

Visual Attention to Print during Storybook Reading in Preschool Children with and without Hearing Loss

Avinaash Korrapati*

UC San Diego

Krystal L. Werfel*

UNIVERSITY OF SOUTH CAROLINA

C. Melanie Schuele

VANDERBILT UNIVERSITY
MEDICAL CENTER

ABSTRACT

Children with normal hearing spend much less time looking at print than at illustrations during storybook reading. However, children are more likely to attend to print when storybooks have high print salience. Although children with hearing loss exhibit documented deficits in print knowledge, little is known about attention to print for children with hearing loss. The purpose of this study was to investigate visual attention to print during storybook reading in preschool children with hearing loss. Preschoolers with and without hearing loss participated in storybook reading sessions. One book with high print salience and one book with low print salience were displayed on a computer screen while a female voice read the text. Visual attention to print was tracked using a Tobii X50 eye tracking system. Eye gaze analysis indicated that younger children with hearing loss focused more on print than children without hearing loss. Children with and without hearing loss both focused more on print in storybooks with high print salience than low print salience. Despite adequate visual attention to print, children without hearing loss do not appear to learn about print during storybook reading. Future research should investigate ways of explicitly teaching children with hearing loss about print.

INTRODUCTION

Literacy outcomes for children with hearing loss are notoriously poor. The average 18-year-old with hearing loss reads at a fourth grade level (e.g., Qi & Mitchell, 2011). Children with hearing loss exhibit deficits in emergent literacy development as early as preschool (for a review see Moeller et al., 2007).

Emergent literacy refers to the set of skills that are critical for conventional reading development. According to Justice and Ezell (2001), emergent literacy consists of three components: print knowledge, phonological awareness, and oral language. Children with hearing loss have documented deficits in phonological awareness and oral language. However, little is known about print knowledge in children with hearing loss. Preliminary results from our lab indicate that children with hearing loss perform well below their same-age peers with normal hearing on tasks that tap conceptual print knowledge (Werfel, Lund, & Schuele, 2012).

Print knowledge includes knowledge of the alphabet, book format, the independence of single written words, and literacy terms (*spell, word, etc.*; Evans & Aubin, 2005). Because print knowledge is a strong predictor of later literacy skills (NELP, 2009), print knowledge has been the focus of numerous studies.

In studies of visual attention to print in storybooks, researchers report that children with normal hearing spend much less time looking at print than at illustrations (e.g., Evans & Saint-Aubin, 2005; Justice et al., 2005). However, Justice and colleagues (2005; 2007) reported that children attended to print more in storybooks with high print salience (e.g., large text, few words on page, contextualized print) than in storybooks with low print salience (e.g., small text, many words on page, no print in illustrations). In addition, children spend more time looking at print when text is within their reading ability than when text exceeds their reading ability (Roy-Charland, Saint-Aubin, & Evans, 2007). Little is known about visual attention to print for children with hearing loss.

Proficiency in literacy is a critical expectation to succeed academically and socially. Children with hearing loss have documented literacy deficits and thus are at high risk for academic failure. To provide effective literacy instruction and intervention, it is important to understand all aspects of literacy development in children with hearing loss and to elucidate areas in which this population struggles.

PURPOSE

The purpose of this study was to evaluate visual attention to print in preschool children with hearing loss.

METHOD

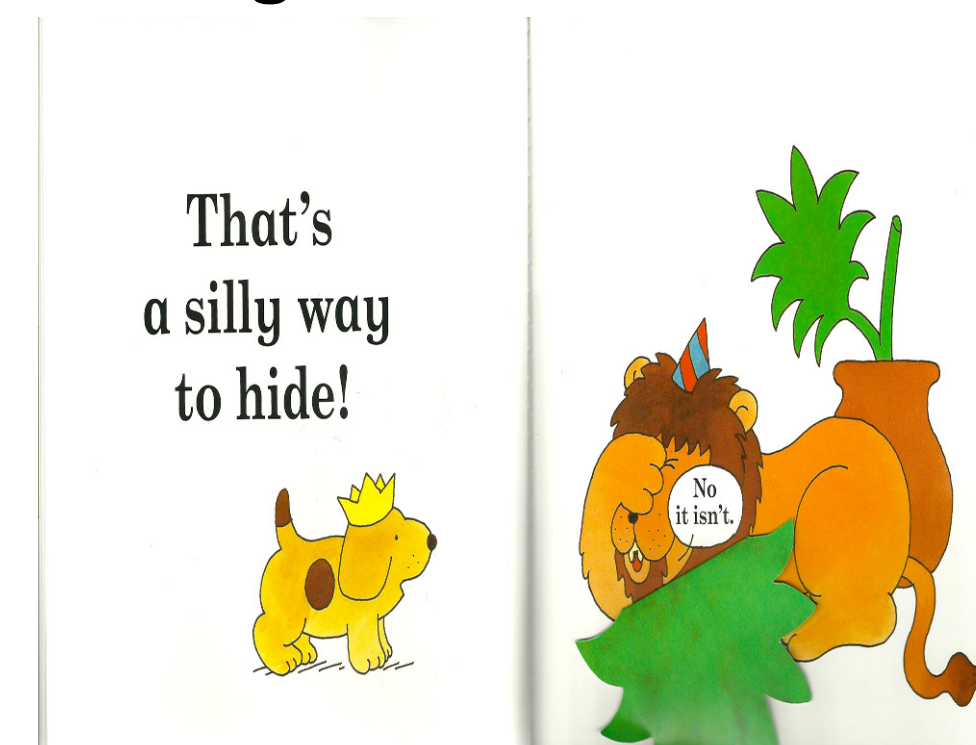
Participants

Four children with hearing loss (three 3-year-olds, one 5-year-old) and five children with normal hearing (two 3-year-olds, three 5- and 6-year-olds) participated in a storybook reading session.

Procedures

Two storybooks were used in the study, *Spot's Birthday Party* (high print salience) and *Spot's Show and Tell* (low print salience). Book pages were scanned into jpeg files, and a female adult voice was recorded reading the book text. E-prime was used to program the experiment. Book pages were displayed on a computer screen one after another. Audio of the reading began 500 ms after the page appeared, and the page changed 3000 ms after the audio ended.

High Print Salience



Low Print Salience



Children sat on an examiner's lap in a chair proximal to the computer screen. First the eye tracker was calibrated for each participant. Then the child viewed the book content (counterbalanced). The examiner did not direct children's attention to print during the reading sessions. While children viewed the screen, visual attention to print was tracked using a Tobii X50 eye tracking system, a non-invasive video camera that tracked eye gaze position.

RESULTS

Do children with hearing loss exhibit less visual attention to print than children with normal hearing during storybook reading?

No. Cohen's *d* effect sizes indicated that children with hearing loss attended to print more than children with normal hearing.

Percent of Total Time During Storybook Reading

	Younger (age 3)			Older (age 5-6)	
	HL	NH	<i>d</i>	HL	NH
High Print Salience					
Print	0.4	0.6	0.29	2.0	4.1
Contextualized Print	4.7	2.0	1.23	5.5	8.5
Pictures	65.1	79.9	1.16	78.4	62.8
White Space	9.3	5.5	1.26	6.2	9.7
Not Looking at Book	20.3	11.9	0.61	8.0	14.9
Low Print Salience					
Print	0.5	0.1	1.43	1.7	0.7
Pictures	75.6	90.3	1.13	80.4	81.9
White Space	6.9	5.9	0.29	9.2	6.8
Not Looking at Book	16.9	3.7	1.56	8.8	10.6

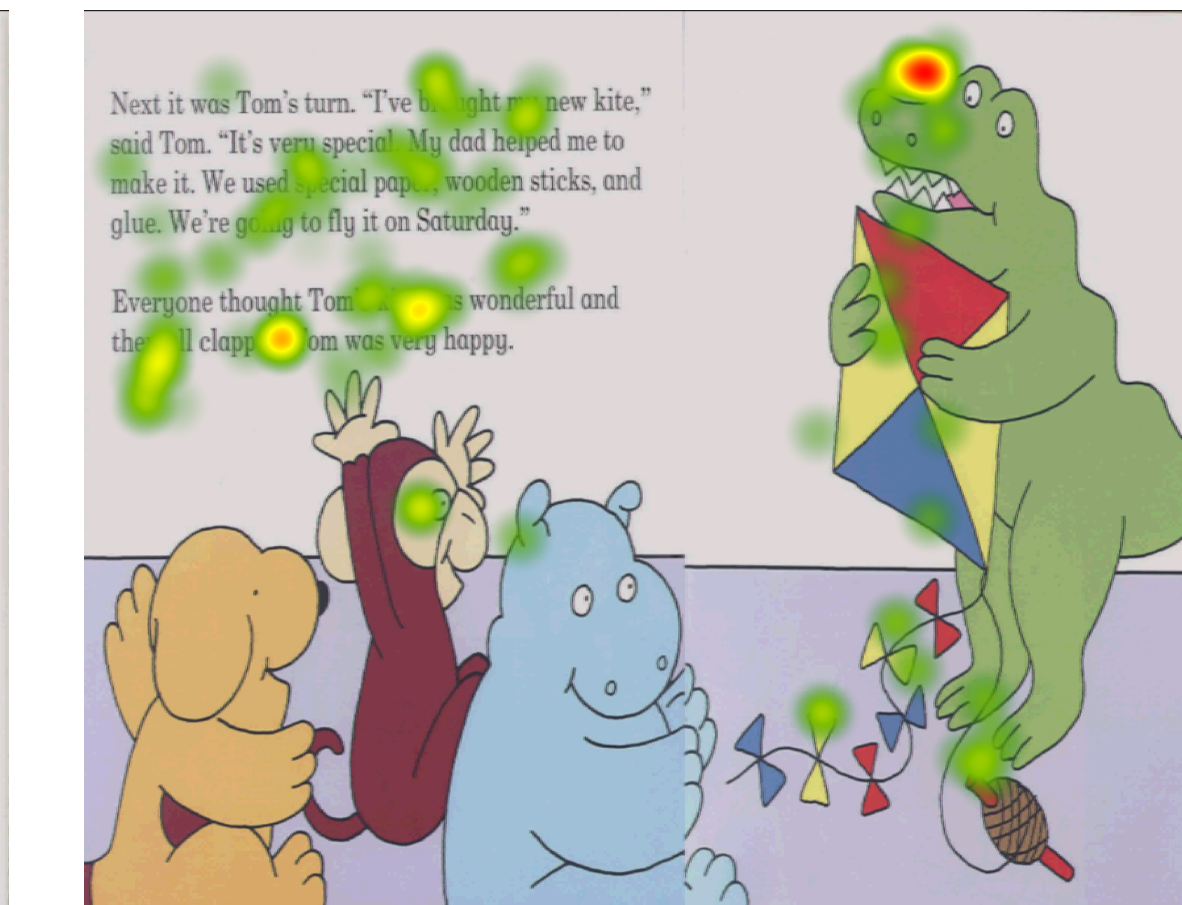
RESULTS

ADULT MODEL

High Print Salience

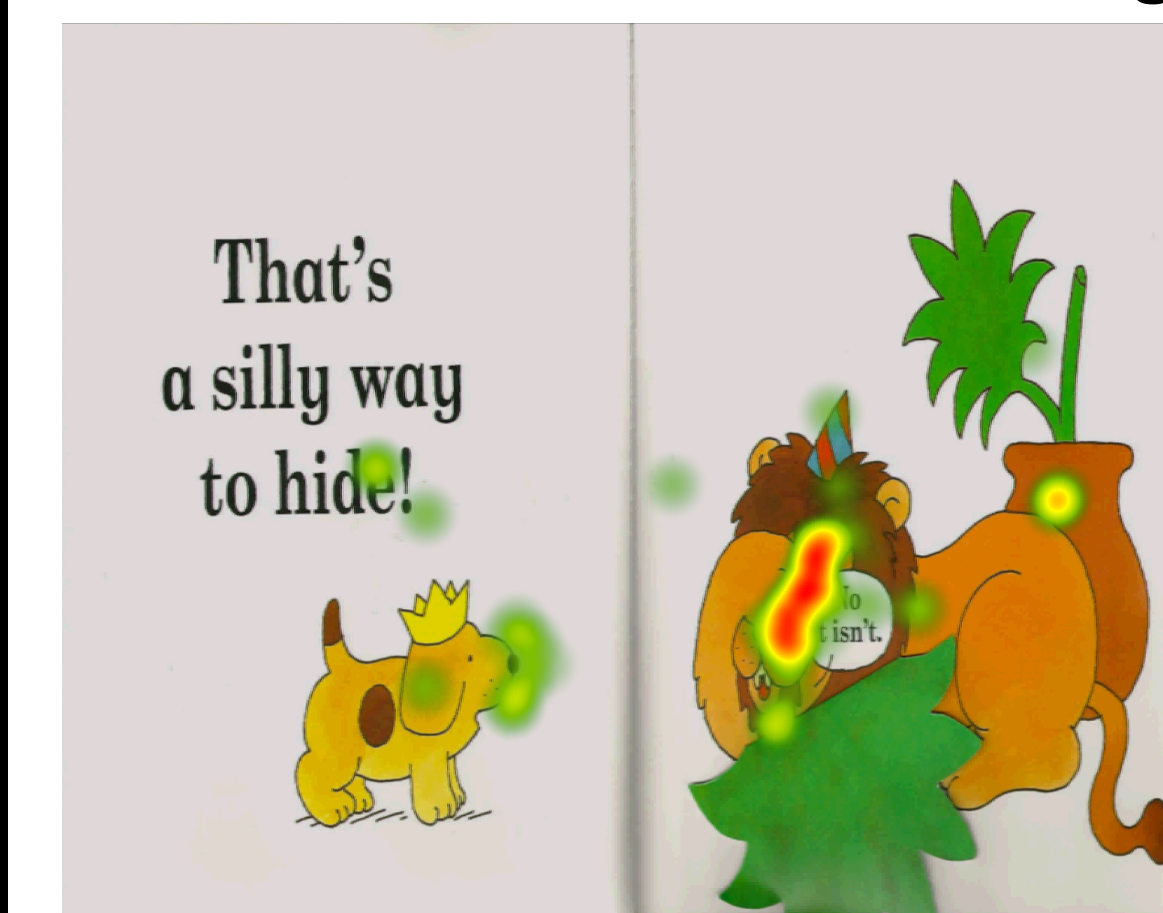


Low Print Salience



HIGH PRINT SALIENCE

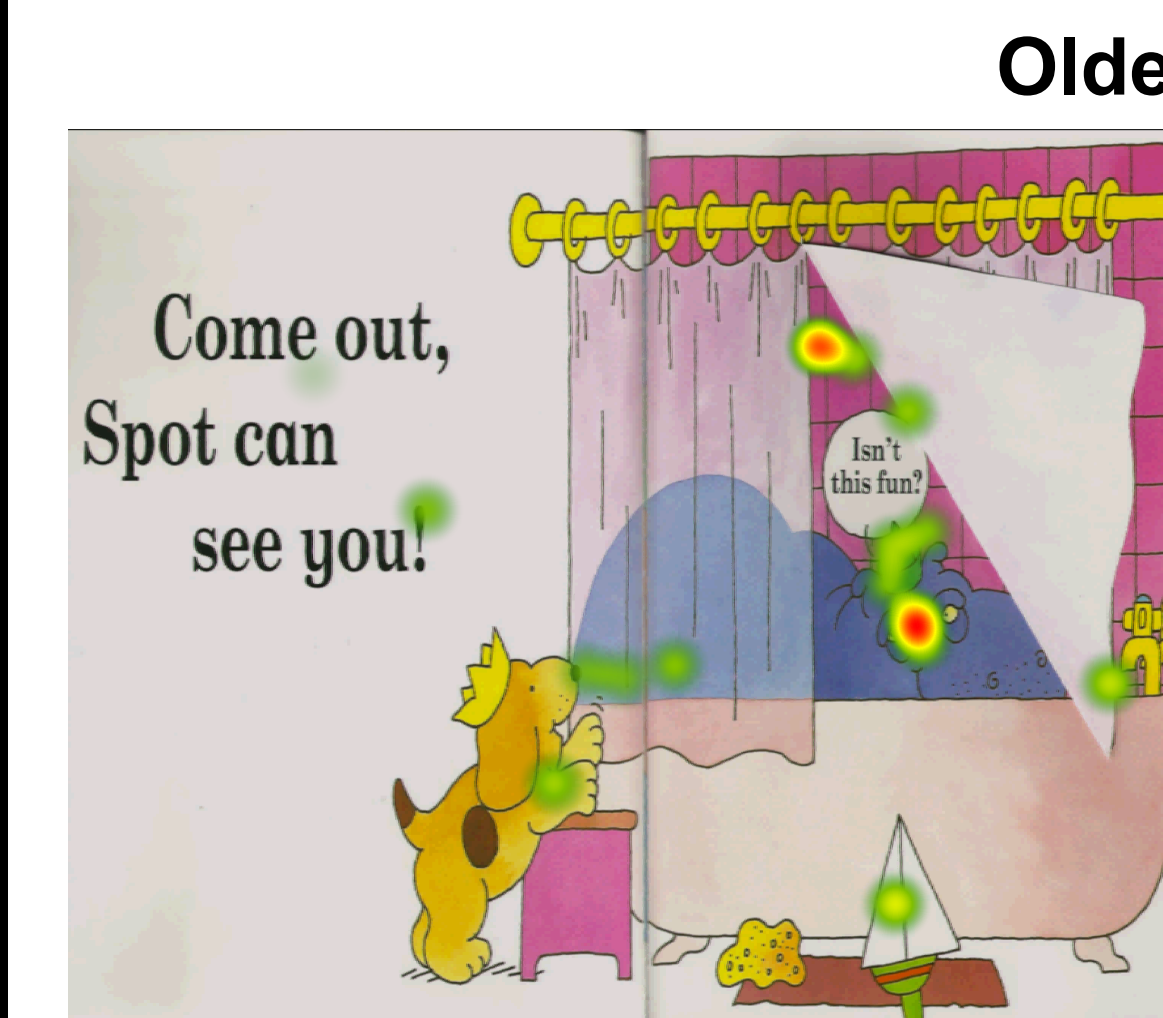
Hearing Loss



Normal Hearing



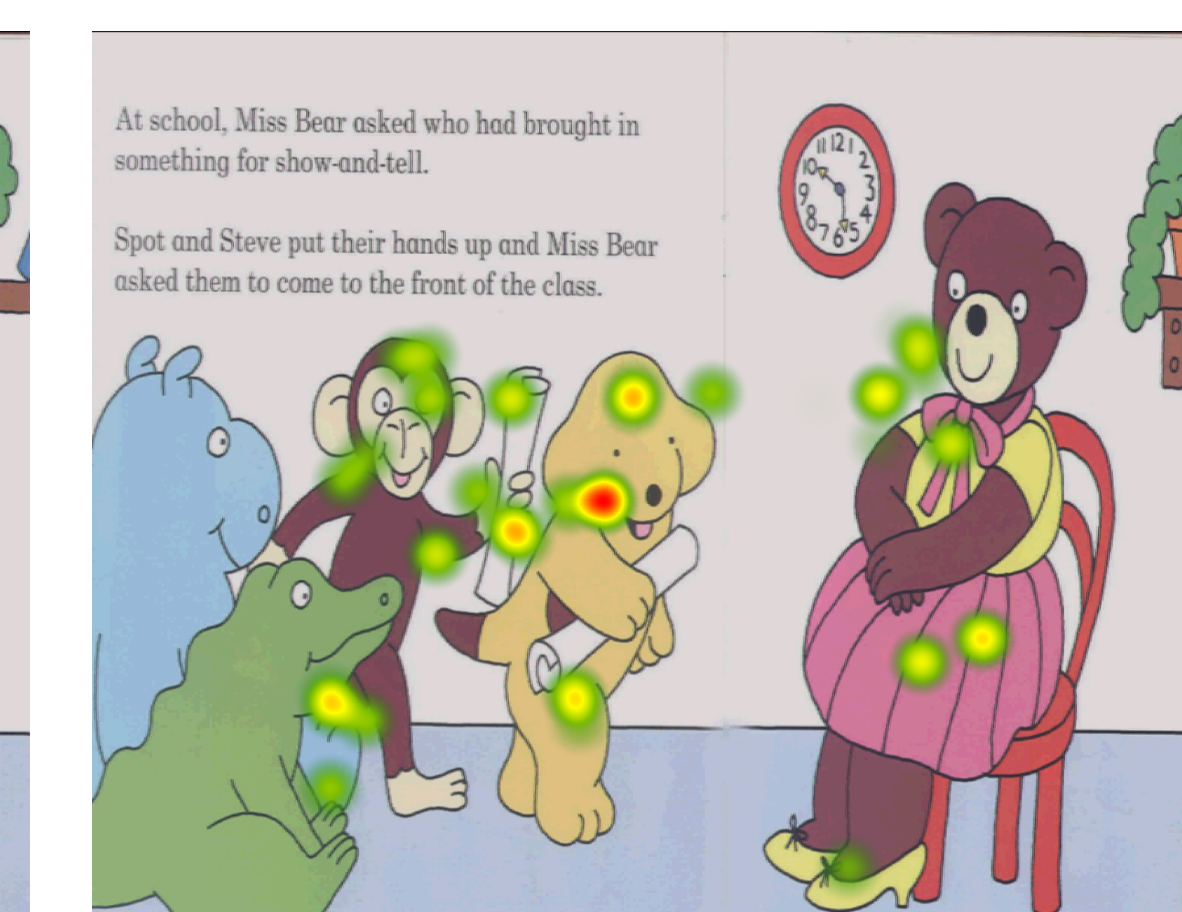
Younger Children



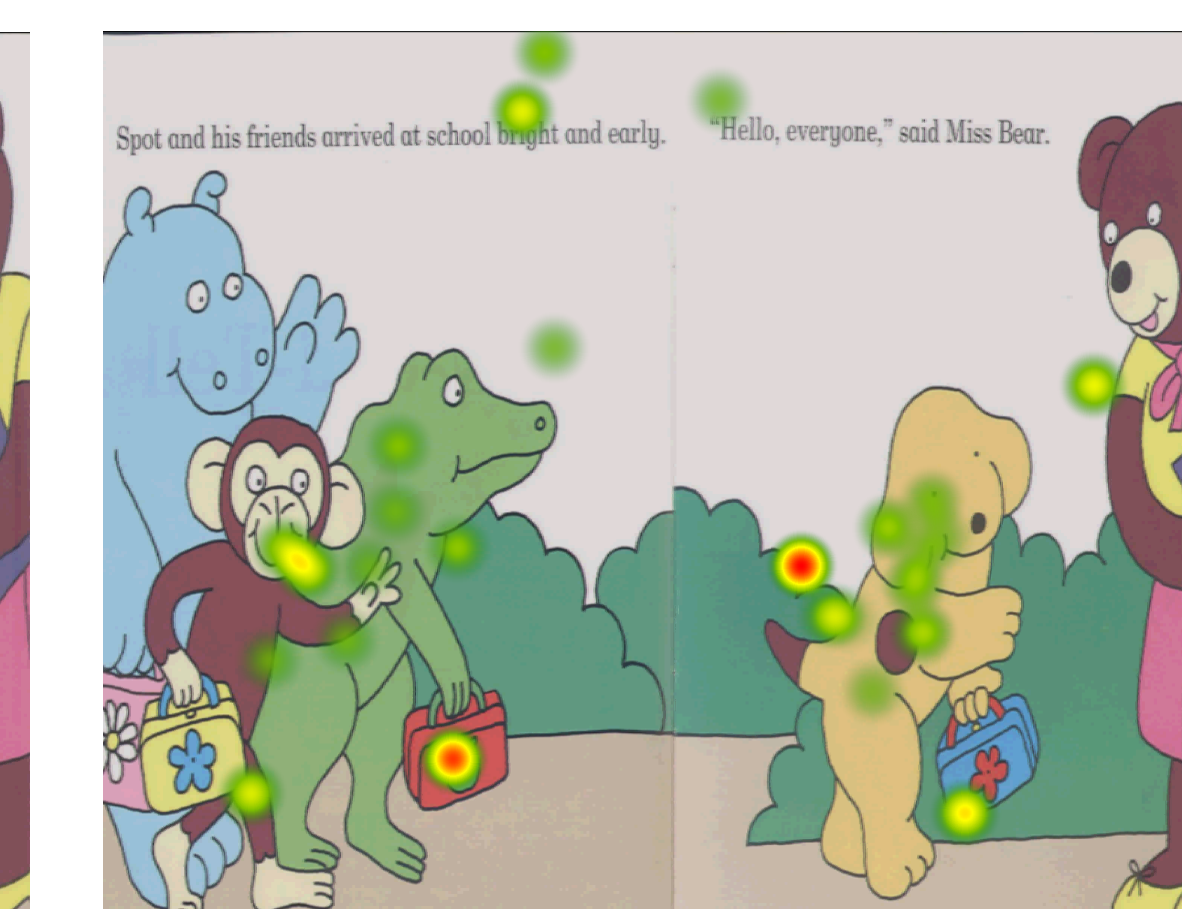
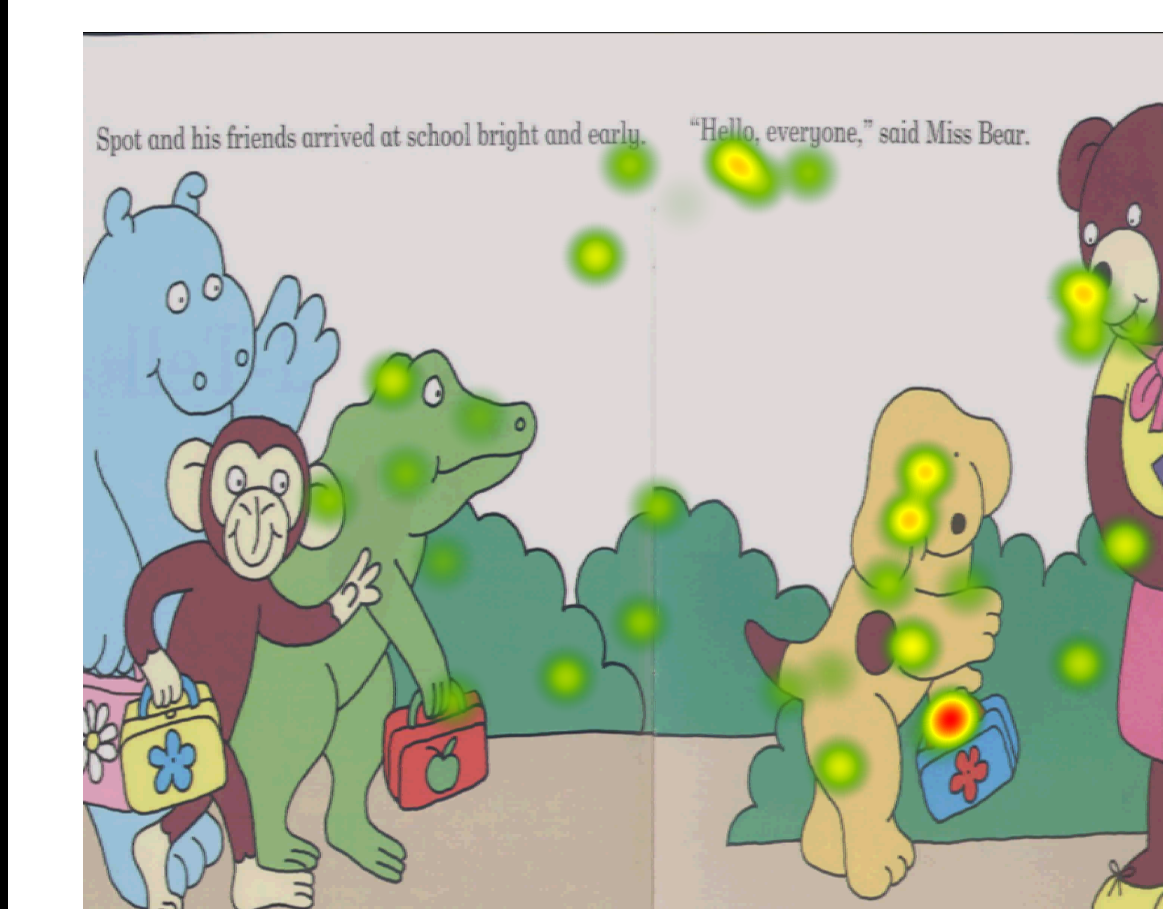
Older Children

LOW PRINT SALIENCE

Younger Children



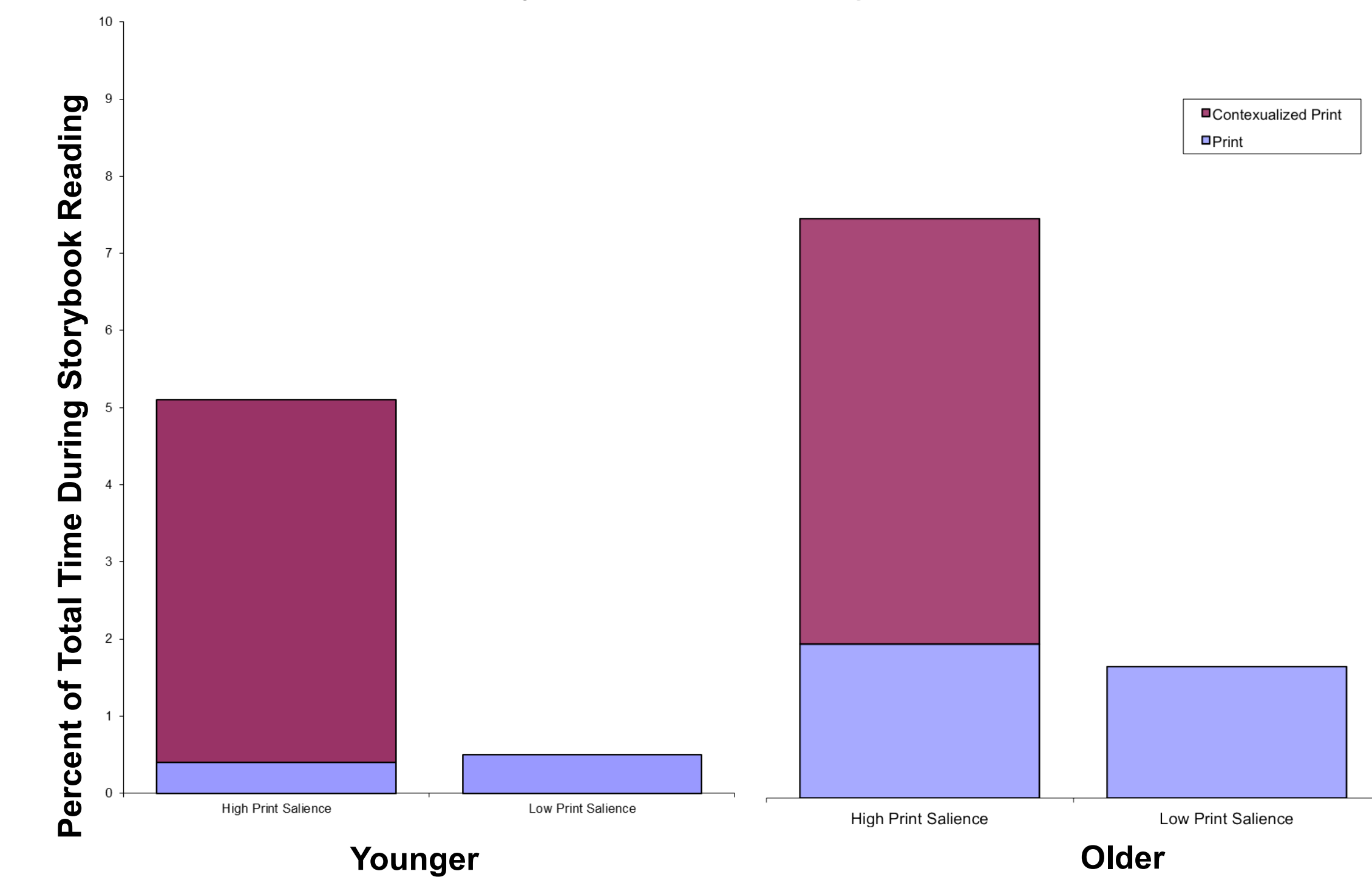
Older Children



RESULTS

Does print salience of storybooks affect visual attention to print for children with hearing loss?

Yes. Children with hearing loss had higher visual attention to print in storybooks with high print salience.



DISCUSSION

Children with hearing loss exhibit documented deficits in print knowledge. One possible explanation for these deficits is that they do not attend to print during storybook reading. However, contrary to our hypothesis, younger children with hearing loss did not attend less to print during storybook reading than children with normal hearing. In fact, effect sizes indicated that younger children with hearing loss looked at print, particularly contextualized print, more than their peers with normal hearing.

The older child with hearing loss, in contrast, attended to print less than peers with normal hearing. The rate of growth of visual attention to print may be slower for children with hearing loss than children with normal hearing. Perhaps this slower rate of growth of visual attention to print can explain deficits in print knowledge in this population.

Children with hearing loss were much more likely to visually attend to print in books with high print salience than low print salience. When targeting print knowledge during storybook reading, books with high print salience should be used.

Because of the early visual attention to print of children with hearing loss, explicit print referencing during storybook reading (e.g., Justice & Ezell, 2000; 2002) may be an effective intervention method for this population. Future research should explore the effectiveness of explicit print referencing interventions for children with hearing loss.

ACKNOWLEDGEMENTS

This study was supported by a Preparation of Leadership Personnel grant (H325D080075; PI: Schuele), US Department of Education. The content is solely the responsibility of the authors and does not necessarily represent the views of funding agencies.

Poster presented at the
2013 American Speech-Language Hearing Association Convention,
Chicago, IL

References available upon request: language@vanderbilt.edu
Poster available at: www.mc.vanderbilt.edu/language

*This work was completed when the first author was a Research Experience for High School Students participant and the second author was a doctoral student at Vanderbilt University.