed, resembling that of a child learning to read syllable by syllable, would allow children to pay more attention on more difficult texts. The results will first be discussed based on basic effects in the shared book reading literature, followed by the results specific to the current goal.

Results for the proportion of time on the printed text for the fast speed, which corresponds to an adult reading speed, are in line with typical results in the shared book reading field. More specifically, children spent more time on the illustrations than on the text. In effect, they spend the majority of their time looking at the illustrations regardless of their grade level. Children in grade 1 spent on average 27 % of their time on the printed text when the narration was at adult speed, which means that 73 % of their time was on the illustrations. For second graders, they spent on average 39 % of their time on the printed text when presented at adult speed, which left 61 % of their time looking at the illustrations. These results again support the idea that the typical practice of shared book reading where an adult simply reads at his or her normal speed without other intervention is more of an oral language activity since children spend the majority of their time looking at the illustrations rather than the printed text (Evans & Saint-Aubin, 2005; Justice et al., 2005; Roy-Charland et al., 2007, 2015).

To the best of our knowledge, only one study examined the effect of text difficulty on attention to print in typical shared book reading (Roy-Charland et al., 2007). In the current study, when examining only the adult presentation speed, results are in line with those of the previous study by Roy-Charland et al. (2007). For first graders, they had a tendency to spend more time on the printed text of the

Table 2 The correlation matrix between proportion of time (PT) and proportion of fixations (PF) as a function of presentation speed and book difficulty [slow and easy (SE); slow and difficult (SD); fast and easy (FE); fast and difficult (FD)] and the proportion of accurate responses for the letter naming task, the proportion of accurate responses for the word reading task, the raw scores for the EVIP and the normalized scores for the EVIP

	PT-SE M = 0.47 SD = 0.14	PT-SD M = 0.52 SD = 0.20	PT-FE M = 0.36 SD = 0.16	PT-FD M = 0.28 SD = 0.22	PF-SE M = 0.46 SD = 0.12	PF-SD M = 0.49 SD = 0.19	PF-FE M = 0.37 SD = 0.16	PF-FD M = 0.28 SD = 0.22	Letters M = 0.98 SD = 0.03	Words M = 0.40 SD = 0.16	Raw M = 86.97 SD = 22.08	Normalised M = 113.26 SD = 15.14
PT-SE	1.00	–	–	–	–	–	–	–	–	–	–	–
PT-SD	0.59**	1.00	–	–	–	–	–	–	–	–	–	–
PT-FE	0.47**	0.72**	1.00	–	–	–	–	–	–	–	–	–
PT-FD	0.55**	0.79**	0.61**	1.00	–	–	–	–	–	–	–	–
PF-SE	0.98**	0.61**	0.48**	0.53**	1.00	–	–	–	–	–	–	–
PF-SD	0.58**	0.99**	0.72**	0.80**	0.61**	1.00	–	–	–	–	–	–
PF-FE	0.43**	0.71**	0.99**	0.58**	0.46**	0.72**	1.00	–	–	–	–	–
PF-FD	0.54**	0.79**	0.61**	1.00**	0.53**	0.81**	0.59*	1.00	–	–	–	–
Letters	0.32*	0.37*	0.12	0.21	0.32*	0.36*	0.11	0.19	1.00	–	–	–
Words	0.09	0.31	0.18	0.23	0.20	0.38*	0.24	0.24	0.31	1.00	–	–
Raw	0.04	0.14	0.03	0.09	0.15	0.19	0.06	0.10	0.01	0.53**	1.00	–
Normalised	0.15	0.14	0.04	−0.01	0.24	0.19	0.07	0.00	0.06	0.46**	0.95**	1.00

The means (M) and standard deviations (SD) are also presented

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

easy book (33 %) than the difficult book (22 %). While the difference was in the same direction, it was smaller for the second graders (37 % for difficult and 40 % for easy). These results support the idea that the younger children might have more difficulty reading the difficult text, thus reverting to the exploration behaviour of preschoolers to pay more attention to the illustrations and of avoiding the text. It should be noted that the analysis could not be computed as a function of the children's ability to read the books used in the current study because most children could read both levels of books. Nevertheless, of the six children unable to read the text from the difficult books, five were in first grade, which could have lowered the proportion of time and number of fixations on the text for these books at the adult speed (Roy-Charland et al., 2007). In sum, these results tend to support role of text difficulty on the attention to print in shared book reading. These results should be considered with caution because there was a significant interaction between the text difficulty and the narration presentation speed.

As mentioned previously, the goal of the current study was to explore the role of text difficulty and reading speed on children's attention to print. The results showed the presence of an interaction between these variables. More precisely, for both the easy and difficult books, children spent more time and made more fixations on the printed text when it was read at a slow pace than at a fast pace. However, at fast speed, children spent more time and made more fixations on the text for the easy than the difficult books, but at slow pace the difference disappeared. In other words, these results suggest that to increase the attention to the printed text of a difficult book, the adult can simply reduce his or her reading speed. These results can add indirect empirical support to the recommendation from the authors of the pair-reading technique (Topping, 1987, 2006). Furthermore, the results have important implications for the practice of shared book reading. If the goal of the activity is to provide a scaffold for reading and written language acquisition, the reader needs to adapt his or her reading speed to accommodate the child's needs and abilities.

Additional analyses were computed to explore the link between the attention to the printed text and reading and language ability measures with psychometric tests. Results revealed that when the text was read at slow speed, as children's letter knowledge increased, the time and number of fixations on the text increased. Furthermore, again at slow speed only, results showed that as children's word reading abilities increased, the time and number of fixations on the text increased. However, receptive vocabulary was not linked to the time spent on the text or the number of fixations on the text. These results suggest that the attention to the printed text was not solely dependent on the characteristics or strategies of the reader but might also be modulated by the child's written language knowledge. Future research should explore these links more explicitly.

Future research and limitations

While the current results provide evidence for the link between reading speed, text difficulty and children's attention to the printed text during shared book reading, the benefits or detriments related to these practices remain unknown. In effect, it is possible that while increasing attention to the printed text, reducing reading speed

might reduce comprehension of the read materials or affect children's interest in the activity. These questions need to be explored in order to make informed recommendations for the practice of this activity.

Conclusion

The current study examined the role of narration presentation speed and text difficulty in children's attention to the printed text in shared book reading. Results showed that reducing presentation speed allowed children to pay more attention to more difficult text. Furthermore, some written language abilities seem to also be involved in the attention to the printed text. Nevertheless, future research should examine the impact of reading speed on other reading related outcomes such as discourse comprehension or interest in reading activities.

Acknowledgments This research was supported by a grant from the Consortium National de Formation en Santé to Annie Roy-Charland. We thank Isabelle Cormier and Macha Roy for their assistance in running participants and Jessica Boulard for her input on previous versions of this work. We would also like to thank Sylvain Boucher for the recording of the narration.

References

Baker, L., Mackler, K., Sonnenschein, S., & Serpell, R. (2001). Parents' interactions with their first-grade children during storybook reading and relations with subsequent home reading activity and reading achievement. *Journal of School Psychology, 39*, 415–438. doi:10.1016/S0022-4405(01)00082-6.

Bus, A. G., van Ijzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research, 65*, 1–21. doi:10.3102/00346543065001001.

Daoust, F., Laroche, L., & Ouellet, L. (1996). Sato-calibrage: Présentation d'un outil d'assistance au choix et à la rédaction de textes pour l'enseignement. *Revue Québécoise de Linguistique, 25*, 205–234.

Desrochers, A. (2008). *The assessment of reading skills among French-speaking children: Test construction procedure and psychometric properties*. Ottawa: Cognitive Psychology of Language Laboratory, University of Ottawa.

Dunn, L. M., Theriault-Whalen, C. M., & Dunn, L. M. (1993). *Échelle de vocabulaire en images Peabody*. Toronto, ON: Psycan.

Evans, M. A., Roy-Charland, A., & Saint-Aubin, J. (2009). A new look at an old format. Eye tracking studies of shared book reading and the implications for eBooks and eBook research. In A. G. Bus & S. B. Neuman (Eds.), *Multimedia and literacy development: Improving achievement for young learners* (pp. 77–88). New York, NY: Routledge.

Evans, M. A., & Saint-Aubin, J. (2005). What children are looking at during shared storybook reading: Evidence from eye movement monitoring. *Psychological Science, 16*, 913–920. doi:10.1111/j.1467-9280.2005.01636.x.

Jackson, M. D., & McClelland, J. L. (1975). Sensory and cognitive determinants of reading speed. *Journal of Verbal Learning and Verbal Behavior, 19*, 565–574.

Jackson, M. D., & McClelland, J. L. (1979). Processing determinants of reading speed. *Journal of Experimental Psychology: General, 108*, 151–181.

Justice, L. M., Skibbe, L., Canning, A., & Lankford, C. (2005). Pre-schoolers, print and storybooks: An observational study using eye movement analysis. *Journal of Research in Reading, 28*, 229–243. doi:10.1111/j.1467-9817.2005.00267.x.

Levy, B. A., Gong, Z., Hessels, S., Evans, M. A., & Jared, D. (2006). Understanding print: Early reading development and the contributions of home literacy experiences. *Journal of Experimental Child Psychology, 93*, 63–93. doi:10.1016/j.jecp.2005.07.003.

Piasta, S. B., Justice, L. M., McGinty, A. S., & Kaderavek, J. N. (2012). Increasing young children's contact with print during shared reading: Longitudinal effects on literacy achievement. *Child Development, 83*, 810–820. doi:10.1111/j.1467-8624.2012.01754.x.

Pick, A. D., Unze, M. G., Brownell, C. A., Drozdal, J. G., & Hopmann, M. R. (1978). Young children's knowledge of word structure. *Child Development, 49*, 669–680.

Roy-Charland, A., Perron, M., Boulard, J., Chamberland, J. A., & Hoffman, N. (2015). "If I point, do they look?" The impact of attention-orientation strategies on text exploration during shared book reading. *Reading and Writing, 28*, 1285–1305.

Roy-Charland, A., Saint-Aubin, J., & Evans, M. A. (2007). Eye movements in shared book reading with children from kindergarten to grade 4. *Reading and Writing, 20*, 909–931. doi:10.1007/s11145-007-9059-9.

Scarborough, H. S., & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Bulletin, 124*, 372–422. doi:10.1006/drev.1994.1010.

Tibo, G., & Germain, P. (2000). *Alex et son chien Touli*. Saint-Lambert, QC: Dominique et Compagnie.

Tibo, G., & Germain, P. (2008). *Alex et le mystérieux Numéro Sept*. Saint-Lambert, QC: Dominique et Compagnie.

Topping, K. J. (1987). Paired reading: A powerful technique for parent use. *Reading Teacher, 40*, 608–614.

Topping, K. J. (2006). Building reading fluency: Cognitive, behavioral, and socioemotional factors and the role of peer-mediated learning. In S. J. Samuels & A. E. Farstrup (Eds.), *What research has to say about fluency instruction* (pp. 106–129). Newark, DE: International Reading Association.

van Kleeck, A., Stahl, S. A., & Bauer, E. B. (Eds.). (2003). *On reading books to children: Parents and teachers*. New York, NY: Routledge.

Wilhelm, H. (2003a). *Je veux aider!*. Merkham, ON: Les Éditions Scholastic.

Wilhelm, H. (2003b). *Je n'ai pas peur!*. Merkham, ON: Les Éditions Scholastic.