American Behavioral Scientist
1–21

DOI: 10.1177/0002764215596551
abs.sagepub.com
SAGE

Toddlers' Judgments of Media Character Source Credibility on Touchscreens

Melissa N. Richards[1] and Sandra L. Calvert[1]

Abstract

In three experiments, 32-month-old children (n = 40 for Experiment 1, n = 36 for Experiment 2) and 24-month-old children (n = 33 for Experiment 3) were asked to judge the credibility of information presented on a touchscreen device. The information was delivered by a familiar and an unfamiliar media character. Two app conditions varied on which character was accurate in naming familiar fruits. Then both characters labeled four novel fruits with nonsense words. Feedback about the accuracy of the characters' labels of the familiar fruits was provided in Experiments 1 and 3, but no such feedback was provided in Experiment 2. Children were more likely to endorse the accurate character as the correct labeler of the novel fruits, regardless of prior familiarity with the character, the feedback presented in the touchscreen application, or the age of the child. Parent scaffolding affected only the 24-month-old children. The results reveal that very young children can make relatively sophisticated judgments about the credibility of information encountered on touchscreen devices.

Keywords

touchscreens, credibility, toddlers, parasocial relationships, feedback, media characters

In the span of 2 short years, touchscreen technology has come of age: 40% of 0- to 8-year-old children in the United States lived in homes that had tablets in 2013, which is 5 times more than was the case in 2011 (Common Sense Media, 2013). Seventy-two percent of 0- to 8-year-olds had used a mobile device such as an iPad or smart phone in 2013 compared to only 38% in 2011 (Common Sense Media, 2013).

[1]Children's Digital Media Center, Georgetown University, Washington, DC, USA

Corresponding Author:
Melissa N. Richards, *Eunice Kennedy Schriver* National Institute of Child Health and Human Development, 6705 Rockledge Drive, Bethesda, MD 20817, USA.
Email: melissa.richards@nih.gov

With touchscreen interfaces increasingly available to very young children, media influences are now embedded in interactive experiences in which children touch, swipe, and pull to gain access to content. These kinds of physical behaviors are easily mastered at young ages, which means that the interface places fewer cognitive demands that would limit access to the content, as compared to using a mouse with a computer (Lauricella, Barr, & Calvert, 2009). In spite of these rapid inroads into the lives of increasingly younger children, we know little about how children interact with and judge the accuracy of the information presented on these touchscreen interfaces, which is the key focus of the research presented here.

With tablets, children's actions can be rewarded with contingent replies that immediately tell them how well they are performing a task. The deliverers of those rewards are at times popular and familiar media characters, with whom children have sometimes formed close, one-sided, emotionally tinged relationships called *parasocial relationships* (Calvert & Richards, 2014). Parasocial relationships are a new frontier in understanding the impact of children's media, as past research has focused almost exclusively on adults (Bond & Calvert, 2014a). While parasocial relationships were historically framed as one-way experiences, newer interactive media experiences may be making the distinction between a "real" and an "imaginary" interaction increasingly blurry, particularly for young children, who often believe that media characters are alive (Calvert & Richards, 2014).

How do children make decisions about who to trust and who to discount when they encounter information on touchscreens? Do they value a character's familiarity over its accuracy? How does the feedback delivered by the touchscreen application (i.e., app) or the parents' scaffolds influence children's decisions about the credibility of the information? Does age affect how children make these credibility judgments? The answers to these questions are important for our theoretical understanding of how children's interactive social relationships with popular media characters on touchscreen interfaces come to serve as perceived sources of reliable or unreliable information and how to make characters effective 21st-century-teachers.

Character Credibility

Preschool-aged children rely on the familiarity of a person's relationship with them as well as the accuracy of the information presented by that person when judging the credibility of a teacher who presented information on a video. In a seminal study on this topic, Corriveau and Harris (2009) presented 3-, 4-, and 5-year-old children with a task in which a familiar or an unfamiliar preschool teacher labeled familiar objects correctly or incorrectly. Next the teachers presented novel objects with made up names (e.g., a "snegg" or a "hoon") to determine who the child would find to be more credible. When faced with uncertainty, the 3-year-olds, but not the 4- and 5-year-olds, "forgave" the familiar teacher and selected her as correct when labeling novel objects, even when she had been previously incorrect in naming the familiar objects (Corriveau & Harris, 2009).

Harris and Corriveau (2011) framed children's decisions about credibility, which they defined as children's beliefs in the trustworthiness of others, from an evolutionary

perspective. Specifically, children's survival at age 3 favors a belief that a small number of caregivers are most credible. With development, the ability to learn new information from unfamiliar people becomes increasingly important. More specifically, survival ultimately depends on the ability to determine the credibility of another's information, regardless of personal closeness to them. Consequently, 3-year-old children revert to an attachment bias when faced with uncertainty whereas 4- and 5-year-old children choose accuracy when faced with uncertainty. Even so, if adults are unfamiliar to them, 3-year-olds will select an accurate over an inaccurate individual during an uncertain situation (Koenig, Clement, & Harris, 2004).

Parasocial Relationships

Corriveau and Harris (2009) investigated children's beliefs about the credibility of real people. Another class of "individuals"—the media characters who serve as symbolic representations of humans and who populate children's daily lives—can also serve as credible sources of information. For example, very young children only 21 months of age who had formed stronger, emotionally tinged parasocial relationships with media characters subsequently learned previously unseen on-screen content from these characters better than those who had weaker parasocial relationships with the same characters (Calvert, Richards, & Kent, 2014; Gola, Richards, Lauricella, & Calvert, 2013). What exactly defines parasocial relationships during early childhood?

In a factor analysis of parental reports about children's favorite characters, Bond and Calvert (2014a) found that early parasocial relationships involved children's beliefs that characters were (1) *real* entities (i.e., social realism) who existed outside of the world of screens and (2) *persons* who could be *trusted* (i.e., character personification), and they found that (3) children were *attached* (i.e., attachment) to these characters. A recent report that directly asked children about their favorite characters yielded similar findings, with factor analyses yielding three distinct dimensions: (1) *social realism*; (2) *character personification*, which included *attachment* items in children's responses; and (3) *humanlike needs*, which included beliefs that the character got hungry or sleepy (Richards & Calvert, 2014). These findings suggest that there are similar kinds of properties that both parents and children report in their relationships with their favorite media characters that are indicative of a parasocial relationship. Parental involvement with their children and their children's media experiences were also a predictor in the development of children's favorite characters (Bond & Calvert, 2014a), accentuating the important role that parent scaffolds play in children's media experiences.

Developmental Differences in Credibility Decisions

Harris and Corriveau (2011) recognized the importance of age when studying children's trust in both familiar and unfamiliar adults, discovering that 3-year-olds, but not 4- to 5-year-olds, trusted a familiar teacher in labeling novel items even if she was previously incorrect when labeling familiar items. Younger children adhered to attachment paradigms, while older children had learned to endorse logic and accuracy.

Although children form strong bonds with their favorite media characters during toddlerhood, less is known about how children look at these characters as credible information sources and form attachment relationships with them at different ages. For example, younger children may form deep, affective attachments with media characters, much as they do with trusted adults (Bowlby, 1969), but soon grow out of this attachment relationship when they find a new favorite character. Indeed, parents have reported that their children outgrow certain characters that they believed had become too young for them, experiencing a phenomenon known as *parasocial breakup* (Bond & Calvert, 2014b). For instance, a child may love Elmo at 18 months of age, but by age 3 look at him as a character that is meant for babies. Consequently, we measured the effects of specific media characters on children's learning and credibility decisions at different ages.

Affordances of Touchscreen Technology

Touchscreen technologies have entered the lives of young children very rapidly (Common Sense Media, 2013), affording contingent replies to children's choices and new opportunities for interacting with on-screen content. Although children form parasocial relationships after viewing characters on television (Hoffner, 1996), traditional observational media such as television programs do not provide immediate, contingent responses or allow a child to be an active agent in making the on-screen image change or advance. Contingent feedback helps children transfer the information acquired from a computer game to a real-life situation (Lauricella, Pempek, Barr, & Calvert, 2010), which may also be true for interactions with tablets such as iPads. Interactive technologies also foster a sense of control, thereby increasing children's engagement with on-screen content (Calvert, Strong, & Gallagher, 2005), which may be further enhanced by parents who scaffold the content (Vygotsky, 1997). The unique tactile interface of devices like iPads is also a particularly good fit for children's early motor skills (Chiong & Shuler, 2010). Children can use these mobile devices in a variety of places at any time (Shuler, 2009), providing considerable opportunities for children to interact with, bond with, and learn from characters.

Despite the potential promise of iPads and their apps, we have little understanding of the processes that explain how young children judge the information conveyed on these screens. The current research will address this knowledge gap by focusing on the credibility that young children attribute to media characters who deliver accurate or inaccurate information in an on-screen tablet application.

Experiment 1

The purpose of Experiment 1 was to examine if young children would find a popular, familiar media character to be more credible than a character who was unknown to them when using an iPad that provided them with contingent feedback. We also consider the role that parents play in scaffolding their children's credibility decisions with media characters on this touchscreen interface. We used the popular Elmo character from Sesame Workshop and a popular Taiwanese character named DoDo from the

Hsin-Yi Foundation, who is unknown in the United States, to deliver information about familiar and novel words. We hypothesized the following:

Hypothesis 1: When playing with an app that provided feedback, young children would attribute more credibility to the familiar Elmo character than to the novel DoDo character, as indicated by their selection of Elmo as correct in labeling unfamiliar fruits, even when Elmo had previously been wrong in labeling the familiar fruits.

Hypothesis 2: When playing with an app that provided feedback, children who had stronger versus weaker parasocial relationships with Elmo, as documented by parent report, would attribute more credibility to Elmo than to DoDo, as indicated by their selection of Elmo as correct in labeling unfamiliar fruits.

Hypothesis 3: Parents' scaffolding during iPad app play would be related to children's credibility decisions when playing with an app that provided feedback.

Method

Participants. Participants were 32-month-old children (M = 990.38 days, SD = 9.88 days; n = 40 [21 males]) who lived in the Washington, D.C., metropolitan area.[1] Parents with children in this age range were invited through e-mail or phone calls to participate in our study. Parents were recruited from our database of over 1,000 families, who had joined us through contact made by posted flyers, by word of mouth, and at local fairs and festivals. Children in our sample were predominantly Caucasian (n = 31), with some children from Asian (n = 3) and other/mixed ethnicities (n = 6). Parents were highly educated, with 79.7% having a graduate degree.

Children were randomly assigned to one of two touchscreen app conditions. In one condition, the familiar character Elmo was correct and the novel DoDo character was incorrect in labeling familiar fruits (n = 21). In the other condition, the novel DoDo character was correct and the familiar Elmo character was incorrect in labeling the familiar fruits (n = 19). Both conditions received feedback from the app about the accuracy of the character's labels during the familiar fruit trials.

Procedure. Each testing session took place at the child's home. Parental consent was obtained, and parents filled out surveys about their children's media use patterns, their children's language skills, their children's parasocial relationship with Elmo, and demographic information about the family. Children and their parents then played with the iPad app in a place in their home where they felt comfortable. Parents were instructed that they did not have to stay quiet during the testing session and could interact with their child as they normally would when playing with their child. The iPad was put into a soft child-friendly case with handles that would make it easy for children to hold while playing with the game.

Surveys. Parents completed surveys about their demographic information, the amount of time that their child used mobile media, and the MacArthur–Bates Communicative

Development Inventory Checklist–Level III (CDI-III), a measure of children's productive vocabulary skills. The CDI measured the number of words and the complexity of the sentences that the children were producing (Fenson et al., 2007). The CDI-III has high concurrent validity with other similar evaluative tests such as the Peabody Picture Vocabulary Test–Revised, the McCarthy Scales of Children's Abilities, and measures of the number of words children said while conversing with their parents, coded through observation during play with toys (Feldman et al., 2005). There were also significant positive correlations between children's scores at age 3 on the CDI-III and their scores at age 2 with a version of the CDI created for younger children, an indicator of predictive validity (Feldman et al., 2005).

Parents also answered questions about their children's parasocial relationships with the Elmo character. Based on the results of a factor analysis conducted by Bond and Calvert (2014a) about children's favorite characters, parents rated how much they agreed with *character personification* statements such as "My child trusts Elmo," *social realism* questions such as "When Elmo acts out a behavior on-screen (like dancing, singing, or playing a game), my child believes that Elmo is performing the behavior in real life," and *attachment* questions such as "Elmo makes my child feel safe." Likert-type scale responses to these questions ranged from *strongly disagree* (1) to *strongly agree* (5). A mean score of parents' responses on individual items in each factor was calculated in order to create a composite score in *character personification, social realism*, and *attachment* for each child. Internal consistency for the items in each subscale was high, $\alpha = .80$ to .91. Table 1 presents all parasocial relationship survey items and their internal consistency.

Stimulus:The experimental app. To construct the app for our iPad, we created an account with the Apple Developer University Program. Using Flash CS 5.5, videos were converted into an ".ipa" file and haptic zones on the app were added in order to register children's touch. This app was developed solely for our study and is not commercially available in the iTunes store.

The sequence of activities and questions asked of children in the app followed the general procedure previously developed by Harris and colleagues to assess children's learning of novel words in video studies of credibility based on the familiarity with the on-screen person (see Corriveau & Harris, 2009; Koenig et al., 2004). The app began with an introduction of both media characters by a female narrator who said, "This is my friend [DoDo/Elmo], say 'Hi' to [DoDo/Elmo]." The audio portion of the app then paused with the character waving at the child while waiting for the child to reply, and then each character, in turn, said "Hi!" Then the narrator explained, "DoDo and Elmo are going to play with you. They're going to name some fruits," as the characters were shown side by side. The video then faded to a close-up of a familiar fruit as the narrator asked, "What is this?" Next, a character was shown in a kitchen, holding this familiar fruit. The character named the fruit either correctly or incorrectly, depending on condition. Then, the second character was shown in a different kitchen holding the same fruit, and the character named the fruit correctly or incorrectly, depending on the condition. The order of presentation for the correct or incorrect labelers of the fruit in these trials was counterbalanced.

Table 1. Parasocial Relationship Survey Questions and Internal Consistency.

Factor	Question	Internal consistency (Cronbach's α)		
		Experiment 1	Experiment 2	Experiment 3
Character personification	My child thinks that Elmo has thoughts and emotions.	.91	.88	.90
	My child gets sad when Elmo gets sad or makes a mistake.			
	My child trusts Elmo.			
	My child treats Elmo as a friend.			
	My child believes that Elmo has needs.			
	My child believes that Elmo has wants.			
Social realism	My child knows that Elmo is imaginary (reverse-coded).	.84	.79	NS
	When Elmo acts out a behavior on screen (like dancing, singing, or playing a game), my child believes that Elmo is performing the behavior in real life.			
	My child believes that Elmo is real.			
Attachment	Elmo makes my child feel comfortable.	.80	.84	.89
	Elmo makes my child feel safe.			
	The voice of Elmo soothes my child.			

Note. NS = not significant.

The app then showed a split screen. DoDo was on one side of the screen, and Elmo was on the other side of the screen (counterbalanced by trial). Both characters were holding the same piece of fruit. The narrator repeated the labels for the fruit that were provided by the characters by stating, "DoDo said this is a [*x*]; Elmo said this is a [*y*]. Touch the one who is right!"

The narrator provided feedback about the app task after children made responses to the familiar fruits. If the child touched the character who correctly labeled the fruit, the narrator provided positive verbal feedback, stating, "Good job! You've got it! [DoDo/Elmo] was right." If the child touched the character who was incorrect, the narrator encouraged the child to touch the correct character, stating, "No, not [DoDo/Elmo]. Try again." The app narrator continued to provide feedback to children for up to three incorrect responses per fruit trial. If there were more than three incorrect responses, the experimenter moved the app forward. After the correct selection was made, Elmo and DoDo appeared again, waving side by side. The narrator said, "Here comes the next one!" This same process was repeated for another three familiar fruits. The same character was consistently correct, or incorrect, in all four familiar fruit scenes for each condition.

Table 2. Fruit Labels.

Fruit picture presented	Label by correct character	Label by incorrect character
Banana	Banana	Grape
Peach[a]	Peach	Cherry
Apple	Apple	Strawberry
Orange	Orange	Watermelon
Star fruit	Fampy	Nimboo
Dragon fruit	Twigwig	Snagbag
Rhubarb	Drapno	Swubat
African cucumber	Abco[b]	Depa

[a]In the second and third experiments, the image of the peach was replaced with a strawberry, and the incorrect strawberry label in the apple trial was replaced with the word watermelon. Cherry and peach then became the incorrect labels for orange and strawberry, respectively.
[b]In the second and third experiments, the unfamiliar fruit label "abco" was replaced with the word "baldoe."

Following the familiar fruit trials, children were presented with four unfamiliar fruits, with a procedure that was similar to the one used for familiar fruit trials. However, instead of one character consistently labeling the fruits correctly or incorrectly, both characters named the fruit with a nonsense label, such as a "nimboo" and a "depa." No positive or corrective feedback was provided during the four video scenes with unfamiliar fruits. Table 2 presents the full sequence of the fruits and labels presented in all eight trials.

Child credibility decisions with corrective app feedback. During game play, an experimenter recorded the character that the child first touched as being correct for each of the eight trials. Twenty-five percent of the sample was later coded by a second scorer using videotapes of the session, which yielded high interrater consistency ($\kappa = .90$). Any disagreements were discussed and a definitive answer was recorded for use in data analysis. Each child received two proportion scores that represented the percentage of time that the child selected Elmo for both the familiar ($n = 4$ trials) and novel fruits ($n = 4$ trials).

Behavioral coding. Child and parent behaviors were coded for analyses using Noldus the Observer XT software. Children were coded for the proportion of time that they were attentive to the on-screen application. Twenty-five percent of the sample was double-coded, yielding an intraclass correlation coefficient of $r = .93$ for visual attention. Parents were coded for behaviors that could provide scaffolds for their children to say a fruit name (e.g., "What is that?"). Twenty-five percent of the sample was double-coded, yielding an intraclass correlation coefficient of $r = .97$ for parent prompting the child to say a fruit name.

Results

Information on mobile media usage, CDI scores, children's parasocial relationships with Elmo according to parent report, visual attention to the app, children's accuracy decisions indicating whether Elmo or DoDo was the correct labeler of the familiar and

unfamiliar fruits, and parent scaffolding by condition are presented in Table 3. Independent samples *t* tests revealed that there were no initial significant pretest differences between the two conditions in mobile media use, CDI scores, and children's parasocial relationship scores with Elmo, as reported by their parents.

Credibility decisions during corrective feedback conditions. When feedback was provided, children were more likely to select the accurate character as being correct for *familiar* fruits, regardless of prior familiarity with the character, $t(38) = 2.94$, $p < .01$, $\eta^2 = .185$. Contrary to prediction, children were also more likely to endorse the previously correct character for *novel* fruits, regardless of prior familiarity with the character, $t(38) = 2.13$, $p = .04$, $\eta^2 = .106$. In other words, 32-month-old children prioritized a character's accuracy over their familiarity with the character in determining credibility when faced with uncertain information during play with an iPad app in which feedback was provided about the accuracy of the child's choices (see Table 3).

The relation between children's parasocial relationships, as reported by parents, and their credibility decisions for the unfamiliar fruit trials were analyzed only in relation to Elmo, as children could not have had a prior relationship with DoDo. Results revealed that there were no significant correlations between children's parasocial relationships (i.e., social realism, attachment, and character personification) with Elmo and who children chose as correct during the unfamiliar fruit trials, all $ps > .05$.

Parent scaffolds of fruit names. Contrary to prediction, parent scaffolding of saying fruit names was not significantly correlated with which character children chose as correct during the familiar or unfamiliar fruit trials, $p > .05$. This finding occurred both in the condition when Elmo was correct and in the condition when DoDo was correct. Nonetheless, parents did tend to scaffold more in the condition where DoDo was correct than in the condition where Elmo was correct ($M = 3.79$, $SD = 5.75$, vs. $M = 1.19$, $SD = 1.21$, respectively), $t(38) = -1.93$, $p = .068$, $\eta^2 = .097$.

Visual attention to the app. As seen in Table 3, visual attention to the app was very high and not significantly different between the two app conditions, regardless of whether Elmo or DoDo was correct in naming the familiar fruits ($M = 85\%$ vs. 87%, respectively). In addition, children in the Elmo correct condition were more likely to choose Elmo for the unfamiliar fruit trials when they were more visually attentive to the app ($r = .45$, $p = .04$).

Summary. In summary, 32-month-old children chose accurate over familiar characters when judging the credibility of characters who presented novel information on an iPad when feedback had been initially provided about the accuracy of the characters' labels of familiar fruits. Children's parasocial relationships with characters, as reported by parents, were not significantly correlated with children's credibility decisions about the on-screen characters' labels of unfamiliar fruits, nor were parents' scaffolding behaviors significantly correlated with children's credibility decisions, although parents tended to provide more scaffolding in the condition where DoDo was correct. Children who were more attentive to the app in the condition in which Elmo was correct were more likely to choose him as the credible character during the unfamiliar fruit trials.

Table 3. Means and (Standard Deviations) of Media Use, CDI Scores, Parasocial Relationship Scores, Attention, Credibility Decisions, and Parent Scaffolding for Experiments 1, 2, and 3.

	Experiment 1 (32 months)		Experiment 2 (32 months)		Experiment 3 (24 months)	
	Elmo correct condition with feedback	Elmo incorrect condition with feedback	Elmo correct condition without feedback	Elmo incorrect condition without feedback	Elmo correct condition with feedback	Elmo incorrect condition with feedback
Minutes of mobile media use per week	32.74 (36.59)	34.21 (36.10)	40.94 (58.68)	51.63 (65.71)	54.85 (65.65)	51.63 (56.38)
CDI score	82.05 (28.69)	74.53 (24.97)	84.35 (28.36)	70.47 (32.00)	29.53 (27.59)	29.56 (20.16)
Parent reports of their children's beliefs in the *social realism* of Elmo (e.g., Elmo was real)	3.40 (0.70)	3.25 (0.76)	3.39 (0.63)	3.52 (0.72)	NS	NS
Parent reports of their children's beliefs in the *character personification* of Elmo (e.g., Elmo has needs)	3.39 (0.57)	3.41 (0.56)	3.33 (0.47)	3.33 (0.82)	3.41 (0.54)	3.09 (0.88)
Parent reports of their children's *attachment* to Elmo (e.g., Elmo makes child feel safe)	3.16 (0.73)	3.09 (0.64)	3.06 (0.75)	3.19 (0.94)	3.25 (0.75)	3.02 (1.09)
Proportion of time children were attentive to app	0.85 (0.10)	0.87 (0.07)	0.93 (0.05)	0.92 (0.06)	0.84 (0.16)	0.83 (0.17)
Percentage of familiar fruit trials children chose Elmo character	0.67** (0.27)	0.42** (0.26)	0.62** (0.31)	0.32** (0.23)	0.57 (0.24)	0.55 (0.23)
Percentage of unfamiliar fruit trials children chose Elmo character (source credibility decisions)	0.65* (0.33)	0.42* (0.35)	0.66** (0.32)	0.37** (0.27)	0.57* (0.24)	0.42* (0.14)
Parent scaffolding of saying a fruit name	1.19† (1.21)	3.79† (5.75)	1.35 (1.84)	2.32 (1.97)	4.0† (4.14)	6.25† (2.86)

Note. CDI = MacArthur–Bates Communicative Development Inventory Checklist; NS = not significant.
**$p < .01$. *$p < .05$. †$p < .10$.

Discussion

The purpose of the first experiment was to examine how young children determine source credibility when a familiar versus an unfamiliar character presents information via an interactive app when corrective feedback is provided. Contrary to prediction, 32-month-old children selected the accurate character as more credible for novel fruit names, even if that character was previously unknown to them. These findings differ from prior research, which found that 3-year-old children believed a familiar on-screen teacher's labels of novel items, even when she had been previously incorrect in labeling familiar items (Corriveau & Harris, 2009). Indeed, it was not until children were 4 years of age that they switched their credibility judgments to the accurate on-screen teacher who they did not know (Corriveau & Harris, 2009), a much older age than was found with our iPad app.

The interactive properties of iPads may be one reason that younger children chose the accurate over the familiar character at younger ages than has been demonstrated in media research in the past. Children are more likely to acquire useful information when they receive immediate, contingent feedback when playing computer games (Lauricella et al., 2010). Our iPad app was programmed to provide children with contingent feedback when they were correct or incorrect after choosing a character who named familiar fruits, thereby teaching them to select accuracy over familiarity. Perhaps the feedback from the app made it abundantly clear when Elmo made a mistake and children had selected him, which is much more difficult to do with a traditional video demonstration. It is possible that the consistent errors that Elmo made when he incorrectly labeled the familiar fruits convinced children that he lacked the knowledge to do this task well.

Experiment 2

To examine the potential role of contingent feedback from the app in making credibility decisions, Experiment 2 was conducted in which the feedback about the names of the familiar fruits was deleted. Once again, the popular Elmo character from Sesame Workshop and the unfamiliar Taiwanese character named DoDo delivered familiar and novel words. We hypothesized the following:

Hypothesis 4: When playing with an app that provided no feedback, young children would attribute more credibility to the familiar Elmo character than to the unfamiliar DoDo character, as indicated by their selection of Elmo as correct in labeling unfamiliar fruits, even when Elmo had been wrong in labeling the familiar fruits.

Hypothesis 5: When playing with an app that provided no feedback, children with stronger parasocial relationships with Elmo, as documented by parent report, would attribute more credibility to the familiar Elmo character than to the unfamiliar DoDo character, as indicated by their selection of Elmo as correct in labeling unfamiliar fruits.

Hypothesis 6: Parents scaffolding during iPad app play would be related to children's credibility decisions when playing with an app that provided no feedback.

Method

Participants. Participants were 32-month-old children (M = 997.03 days, SD = 17.33 days; n = 36 [15 males]) who lived in the Washington, D.C., metropolitan area.[2] Children in this sample were predominantly Caucasian (n = 24), with some children from Asian (n = 6) and other/mixed ethnicities (n = 6). Parents were highly educated, with 77.8% having a graduate degree.

Children were randomly assigned to one of two touchscreen app conditions. In one condition, the familiar character Elmo was correct and the unfamiliar DoDo character was incorrect in labeling familiar fruits (n = 17). In the other condition, the unfamiliar character DoDo was correct and the familiar Elmo character was incorrect in labeling the familiar fruits (n = 19). Neither condition provided feedback about the accuracy of the characters' labels of the familiar fruits.

Procedure. The methods of Experiment 2 were virtually identical to that of Experiment 1, except that we removed feedback after the familiar fruit presentations and replaced fruits that possibly caused confusion in the first study. In particular, a strawberry replaced the peach as a target familiar fruit because some children immediately said "Apple!" when seeing the picture of the peach on-screen in Experiment 1, and the distractor item of stawberry in the apple trial was replaced with the word watermelon. Cherry and peach then became the incorrect labels for the orange and strawberry trials, respectively. The unfamiliar label of "abco" sounded a bit like "apple" to some children so we also changed "abco" to "baldoe."

Parents filled out the same surveys as in Experiment 1. The same parasocial relationship scale items were calculated, leading to good internal consistency, with Cronbach's alphas ranging from .79 to .88. See Table 1.

Consistent with the procedure in Experiment 1, an experimenter recorded the character that the child first touched as being correct for each of the eight trials. Twenty-five percent of the sample was later coded by a second scorer using videotapes of the session, which yielded a high interrater consistency (κ = .92). Any disagreements were discussed and a definitive answer was recorded for use in data analysis. Each child received two proportion scores that represented the percentage of time that the child selected Elmo for both the familiar (n = 4 trials) and novel fruits (n = 4 trials).

Behavioral coding. Visual attention to the iPad application was recorded, with 25% of the sample double-coded, yielding an intraclass correlation coefficient of r = .89. In addition, the number of times the parent prompted the child to say a fruit name was coded, with 25% of the sample double-coded, yielding an intraclass correlation coefficient coefficient of r = .92.

Results

Information on mobile media usage, CDI scores, children's parasocial relationships with Elmo according to parent report, visual attention to the app, children's accuracy decisions indicating whether Elmo or DoDo was the correct labeler of the familiar and

unfamiliar fruits, and parent scaffolding by condition are presented in Table 3. Independent samples *t* tests revealed that there were no initial significant pretest differences between the two conditions in mobile media use, CDI scores, and children's parasocial relationship scores with Elmo, as reported by their parents.

Credibility decisions during no feedback conditions. Consistent with the findings of the first experiment, young children were more likely to endorse the accurate character for *familiar* fruits, even when the app in the current condition did not give feedback, $t(34) = 3.34$, $p = .002$, $\eta^2 = .247$. Contrary to prediction, children were still more likely to endorse the previously correct character for *novel* fruits, regardless of the character's familiarity, in the app that did not provide feedback $t(34) = 3.00$, $p = .005$, $\eta^2 = .209$. Even without feedback, then, the 32-month-old children favored accurate media characters over familiar ones, contrary to the findings of Corriveau and Harris (2009).

As in the first experiment, the relation between children's parasocial relationships, as reported by parents, and their credibility decisions for the unfamiliar fruit trials were analyzed only in relation to Elmo, as children could not have had a prior relationship with DoDo. Results revealed that there were no significant correlations between children's parasocial relationship scores, as reported by parents, and how often they chose the Elmo character for the unfamiliar fruit trials.

Parent scaffolds. As in Experiment 1, parent scaffolding of familiar or unfamiliar fruit names was not significantly correlated with children's credibility decisions, $p > .05$. This finding occurred for children in the condition where Elmo was correct, as well as in the condition where DoDo was correct. The amount of parent scaffolding did not differ significantly between the conditions.

Visual attention. Visual attention was very high and similar between the two no feedback conditions (93% when Elmo was correct vs. 92% when DoDo was correct). There were no significant correlations between visual attention and who children chose as correct during the familiar and unfamiliar fruit naming trials, both in the condition where Elmo was correct and in the condition where DoDo was correct.

Summary. In summary, 32-month-old children chose accurate over familiar characters when making credibility judgments of characters who were presenting novel information, in this case for an app in which no feedback had been provided about the prior accuracy of the characters' labels. Additionally, parent-reported parasocial relationship scores, parental scaffolds, and visual attention were unrelated to children's credibility decisions.

Experiment 3

The first two experiments demonstrated that regardless of the amount of feedback that the app gave participants, 32-month-old toddlers placed their credibility in an accurate character over a familiar one. This finding occurred at a younger age than was previously found, with children being 4 years old before selecting the accurate over the

familiar teacher in a video credibility task (Corriveau & Harris, 2009). Given the importance of attachment at young ages, the third experiment investigated if 24-month-old children would select the familiar character over the accurate character, even when the character was unfamiliar to them. Using feedback in this study, we hypothesized the following:

Hypothesis 7: Children 24 months of age would place their trust in the familiar Elmo character rather than in the novel DoDo character and view Elmo as a more credible information source than DoDo during the unfamiliar fruit trials, even when Elmo was previously incorrect in labeling the familiar fruits.
Hypothesis 8: Children 24 months of age with a stronger parasocial relationship with Elmo, as reported on the parent questionnaire, would be more likely to attribute credibility to Elmo than DoDo during the unfamiliar fruit trials.
Hypothesis 9: Within this younger age group, parent scaffolding would be significantly related to who children selected as a credible information source during the unfamiliar fruit trials.

Method

Participants. Children were 24 months of age and lived in the Washington, D.C., area *(M* = 744.94 days, *SD* = 8.05 days; *n* = 33 [15 males]).[3] The ethnic breakdown of our sample was Caucasian (*n* = 25), Asian (*n* = 3), and other/mixed ethnicities (*n* = 5). Most parents (78.5 %) reported having a graduate degree.

Children were assigned randomly to one of two conditions. The first condition (*n* = 17) presented the familiar Elmo character as consistently correct in labeling four familiar fruits, while the unfamiliar character DoDo was consistently incorrect in labeling these familiar fruits. In the second condition (*n* = 16), the unfamiliar DoDo character was consistently correct in labeling the familiar fruits, while the familiar Elmo character was consistently incorrect in labeling these fruits.

Procedure. The procedure for Experiment 3 was virtually identical to that of Experiment 2, except the app provided the participants with feedback, as had been the case in Experiment 1. Parents completed the same surveys as those used in Experiments 1 and 2, and the same parasocial relationship items (i.e., character personification, social realism, and attachment) were calculated. As seen in Table 1, the internal consistency of these items was satisfactory (α = .89- .90) except for the social realism subscale. Because the validity of the social realism questions was low for this younger sample, social realism was not used in the analyses.

An experimenter at the testing sessions recorded who the children first touched as their selection during the fruit trials. Videos were also taken at the testing session, and 25% of the sample was double-coded at the lab, yielding high interrater agreement (κ = .86). If there were any disagreements between the primary and secondary coder, the disagreement was discussed and an answer was agreed on for use in data analysis. Just as in the prior experiments, children received two proportion scores. One was for

the percentage of time they chose Elmo as the correct character during the familiar fruit trials, and one was for the percentage of time they chose Elmo as the correct character during the unfamiliar fruit trials.

Behavioral coding. Children were scored for the proportion of time that they were attentive to the iPad application. One quarter of the sample was double-coded, yielding a high intraclass correlation coefficient of $r = .97$. Parents were also coded for the number of times they prompted their child to say one of the fruit names, with 25% of the sample double-coded (intraclass correlation coefficient was $r = .80$).

Results

Table 3 presents the means and standard deviations on mobile media usage, CDI scores, children's parasocial relationship scores, visual attention, credibility decisions during the familiar and unfamiliar fruit trials, and parent scaffolding. There were no pretest condition differences on mobile media use, CDI scores, and parasocial relationships with Elmo.

Credibility decisions for 24-month-olds with corrective app feedback. Independent samples *t* tests revealed that the 24-month-old children were not more likely to choose the correct character for the familiar fruit trials, $t(31) = .260$, $p = .797$, $\eta^2 = .002$. Further investigation revealed that the first (i.e., banana) trial for the 24-month-old toddlers in the condition where DoDo was correct contributed to the high mean score of children choosing Elmo for the familiar fruit trials. For that banana trial, a chi-square analysis revealed that in the DoDo correct condition, children were significantly more likely to choose the incorrect character (63% chose Elmo when he was incorrect) than children in the Elmo correct condition were to choose the incorrect character (19% chose DoDo when he was incorrect), $\chi^2(1, N = 32) = 6.35$, $p = .012$. This pattern was not significant for the subsequent three familiar fruit trials.

For the unfamiliar fruit trials, the 24-month-old toddlers demonstrated a preference for the previously correct character, $t(31) = 2.19$, $p = .036$, $\eta^2 = .134$. Overall, then, very young toddlers still chose accurate over familiar characters in the unfamiliar fruit trials, although their preference for the accurate character did not occur during the familiar fruit trials.

As in the prior experiments, children's parasocial relationships scores with Elmo were examined. Correlations revealed that within the Elmo correct condition, the less children chose Elmo for the unfamiliar fruit trials, the more their parents reported that they were attached to Elmo *(*$r = -.810$, $p < .001$), and the higher children's reported character personification scores were with Elmo ($r = -.627$, $p = .009$). No significant correlations were found within the condition where DoDo was correct.

Parent scaffolds. Independent samples *t* tests revealed a trend for parents of children in the condition where DoDo was correct during the familiar fruit trials to provide more scaffolds than those in the condition where Elmo was correct during the familiar fruit

trials ($M = 6.25$, $SD = 2.9$, vs. $M = 4.0$, $SD = 4.1$, respectively), $t(31) = -1.81$, $p = .08$, $\eta^2 = .095$. In the condition in which Elmo was correct, the more that parents provided scaffolds for their children, the less children chose the correct Elmo character for the *familiar* fruit trials ($r = -.61$, $p = .009$), and the more children tended to choose Elmo for the *unfamiliar* fruit trials ($r = .460$, $p = .063$). No significant correlations were found within the condition where DoDo was correct in naming the familiar fruits.

Visual attention. No significant differences in attention to the app were found when Elmo was correct versus when DoDo was correct ($M = 84\%$ vs. 83%, respectively). In addition, no significant correlations existed between children's visual attention to the app and the percentage of time that they chose Elmo for both the familiar and unfamiliar fruit trials.

Summary. The results from Experiment 3 demonstrated that even 24-month-old children were more likely to endorse a previously correct characters' labels for unfamiliar fruits when the app provided contingent feedback, but that pattern did not occur for the familiar fruits. Contrary to prediction, toddlers' parasocial relationships with Elmo, as reported by their parents, were negatively correlated with the character that children chose during the unfamiliar fruit trials when Elmo had previously been correct. In the condition in which Elmo was correct, parent scaffolding had a differential effect, with parents scaffolding more when their child responded incorrectly during the familiar fruit trials, yet correlating positively with their child's choice of Elmo for the unfamiliar fruit trials. Visual attention was unrelated to children's choices.

General Discussion

The purpose of these studies was to examine how very young children determine source credibility when a familiar versus an unfamiliar character presents accurate or inaccurate information on a touchscreen tablet app. In particular, we wanted to understand how children judged the credibility of the characters' (i.e., Elmo's or DoDo's) naming of unfamiliar, novel fruits as a function of the children's age, the familiarity of the character, and the amount of feedback the app gave children on the correctness of the character's labels.

Building on the research of Harris and colleagues (e.g., Corriveau & Harris, 2009), we predicted that when children were subsequently faced with a decision about uncertain information (i.e., the "correct" names of novel fruits), children younger than 3 years would attribute more credibility to a familiar character, with whom they may be attached, than to an unfamiliar character that had been accurate. Contrary to prediction, both 32-month-old and 24-month-old children selected the accurate character as more credible, even if that character was previously unknown to them or if corrective feedback was not provided by the app for the 32-month-old children. Put another way, our findings demonstrated that 24- and 32-month-old children can accurately judge the credibility of media characters on an iPad, which documents the relatively sophisticated responses that young children are capable of making with newer interactive mobile devices. How exactly did children make those decisions?

The interactive properties and contingent feedback of iPads is one potential reason for the mature credibility decisions. In prior research, 2-year-old toddlers learned the names of new objects when given contingent feedback about naming items during face-to-face interactions with an adult experimenter who used real, 3-D objects (Bedford et al., 2013). Consistent with these findings, young children were able to solve an object retrieval task better when the items were part of an interactive computer game rather than an observational television viewing experience (Lauricella et al., 2010). In both instances, contingent feedback was a key to successful performance. In the current studies, both 24- and 32-month-old toddlers trusted the previously accurate character when faced with an uncertain situation when contingent feedback had been provided for the familiar fruit trials. However, the 32-month-old children also trusted the accurate character in the face of uncertainty when no feedback was provided about the accuracy of the familiar fruit labels. Thus, contingent feedback by the app alone is insufficient to explain children's behaviors.

Another possible explanation for our findings is that children relied on their own knowledge when using this app, as they probably knew the familiar fruit names and decided that the character who knew that familiar fruit name was the "right" choice. Although Elmo is highly popular and affected the learning of 21-month-old toddlers when he was correct (Lauricella, Gola, & Calvert, 2011), he may have been perceived as a poor source of information, even by the 24-month-olds in our study, when he was wrong. More specifically, when Elmo made errors about what children already knew to be true and when shown directly next to DoDo, who was consistently correct, Elmo's credibility appeared to be questionable. These results may be comforting to those parents who are concerned that their children are *too* trusting of their favorite media characters, as children may take their own prior knowledge into account when interacting with characters.

The vertical relationship that children have with adults and the horizontal relationships that children have with media characters may also explain our findings (Calvert & Richards, 2014). In particular, adult teachers, as studied by Corriveau and Harris (2009), are clearly more knowledgeable than their pupils, and are in a vertical relationship with children such that the adult is perceived as more powerful and more informed than children. By contrast, the parasocial relationships that children have with media characters are more likely to be horizontal friendships of equal power and knowledge (Calvert & Richards, 2014), possibly making the characters appear to be more fallible. Horizontal relationships could also explain, in part, why 24-month-old children with stronger parasocial relationships with Elmo chose him less for the unfamiliar fruit trials—children may have looked at him as more of a friend, companion, and source of comfort rather than as a credible informational authority. Similar negative correlations were found between children's perceived similarity with child characters and learning from them on-screen, presumably because the characters are perceived as too young to trust for accurate information (Richert, 2014).

Alternately, the parasocial relationship measure created by Bond and Calvert (2014a) and those of other scholars (Hoffner, 1996; Wilson & Drogos, 2007) have focused on assessments of children's favorite characters, and those results may not be comparable to assessments of media characters that are not the children's favorites, as

was done in the current study and that of Richert (2014). Future research needs to disentangle if parasocial relationship scales are valid when the character of interest is not the child's favorite one, as the child's favorite character may have a much more important influence on them than other characters have. Moreover, parents may not even know how important nonfavorite media characters are to children.

A final explanation for the children's skills at choosing accurate over familiar characters may be parent scaffolds. Prior television research found that parental scaffolds can aid 24-month-old children's learning (Barr & Wyss, 2008). In our study, the age group that was most likely to choose the familiar character Elmo, even when he was incorrect in naming a familiar fruit, was the 24-month-old toddlers. This finding suggests an initial attachment bias for the familiar character, as was found for 3-year-old children in a video task (see Corriveau & Harris, 2009). Through the process of scaffolding, children apparently began to trust DoDo and perceive him as a credible information source. Parents likely played an important role in this switch to DoDo, given that parents tended to provide more scaffolds in the DoDo correct than in the Elmo correct condition and contingent feedback from the app was held constant in both of the 24-month-old conditions. These findings suggest the important role of parent scaffolds as an aid in 24-month-old children's credibility decisions, helping them move from an attachment bias to a more evolutionarily sophisticated choice of accuracy over familiarity over the course of game play.

A similar parental scaffolding pattern was demonstrated within the 24-month-old children in the Elmo correct condition, with parents providing significantly more scaffolds when the child chose the incorrect character during the familiar fruit trials. Later on during game play, parental scaffolds tended to be linked to children choosing the more credible Elmo character during the unfamiliar fruit trials, suggesting that children were learning from their parents' efforts.

In contrast to the positive effect of parent scaffolding on 12- to 18-month-old infants' visual attention (Barr, Zack, Garcia & Muentener, 2008), parent scaffolding was unrelated to visual attention in our studies. Touchscreen interactions appear to be highly engaging for very young children, with visual attention at over 80% for all of our conditions, even for the 24-month-old toddlers, whose tiny fingers sometimes had difficulty in registering touch on the iPad. Within the condition in which Elmo was correct and corrective feedback was provided, we also found that 32-month-old children who were more attentive were more likely to choose Elmo as the trusted character during the unfamiliar fruit trials, suggesting that heightened interest in the character resulted in more accurate credibility assessments.

It is interesting that the mobile media use by our samples, as reported by parents, increased from an average of 33.4 minutes for 32-month-old children in Experiment 1 to an average of 40.9 minutes for 32-month-old children in Experiment 2, and 53.2 minutes for 24-month-old children in Experiment 3, reflecting broader social trends of children's increased mobile media use in U.S. society (see Common Sense Media, 2013). Experiment 1 data were collected primarily in 2012, while Experiment 2 and 3 data were collected in late 2013 and 2014. Therefore, even within 2 years, young children's use of mobile media expanded, and cohort differences were emerging in exposure to touchscreen devices.

Limitations of our study include our small, highly educated sample of children and parents, and that parents rather than children were asked about children's parasocial relationships with Elmo. Moreover, we did not assess children's favorite character but, instead, assessed one that was familiar to them. Because parents were not asked in advance if they knew the names of the unfamiliar fruits, it is also possible that parents engaged in less scaffolding if they knew that the label used for the unfamiliar fruits was not useful or if they actually knew the real name of the "novel" fruit. Future research should also disentangle exactly how young children are able to make credibility decisions about the accuracy of the information provided in an app.

In conclusion, our study is the first to demonstrate that young children use the accuracy of the information provided by characters more so than their familiarity with the characters to assess source credibility, and that they can make these judgments as early as age 24 months. Moreover, children make the same kind of judgments whether feedback about the accuracy of the characters' initial labels of familiar items is provided or not, suggesting that even very young children can effectively use touchscreen devices and make relatively sophisticated decisions early in life. Interactive devices like tablets, then, hold promise for assessing children's beliefs about what media characters know, making the small hands of young children a gateway to a world of knowledge.

Acknowledgments

We would like to thank all the children and parents who participated in this project. We also thank Bryce Walker and Dr. Roberto Joseph for their assistance in creating the touchscreen application; Dr. Bradley Bond for his feedback about the conceptualization of this study; Dr. Kaitlin Brunick, Marisa Putnam, Maggie Girard, Brian Borromeo, Alessandra Caruso, Daniel Galloway, Katie Poplawski, Jenniffer Torres Ortega, Krista Engemann, Barrie Adleberg, Christine Hildreth, Lindsay Rosenthal, Bridget Mullen, Elise Dedominicis, Christina Sharkey, Alison McRae, Molly Roach, Efren Lemus, Marisa Kataoka, Lauren McGarry, Sana Charania, Stephanie Donahue, and Lydia Bickel for their assistance in feedback, data collection and coding; and Dr. Rusan Chen for his assistance with the statistical analyses included in this article.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by grants from the National Science Foundation (NSF#0126014, NSF#1251745) and an internal faculty research grant from Georgetown University to Sandra L. Calvert.

Notes

1. An additional child was dropped from the experiment because the mother noted that her daughter was extremely afraid of Elmo.

2. One additional child was dropped from the experiment due to app malfunction.
3. Additional children were dropped due to parental interference ($n = 3$), sibling interference ($n = 2$), and a developmental delay ($n = 2$).

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Author Biographies

Melissa N. Richards, PhD, is a Postdoctoral Research Fellow at the *Eunice Kennedy Schriver* National Institute of Child Health and Human Development (NICHD). This research was completed as part of her doctoral disseration. She is interested in the practical and policy implications of using characters, media devices, and classic toys to improve children's learning, cognition, and healthy behaviors.

Sandra L. Calvert, PhD, is Professor of Psychology at Georgetown University and Director of the Children's Digital Media Center, a multi-site interdisciplinary research center funded by multiple grants from the National Science Foundation and by private foundations. Dr. Calvert has authored seven books and more than 90 journal articles and book chapters. She is a fellow of Division 7 of the American Psychological Association, a fellow of the International Communication Association, and has served on committees for the National Academies and the American Psychological Association as well as numerous advisory boards.