



To the letter: Early readers trust print-based over oral instructions to guide their actions

Kathleen H. Corriveau^{1*†}, Shiri Einav^{2*†}, Elizabeth J. Robinson³ and Paul L. Harris⁴

¹School of Education, Boston University, Massachusetts, USA

²School of Psychology, University of Nottingham, UK

³Department of Psychology, Warwick University, UK

⁴Graduate School of Education, Harvard University, Cambridge, Massachusetts, USA

Children have many opportunities to learn from others through oral and written sources. Recent evidence suggests that early readers place more trust in written over oral testimony when learning names for unfamiliar objects. Across three studies, we examined whether the authority of print extends beyond mere naming to guide children's actions in the physical world. In Study 1, 3- to 6-year-olds received conflicting oral and print-based advice from two puppets about how to operate a novel apparatus. Whereas pre-readers were indiscriminate in their trust, early readers preferred to follow the print-based advice. In Study 2, we replicated this finding, controlling for the amount of corroborating evidence presented by both sources, and the location of the print. In Study 3, we explored whether readers' preference for print-based information was due to a global preference for external representations, or a more specific preference for text. Children were presented with conflicting instructions based on text versus a coloured circle. Whereas pre-readers preferred to follow the colour circle, readers preferred to follow the text. Together, the results suggest that when children learn to read, they rapidly come to regard the written word as a particularly authoritative source of information about how to act in the world.

Imagine you are on your way to an important meeting that is taking place in an unfamiliar building on campus. Before you set off, your colleague who has previously visited the building gives you directions and tells you to turn left at the cafeteria. However, on reaching the cafeteria, you see a sign that directs you to the right instead. Standing at these cross-roads with time ticking by, you must decide what course of action to take. Chances are you would trust the information read from the sign over the testimony of your colleague. The printed source is treated as the more reliable, and you reason that your colleague must have been mistaken as you head towards the right. In the following studies, we examined how young children handle conflicting information from written versus oral testimony to guide their actions.

Although a great deal of information is passed on orally, members of literate societies rely extensively on the written word as a vehicle for the transmission of knowledge that can

*Correspondence should be addressed to Kathleen Corriveau, Human Development, School of Education, Boston University, Boston, MA 02215, USA (email: kcorriv@bu.edu) or to Shiri Einav, School of Psychology, University of Nottingham, Nottingham NG7 2RD, UK (email: shiri.einav@nottingham.ac.uk).

†Both authors contributed equally.

transcend time and space between author and reader. Even before they can formally read, children are exposed both to the written word and to people obtaining information from written sources such as books, signs, labels, and the Internet. However, little is known about children's awareness of the knowledge-providing potential of writing, or their assumptions about its reliability as a source for learning. Reflecting the early classroom emphasis on learning to read rather than reading to learn (Hall & Moates, 1999; Neuman & Dickinson, 2011), research on early reading has focused on children's developing print (Hiebert, 1981) and phonological awareness (Neuman & Dickinson, 2011), and the relationship between these skills and later decoding and comprehension of written texts. Yet, the trust that children invest in print is a particularly pressing question given the unprecedented amount of unchecked written information available to children online.

Many recent studies have shown that when it comes to spoken testimony, preschoolers effectively discriminate between reliable and unreliable sources. For example, when faced with a choice of informants, they show selective trust on the basis of the speakers' confidence and previous accuracy (Birch, Vauthier, & Bloom, 2008; Corriveau & Harris, 2009a; Einav & Robinson, 2010; Koenig, Clément, & Harris, 2004; Sabbagh & Baldwin, 2001; Scofield, Gilpin, Pierucci, & Morgan, 2013), even taking into account the reasons underlying speakers' correct and incorrect claims when predicting their future reliability (Einav & Robinson, 2011; Kondrad & Jaswal, 2012; Nurmsoo & Robinson, 2009). Children also select among speakers by attending to epistemically relevant characteristics such as age, expertise, and familiarity (Corriveau & Harris, 2009b; Jaswal & Neely, 2006; Lutz & Keil, 2002; Sobel & Corriveau, 2010).

However, printed sources cannot ordinarily be scrutinized for reliability using many of the criteria that children apply when evaluating oral testimony. Children are unlikely to have any knowledge of the author's prior accuracy, age, relevant experience, confidence, or intentions. Indeed, young children may not realize that texts have authors (Francis, 1982). Therefore, the development of trust in the written word warrants investigation.

A few recent studies investigating children's trust in written versus oral information suggest that as soon as children acquire a basic reading ability, they place greater trust in text-based over spoken claims. Robinson, Einav, and Fox (2013) presented children with two dolls who made conflicting claims when identifying the referent for an unfamiliar animal name: one doll made stand-alone oral statements (e.g., 'This is the neri'), whereas the other based its suggestion on printed names that it read aloud (e.g., 'This word says neri'). Participants were asked to decide which doll was right and to identify the target animal. Younger pre-readers showed no preference for either informant, but children with very basic reading skills treated the informant whose knowledge was gained from print as more reliable than the speaker who relied on her own knowledge base (see also Einav, Robinson, & Fox, 2013). In a separate study, Eyden, Robinson, Einav, and Jaswal (2013) found a similar developmental pattern when they tested children's willingness to accept implausible labels for perceptually ambiguous entities. Pre-readers were highly deferential to both oral and printed suggestions that were read aloud by the informant. By contrast, readers trusted their own interpretation over a conflicting oral suggestion, but deferred to a conflicting print-based suggestion, indicating that print held special authority for them. Taken together, these data indicate that prior to the ability to decode print, children are equally trusting of oral and written information. After children are able to decode, they defer to print-based information – even when it conflicts with perceptual information.

In this study, we asked how far young children trust the written over the spoken word not just as a source of information about object names but as a source of information about

the workings of the physical world. One possibility is that children have a relatively circumscribed trust in the authority of text. More specifically, they might not expect text to have any particular authority outside of the naming context, for example, in providing explanation and instruction about the functioning of objects. An alternative possibility is that children view text as having extended authority across domains so that when faced with uncertainty about how to interact with a novel object, they might invest more trust in written as opposed to oral instructions.

To test these competing hypotheses, we presented children with a simple physical apparatus, adapted from previous research on imitation by preschool children (Want & Harris, 2001). Children were shown a Y-shaped, tubular apparatus with a cup at the base and introduced to the 'tubes game'. They were told that the goal of the game was to drop a marble into one of the two arms and get it to go 'all the way to the bottom cup' but that one of the two arms was blocked. During test trials – each involving a differently coloured pair of opaque tubes – children received conflicting advice from two puppets. One offered advice based on a label attached to the apparatus, whereas the other offered purely oral advice. Children were then invited to drop the marble in the tube they thought would enable it to reach the cup at the bottom.

In Study 1, children ranging from 3 to 6 years of age were tested, thereby allowing us to assess the robustness of the documented developmental shift in children's trust in the written word between pre-readers and early readers (Robinson *et al.*, 2013) using a different experimental paradigm. Children's reading competence was checked by means of a simple word recognition test involving colour words. Note, however, that because each puppet stated which coloured tube children should choose, competence at reading colour words was not a prerequisite for favouring advice based on the written word. In studies 2a and 2b, we ran important controls to rule out alternative explanations for our findings. Finally, in Study 3, we compared children's trust in text versus a conflicting external sign (colour circle) to examine whether they show a specific preference for text over other physically enduring representations.

STUDY 1

Method

Participants

Participants were 21 3-year-olds ($M = 3;5$, range = 3;1–3;11, 8 females), 21 4-year-olds ($M = 4;6$, range = 4;1–4;11, 12 females), 23 5-year-olds ($M = 5;4$, range = 5;0–5;11, 7 females), and 17 6-year-olds ($M = 6;8$, range = 6;3–7;1, 8 females). Participants were recruited from a children's exhibit in a local science museum. Most participants were White and middle class. All available children in the age range studied were invited to participate and most accepted.

Materials

Two child-like hand puppets named 'Benny' and 'Lenny' served as the informants. Several Y-shaped tubular apparatuses connected to a cup at the bottom were used. The bottom of the cup was lined with a sponge, to reduce sound. For the training, the apparatus was all white and did not display any label. One tube was blocked, and this tube was also lined with a sponge. For the test trials, the two tube arms were coloured as follows: blue/red; purple/yellow; pink/green; orange/brown; black/white. An envelope was attached to the

central trunk of the apparatus; when the flap was lifted, a colour word was displayed (e.g., red). A marble was given to the child on each trial. For the word–colour matching task, an array of eight differently coloured circles was used and also a set of matching colour words.

Procedure

Children were shown the apparatus and watched as the experimenter demonstrated that a marble dropped into one opaque arm reached the cup at the base, whereas a marble dropped into the other opaque arm was blocked from reaching the cup. The sound the marble made when hitting the cup was identical to the sound made when it was blocked. The experimenter said ‘I have a bunch more of these tubes and sometimes the tube that lets the marble go to the bottom is on this side (points to one arm) and sometimes the tube that lets the marble go to the bottom is on this side (points to the other arm). You get a sticker each time it gets to the bottom. It’s tricky though, right? So I have some friends who can help’. The experimenter brought out two puppets. To establish that both puppets were competent readers, the puppets identified which of two boxes contained marbles and stickers by each reading correctly the labelled contents of one of the boxes. (e.g., ‘This says marbles. This is the marbles box’.)

For each of the four test trials, the experimenter brought out the apparatus, asked the child to name the colours of the tubes (all children did so accurately), and held up the two puppets. One puppet always provided oral information: he looked at the apparatus and said, ‘I say blue. Choose the blue one’. The other puppet always provided text-based information: he looked at the apparatus, lifted up the envelope flap momentarily to reveal the label and said, ‘This says red. Choose the red one’. The child was invited to place a marble in one of the two tubes. Children could not see or hear whether or not the marble reached the cup. They received no immediate feedback from the experimenter. The identity of the text puppet and the colour word displayed by the label on each trial were counterbalanced across participants. The order in which the puppets made their suggestions was counterbalanced across the four trials.

Immediately following the fourth test trial, children were presented with the *explicit strategy* trial. The experimenter introduced a further tubes apparatus (black/white) as well as an additional puppet. She said, ‘This puppet has never seen these tubes before, so she needs your help’. The uninformed puppet then asked for the child’s help: ‘Can you help me decide which tube to pick? How should I choose?’ The objective of this trial was to probe whether children would articulate the rationale for their own choices. Explicit verbal or non-verbal responses (e.g., looking in the envelope) were accepted.

Finally, children were tested on the *word–colour matching task*. They were shown the array of differently coloured circles (the colours of the tubes in the 4 test trials) and the set of colour words and were asked to point to the circle that matched each colour word. The experimenter provided an initial training trial (with the colour red) and then presented the seven test trials in a random order, displaying each colour word at a time without replacement.

Results and discussion

For each test trial, children received one point for selecting the tube endorsed by the text puppet (maximum = 4). Mean preferences, and comparisons to 50% chance, for the tube endorsed by the text puppet are shown in Table 1 as a function of age. Inspection of

Table 1. Mean frequency of endorsement of the text puppet (maximum = 4), comparisons with 50% chance, and reading scores (maximum = 7) by age in years in studies 1–3

	Endorsement of text puppet			Reading score Mean (SE)
	Mean (SE)	<i>t</i>	<i>d</i>	
Study 1				
3-year-olds	1.67 (.19)	−0.167	−0.36	1.00 (.23)
4-year-olds	2.14 (.28)	0.51	0.11	1.76 (.41)
5-year-olds	2.35 (.27)	1.28	0.27	3.35 (.62)
6-year-olds	3.06 (.16)	6.63***	1.60	6.82 (.13)
Study 2a				
5-year-olds	2.44 (.18)	2.47*	0.47	4.11 (.53)
Study 2b				
5-year-olds	2.41 (.21)	1.99†	0.37	3.97 (.54)
Study 3				
5-year-olds	2.11 (.18)	0.63	0.10	4.14 (.49)

Note. † $p < .10$; * $p < .05$; *** $p < .001$.

Table 1 indicates that only 6-year-olds selectively endorsed the tube indicated by the text puppet.

Children received one point for correctly matching the colour word with the appropriate colour circle on the word–colour matching task (maximum = 7). Average reading scores by age are displayed in Table 1. To determine whether children’s reading ability influenced their strategy when choosing where to place their marble, we divided children into ‘readers’ (at least 5 of 7 correct on the colour task) and ‘pre-readers’ (<5 of 7 on the colour task). Note that at least three of the seven colour words were not seen by children during the tubes task because these referred to the colour of the non-labelled tube. Therefore, children could not score higher than four on this task simply by recognizing the relevant orthography of the labels that were previously read aloud by the text puppet. Table 2 (upper panel) displays mean preference for endorsing the text puppet by age and reading status (readers vs. pre-readers). Inspection of Table 2 indicates that 5- and 6-year-old readers – and a few 4-year-old readers – systematically followed the instruction provided by the text puppet. By contrast, 3-, 4- and 5-year-old pre-readers showed no systematic preference.

To assess the contribution of reading ability and age to children’s choice of which instructions to trust, we conducted an ANCOVA with reading status (readers, pre-readers) as a between-subjects variable and age in months as a covariate, on the number of trials where the text puppet was endorsed. This revealed a main effect of reading status, $F(1, 79) = 6.61, p = .01, \eta_p^2 = .08$, with readers being more likely to follow the text puppet’s advice than pre-readers but no effect of age, $F(1, 79) = 1.34, ns$.

Finally, recall that on the *explicit strategy* trial, children were asked to spontaneously generate a rule for how to decide where to place the marble. Only 10 children (12%: two 4-year-olds, three 5-year-olds, and five 6-year-olds) demonstrated a rule: 9 children explicitly mentioned looking in the envelope (e.g., ‘Whatever the envelope says’), and one child looked inside it. On average, these 10 children displayed a selective preference for the text-based instruction, $M = 3.20, SD = 0.78, t(9) = 4.81, p = .001, d = 1.53$. The remaining children either pointed to one of the tubes without mentioning a rule, or provided an uninformative response, for example, ‘Look at the tubes’.

Table 2. Mean frequency of endorsement of the text puppet (maximum = 4) as a function of age and reading status in studies 1–3

	Readers				Pre-Readers			
	<i>n</i>	Mean (SE)	<i>t</i>	<i>d</i>	<i>n</i>	Mean (SE)	<i>t</i>	<i>d</i>
Study 1								
3-year-olds	0				21	1.67 (.19)	1.67	−0.36
4-year-olds	3	3.00 (.00)			18	2.00 (.31)	0	0
5-year-olds	9	3.00 (.44)	2.27*	0.76	14	1.93 (.31)	−0.23	0.06
6-year-olds	17	3.06 (.16)	6.62***	1.61	0			
Study 2a								
5-year-olds	13	2.92 (.24)	3.86**	1.07	14	2.00 (.21)	0	0
Study 2b								
5-year-olds	14	2.85 (.25)	3.38**	0.90	15	2.00 (.29)	0	0
Study 3								
5-year-olds	20	2.55 (.23)	2.34*	0.53	16	1.56 (.20)	−2.15*	−0.54

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Overall, the results of Study 1 indicated that children with basic reading ability preferred to follow written as opposed to oral instructions to guide their actions. In contrast, children with little or no reading ability were indiscriminate in their choice. These results extend previous findings (Eyden *et al.*, 2013; Robinson *et al.*, 2013), which suggest that readers invest more trust in written over oral testimony by demonstrating that the authority that children ascribe to print extends beyond the naming context to guide children's actions in the physical domain.

However, it is important to rule out alternative explanations for why readers may have favoured the written instructions. First, the physical presence of the label, which children could momentarily see for themselves when the flap was lifted by the text puppet, might have increased the salience of the written compared with the oral instructions. This also meant that children had direct access to the textual evidence cited by the text puppet, whereas they were completely reliant on the oral puppet's testimony. Further, one could argue that the written condition presented children, especially readers as opposed to pre-readers, with a greater amount of evidence overall because it effectively included two sources of information (the label itself plus the puppet's endorsement of that label, e.g., 'This says red, choose the red one'), whereas the oral condition presented just one source (the puppet's claim, e.g., 'I say blue, choose the blue one'). Thus, it is plausible that children may have acted on the advice of the written words because (1) they found it hard to resist following the more salient instructions, which they themselves had access to or (2) they evaluated the overall amount of evidence present rather than trusting written words over spoken words per se. Study 2 was a control study designed to rule out these explanations.

STUDY 2

In Study 2, we adapted the paradigm used in Study 1 such that both informants based their advice on an external source, thereby equating the overall amount of evidence presented on both sides. The text puppet still endorsed information provided by the label, but

children could not see the words read by the puppet, allowing us to rule out access to the text, and its physical salience as a contributing factor. The oral puppet now endorsed information provided by a third puppet who ‘whispered’ an answer in his ear. If readers were simply attending to the fact that the tube indicated by text was endorsed by two sources (over 1 source) in Study 1, they should be at chance in choosing between the text and oral puppet in Study 2. By contrast, if readers were sensitive to the nature of that second source (written vs. oral), they might still display a selective preference for the information provided by the text puppet.

Further, in Study 2a, we asked whether children’s preference for the information from the text puppet varied by their receptive vocabulary ability, as an index of verbal intelligence. In Study 2b, we checked that children’s preference for the text-based instructions was not due to the envelope’s attachment to the apparatus. Five-year-olds were the focus of both studies as Study 1 found the greatest variance in children’s reading ability at this age.

STUDY 2a

Method

Participants

Participants were 27 5-year-olds ($M = 5;6$, range: 4;10–6;0, 15 females) recruited from local area preschools and kindergartens. Most participants (91%) were White. Although information on socioeconomic status was not collected, the schools primarily serve middle to upper middle class families. Children participated with parental consent.

Materials

The same stimuli were used as in Study 1. An additional puppet, situated close to the apparatus throughout the trials, was used as the whisperer. Receptive vocabulary was measured using the Peabody Picture Vocabulary Test-III (PPVT; Dunn & Dunn, 1997).

Procedure

The procedure for Study 2a was identical to the procedure in Study 1 with the following modification. On each trial, the text puppet said, ‘I’m going to look in this envelope. This word says [blue]. Choose the [blue] one’. When the oral puppet provided information, instead of simply stating his choice, he sought information from a third party, ‘I’m going to ask this girl. [Experimenter made a whisper sound while the girl puppet whispered the answer to the oral puppet] This girl says [red]. Choose the [red] one’. All three puppets remained visible as children were invited to place the marble down one of the two tubes. Note that although both third parties were physically present, children did not have access to the original information from either source – the word on the envelope was kept hidden from the child, and the whisper was unintelligible.

Children’s reading ability was assessed through the same eight-circle *word–colour matching task*. Finally, children’s receptive vocabulary ability was assessed using the PPVT-III. In this task, children were given a series of pages with four pictures and were asked to point to the picture that best matched the word stated by the experimenter.

Results and discussion

As in Study 1, children received one point for selecting the tube endorsed by the text puppet on test trials (maximum = 4). Inspection of Table 1 indicates that on average, children did display a selective preference for the information provided by the text puppet. However, it can be seen in Table 2 that 5-year-old pre-readers ($n = 14$) showed no systematic preference, whereas 5-year-old readers ($n = 13$) systematically followed the instruction provided by the text puppet.

Overall, the standard scores for most children indicated that they had receptive vocabularies within 1 SD of what would be expected for typical development ($M = 104$, $SD = 9.9$, range: 86–120). Readers and pre-readers displayed similar levels of receptive vocabulary, readers: $M = 105$, $SD = 10$, pre-readers: $M = 104$, $SD = 10.1$, $t(25) = 0.35$, ns , suggesting the difference in selectivity towards text for readers was not due to a difference in general verbal ability.

To confirm these findings and to assess the contribution of reading ability, age, and receptive vocabulary to children's choice of whose advice to trust, we conducted an ANCOVA with reading status (readers, pre-readers) as a between-subjects variable and age in months and standard score on the PPVT as covariates. This analysis revealed a main effect of reading status, $F(1, 23) = 6.29$, $p = .02$, $\eta_p^2 = .22$, with readers being more likely to follow the text puppet's advice than pre-readers but no effect of age, $F(1, 23) = 1.17$, ns , or receptive vocabulary, $F(1, 23) = 0.84$, ns .

Finally, we explored children's responses on the *explicit strategy* trial. Eighteen children (67%) explicitly provided a rule. The remaining nine children either pointed to one of the tubes without mentioning a rule or provided an uninformative response, for example, 'Don't know'. Of those 18 children, 12 explicitly suggested looking in the envelopes (e.g., 'Read the envelope') or asking the text puppet. These 12 children did selectively prefer to learn from the puppet who used text information, $M = 3.08$, $SD = 0.67$, $t(11) = 5.61$, $p < .001$, $d = 1.62$. The remaining six children said the uninformed puppet should ask the oral puppet. These six children did not display a selective preference for either puppet on the test trials.

In sum, Study 2a helps to rule out alternative interpretations of readers' selective preference for following the print-based instructions in Study 1. Children still preferred to learn from the text puppet over the oral puppet – even when each claim was endorsed by two corroborating sources. These results argue against the possibility that readers in Study 1 favoured the advice of the text puppet due to the greater salience of the written testimony or because the text puppet's advice consisted of more pieces of evidence overall than the oral puppet's. In addition, the fact that we found no effect of receptive vocabulary on children's selective preference for the print-based instructions indicates that the difference in performance between pre-readers and readers is not simply an artefact of verbal intelligence.

STUDY 2b

Study 2b was designed to rule out one additional alternative interpretation: that readers were more inclined to follow the written instruction because it was attached to the tubes. On this interpretation, children might view the text as an inherent and relevant part of the apparatus, whereas the oral puppet's testimony was independent. To rule out this

possibility, we repeated Study 2a, but the envelope with the text label was separate from the apparatus.

Method

Participants

Participants were 29 5-year-olds ($M = 5;6$, range: 4;9–6;3, 17 females) recruited from local area preschools and kindergartens, as well as from a children's exhibit in a local science museum. Most participants were White and middle class. Children participated with parental consent.

Materials and procedure

The same stimuli and procedure were used as in the previous studies, with the following modification: the text envelope was placed on the table, instead of on the tube apparatus.

Results and discussion

Inspection of Table 1 indicates that on average, children displayed a trend towards selectively preferring the information provided by the text puppet. Table 2 indicates that 5-year-old pre-readers ($n = 15$) showed no systematic preference whereas 5-year-old readers ($n = 14$) systematically followed the instruction provided by the text puppet. An ANCOVA with reading status (readers, pre-readers) as a between-subjects variable and age in months as a covariate revealed a main effect of reading status, $F(1, 26) = 5.10$, $p = .03$, $\eta_p^2 = .16$. No other main effects or interactions were found. Thus, readers still preferred to learn from the text puppet over the oral puppet – even when the envelope containing the text-based information was not attached to the apparatus.

On the *explicit strategy* trial, 16 children (55%) explicitly provided a rule. Of those, eight explicitly suggested looking in the envelopes (e.g., 'Because of the envelope') or asking the text puppet. These eight children displayed a trend to trust the puppet who used text information, $M = 2.87$, $SD = 1.13$, $t(7) = 2.19$, $p = .06$, $d = 0.78$. The remaining eight children said the uninformed puppet should ask the oral puppet. These 8 children did not display a systematic preference for either puppet.

STUDY 3

In Study 3, we explored one other related question concerning children's selective trust in text. In Study 1 and in studies 2a and 2b, we compared children's preference for an external and physically enduring representation (print) over transitory oral information. Although children's preference for the text information remained even after equating text and oral information for salience in studies 2a and 2b, it remains plausible that their response was driven by a preference for external signs more broadly – and not just for specific text-based representations. That is, there may be something about print's physical reality that makes it authoritative over speech, and if so, any physically enduring representation would have the same authority. In Study 3, we explored this possibility by comparing children's trust in two external signs: a written word on an envelope and a colour circle on an envelope. Unlike text, the colour circle symbol can easily be interpreted, regardless of reading ability. Thus, we anticipated that pre-readers might

privilege information from the informant who uses colour circles over text-based information. In contrast, readers should be able to decode the information from both colour and text-based signs, making them comparably informative. If the preference for text in studies 1 and 2 stemmed from the authority ascribed to text-based symbols, readers should perform above chance in learning from the informant who uses text. On the other hand, if it was driven by a more general trust in external representations, readers should perform at chance.

Method

Participants

Participants were 36 5-year-olds ($M = 5;4$, range: 4;6–6;1; 18 females) recruited from local area preschools and kindergartens, as well as from a children's exhibit at a local science museum. Children participated with parental consent.

Materials

The same stimuli were used as in studies 1 and 2. Additional envelopes with colour circles were used as the second symbol for each trial.

Procedure

The procedure for Study 3 was identical to the procedure in Study 2b with the following modifications. Children were first introduced to colour circles and colour words in the training trial. When introducing the colour circles, the experimenter said, 'See, this circle is white'. When introducing the colour words, the experimenter said, 'See, this word says white'. On each test trial, the experimenter brought out two envelopes and placed them on the table in front of the apparatus (side counterbalanced across trials and participants). Each puppet then opened an envelope and, without making the contents visible to the child, stated his choice. For example, the text puppet might say, 'This word says [blue]. Choose the [blue] one'. The colour puppet would say, 'This circle is [red]. Choose the [red] one'. As in studies 1 and 2, children's reading ability was assessed through the same eight-circle *word-colour matching task*.

Results and discussion

Inspection of Table 1 indicates that on average, children displayed a trend towards selectively preferring the information provided by the text puppet. However, Table 2 indicates that 5-year-old pre-readers ($n = 16$) showed a systematic preference for following the instruction provided by the colour circle puppet. By contrast, 5-year-old readers ($n = 20$) showed a systematic preference for following the instruction provided by the text puppet. An ANCOVA with reading status (readers, pre-readers) as a between-subjects variable and age in months as a covariate was conducted on the number of trials where the text puppet was endorsed. This revealed a main effect of reading status, $F(1, 33) = 5.91$, $p = .02$, $\eta_p^2 = .15$. No other main effects or interactions were found.

Finally, we explored children's responses on the *explicit strategy* trial. Twenty-one children (58%) explicitly provided a rule. The remaining 15 children either pointed to one of the tubes without mentioning a rule or provided an uninformative response, for

example, 'Don't know'. Of those 21 children, 11 explicitly suggested asking the text puppet. These 11 children did selectively prefer to learn from the puppet who used text information, $M = 2.72$, $SD = 0.90$, $t(10) = 2.67$, $p = .02$, $d = 0.81$. The remaining 10 children said the uninformed puppet should ask the colour circle puppet. These 10 children displayed a selective preference for the puppet who used colour-based information, $M = 1.30$, $SD = 0.67$, $t(9) = 3.28$, $p = .01$, $d = 1.04$.

In sum, Study 3 found that when given the choice of following instructions based on a colour circle versus a written sign, pre-readers and readers once again differed in their response. Whereas pre-readers' actions were guided by the colour sign, readers followed the text-based instruction. Readers' systematic responding provides further support for their selective trust in the written word. Despite both signs being informative and physically enduring external representations, they attached more authority to the text, suggesting that it in itself drives readers' trust.

GENERAL DISCUSSION

Taken together, our results provide strong and consistent support for the hypothesis that the authority of the written word extends beyond mere naming for early readers and can guide their actions. In Study 1 and across two important controls, readers preferred to act in accordance with print-based rather than oral instructions when shown an apparatus whose workings were opaque. In Study 3, text continued to hold sway when pitted against a conflicting sign composed of a colour circle, demonstrating selective trust in text over other physically enduring representations. In contrast, pre-readers were equally likely to follow the instructions of the text puppet and the oral puppet in Studies 1 and 2. Indeed, pre-readers showed the opposite response pattern to readers in Study 3, placing more trust in the instructions based on the colour sign than the print, a finding we return to later.

The clear developmental change between pre- and early readers replicates and extends previous findings (Einav *et al.*, 2013; Eyden *et al.*, 2013; Robinson *et al.*, 2013) and invites three interrelated questions. First, what is it about the process of learning to read that encourages children to invest trust in the written word? Second, what underlies the perceived authority of text compared with oral testimony for early readers? Third, can we be sure that children's selective trust in the written word is a direct consequence of their reading skills, as opposed to those cognitive skills that underpin the emergence of reading? We consider each of these questions in turn.

In some respects, readers' emerging trust in the written word is puzzling. Books for young children are rarely confined to factual or historical matters. Children are told stories about talking animals, magical transformations, and non-existent creatures. Recent findings show that preschoolers realize that the protagonists embedded in such fantastical stories are make-believe. Indeed, 5- to 6-year-olds spontaneously rely on such implausible story elements to infer the make-believe status of an unfamiliar story protagonist (Corriveau, Kim, Schwalen, & Harris, 2009). Thus, preschoolers are often presented with written materials that describe a make-believe world rather than reality, and children understand that to be the case. Why then do children regard written claims as true when so many of the claims they encounter in books are false? A plausible answer is that young children make a working distinction between two kinds of truth. On the one hand, they recognize the existence of fictional worlds and take stories to provide true and accurate accounts of what happens in those fictional worlds. On the other hand, they recognize the

existence of the real world and take certain kinds of books and narratives to provide a true and accurate account of what happens there.

However, it is still appropriate to ask how children come to treat written texts as authoritative guides for action in the real world – as exemplified by the current findings – when many of their encounters with written texts involve fictional worlds rather than the real world. A plausible answer is that children’s conception of the written word is not guided exclusively by their own encounters with what it says. Broadly speaking, we can divide children’s encounters into three classes: (1) written materials that children can decode for themselves; (2) written materials that are read aloud to them by an adult; and (3) written materials they see adults reading for themselves – occasionally aloud but mostly in silence. Even if the materials that fall into categories (1) and (2) mostly describe a fictional world, materials in category (3) will be more heterogeneous. Children will frequently be able to observe a connection between the act of reading and the reader’s subsequent behaviour. Whenever an adult reads a recipe, a map, a menu, a price sticker, a set of instructions, or a label, children will often have an opportunity to see the adult subsequently engage in actions guided by what they have read (Levy, Reese, & Wiser, 2012). On this argument, children observe adults acting in the real world on the basis of written texts and come to invest them with a similar authority themselves.

Despite the initial plausibility of this analysis, it does not provide an adequate account of the current findings. If children’s observations of adult readers were sufficient to lead them to invest written materials with real-world authority, we might also expect pre-readers to make that investment. After all, pre-readers have plenty of opportunities to observe adults acting on the basis of what they have just read. Yet, the results from our studies suggest that pre-readers had no systematic preference for the text instructions – even 5-year-old pre-readers who have presumably seen adults read and then act on many occasions.

Accordingly, a more refined version of the above hypothesis is needed. Granted that children’s observation of adults’ reading practices is important, it is likely that full insight into those practices is hampered until children can read themselves. Only then do they fully appreciate what it means for others to gain knowledge from this medium; the pre-reader’s experience of observing other people gain knowledge in this way may be insufficient. This proposal is consistent with pre-readers’ preference for following the colour sign in Study 3, which, in contrast to the text label, was easily interpretable by them. Moreover, being able to read the specific written materials that guide the adult’s actions is likely to illuminate just why those materials should be used as a guide. The materials will be seen not simply as a generic exemplar of writing but as a meaningful and specific text that guides the particular actions selected by the adult reader. We speculate that the first fundamental discovery occurs when children acquire rudimentary reading skills, whereas the additional insight afforded by having access to the meanings of specific text exemplars used by adults will come into play as children’s reading skills continue to improve.

Turning to the second question, why do early readers prioritize text over oral information when they have years of experience learning from spoken testimony? A possible explanation is that whereas a spoken message can be directly tied to its individual messenger, written information is mostly anonymous, especially for young children who may not even realize that texts have authors. On this view, a person’s spoken utterance reflects the individual’s beliefs and is thereby open to error and evaluation; an anonymous text, by contrast, would appear to be an objective truth. We note, however, that this explanation cannot by itself account for readers’ selective trust in text over the equally anonymous colour sign in Study 3. This finding opens up an interesting avenue for future

research to examine how children come to interpret different types of external representations (e.g., drawings, photographs, print, and maps) as a source of knowledge.

Finally, despite the close connection between reading status and selective trust in the text puppet that emerged in the present and previous studies, we may still ask whether children's reading skill is indeed the key causal factor. Study 2a has shown that the size of children's vocabulary is not associated with their trust in text, at least within the normal range included in this sample. Nonetheless, reading status is likely to be associated with a variety of other factors, such as the socio-economic status of the child's parents, the level of the child's phonological awareness, and so forth. While it is not easy to see why any of these associated factors might have a direct effect on children's trust in written materials, we cannot rule out that possibility. However, if our analysis is correct, it predicts that children's trust will be markedly affected by the age at which they learn to read. It would therefore be interesting for future research to investigate children's trust in countries such as Scandinavia where children typically start learning to read only at approximately 6 years of age. Our hypothesis predicts that because reading status is a critical component of trust in text – rather than, for example, socio-economic background or other cognitive skills – such selective trust should be delayed.

Acknowledgements

This work was supported by an EPS Study Visit Award to SE. We thank the staff, parents, and children at the Boston Science Museum's Living Lab for their support. Thanks also to Catherine Glennon, Katelyn Kurkul, Grace Min, Jason Chin, Noemi Skala, Avery Steele, Amanda Haber, Naomi Anderson, Stefanie Grossano, Christie Tang, Sarah Gretter, and Jennifer Zinzer for their assistance in data collection.

References

- Birch, S. A. J., Vauthier, S. A., & Bloom, P. (2008). Three and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, *107*, 1018–1034. doi:10.1016/j.cognition.2007.12.008
- Corriveau, K. H., & Harris, P. L. (2009a). Preschoolers continue to trust a more accurate informant 1 week after exposure to accuracy information. *Developmental Science*, *12*, 188–193. doi:10.1111/j.1467-7687.2008.00763.x
- Corriveau, K. H., & Harris, P. L. (2009b). Choosing your informant: Weighing familiarity and recent accuracy. *Developmental Science*, *12*, 426–437. doi:10.1111/j.1467-7687.2008.00792.x
- Corriveau, K. H., Kim, A. L., Schwalen, C., & Harris, P. L. (2009). Abraham Lincoln and Harry Potter: Children's differentiation between historical and fantasy characters. *Cognition*, *112*, 213–225. doi:10.1016/j.cognition.2009.08.007
- Dunn, L. M., & Dunn, L. M. (1997). *Peabody picture vocabulary test* (3rd ed.). Circle Pines, MN: American Guidance Service.
- Einav, S., & Robinson, E. J. (2010). Children's sensitivity to error magnitude when evaluating informants. *Cognitive Development*, *25*, 218–232. doi:10.1016/j.cogdev.2010.04.002
- Einav, S., & Robinson, E. J. (2011). When being right is not enough: Four-year-olds distinguish knowledgeable from merely accurate informants. *Psychological Science*, *22*, 1250–1253. doi:10.1177/0956797611416998
- Einav, S., Robinson, E. J., & Fox, A. (2013). Take it as read: Origins of trust in knowledge gained from print. *Journal of Experimental Child Psychology*, *114*, 262–274. doi:10.1016/j.jecp.2012.09.016

- Eyden, J., Robinson, E. J., Einav, S., & Jaswal, V. K. (2013). The power of print: Children's trust in implausible printed suggestions. *Journal of Experimental Child Psychology, 116*, 593–608. doi:10.1016/j.jecp.2013.06.012
- Francis, H. (1982). *Learning to read: Literate behaviour and orthographic knowledge*. Boston, MA: Allen & Unwin.
- Hall, S. L., & Moates, L. C. (1999). *Straight talking about reading*. Columbus, OH: McGraw-Hill Trade.
- Hiebert, E. H. (1981). Developmental patterns and interrelationships of preschool children's print awareness. *Reading Research Quarterly, 16*, 236–260.
- Jaswal, V. K., & Neely, L. A. (2006). Adults don't always know best: Preschoolers use past reliability over age in learning new words. *Psychological Science, 17*, 757–758. doi:10.1111/j.1467-9280.2006.01778.x
- Koenig, M., Clément, F., & Harris, P. L. (2004). Trust in testimony: Children's use of true and false statements. *Psychological Science, 10*, 694–698. doi:10.1111/j.0956-7976.2004.00742.x
- Kondrad, R. L., & Jaswal, V. K. (2012). Explaining the errors away: Young children forgive understandable semantic mistakes. *Cognitive Development, 27*, 126–135. doi:10.1016/j.cogdev.2011.11.001
- Levy, D., Reese, E., & Wiser, M. (2012). Early understanding of the functions of print: Parent-child interaction and preschoolers' notating skills. *First Language, 32*, 301–323. doi:10.1177/0142723711410793
- Lutz, D. J., & Keil, F. C. (2002). Early understanding of the division of cognitive labor. *Child Development, 73*, 1073–1084. doi:10.1111/1467-8624.00458
- Neuman, S. B., & Dickinson, D. (Eds.) (2011). *Handbook of early literacy research*. New York, NY: Guilford.
- Nurmsoo, E., & Robinson, E. J. (2009). Children's trust in previously inaccurate informants who were well or poorly-informed: When past errors can be excused. *Child Development, 80*, 23–27. doi:10.1111/j.1467-8624.2008.01243.x
- Robinson, E. J., Einav, S., & Fox, A. (2013). Reading to learn: Pre-readers' and early readers' trust in text as a source of knowledge. *Developmental Psychology, 49*, 505–513. doi:10.1037/a0029494
- Sabbagh, M. A., & Baldwin, D. A. (2001). Learning words from knowledgeable versus ignorant speakers: Links between preschoolers' theory of mind and semantic development. *Child Development, 72*, 1054–1070. doi:10.1111/1467-8624.00334
- Scofield, J., Gilpin, A. T., Pierucci, J., & Morgan, R. (2013). Matters of accuracy and conventionality: Prior accuracy guides children's evaluations of others' actions. *Developmental Psychology, 49*, 432–438. doi:10.1037/a0029888
- Sobel, D. M., & Corriveau, K. H. (2010). Children monitor individuals' expertise for word learning. *Child Development, 81*, 669–679. doi:10.1111/j.1467-8624.2009.01422.x
- Want, S. C., & Harris, P. L. (2001). Learning from other people's mistakes: Causal understanding in learning to use a tool. *Child Development, 72*, 431–443. doi: 10.1111/1467-8624.00288

Received 25 June 2013; revised version received 15 April 2014