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BELIEVING THE UNBELIEVABLE: UNDERSTANDING YOUNG PEOPLE'S INFORMATION LITERACY BELIEFS AND PRACTICES IN THE UNITED STATES

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Young people are increasingly turning to the Internet more than to traditional media and information sources to find information. Yet, research demonstrates suboptimal online information literacy among youth today, suggesting potential shortcomings in young people's information consumption behaviors. To assess this, this study investigates several predictors of young people's success in online information evaluation, including their awareness of credibility problems associated with digital information, their use of specific information evaluation practices, and their accuracy in credibility assessment. Results from a study of 2,747 11–18-year-old Internet users indicate both expected and surprising influences of young people's cognitive development, decision-making style, demographic background, and digital information literacy training on their information evaluation awareness, skills, and practices. Theoretical implications and those for redesigning online information literacy interventions are discussed.

KEYWORDS Internet; information literacy; credibility; information evaluation; survey; children and media

The abundance of information currently available via digital technologies is unmatched in human history. Given the considerable information options available today, finding reliable information is a complex and challenging task for any information consumer, but especially so for young people. Indeed, contemporary youth are a particularly intriguing group to consider with regard to information credibility issues (Metzger & Flanagin, 2008). Although young people have been described as "digital natives in a land of digital immigrants" (Rainie, 2006, p. 3; see also Prensky, 2001), they may lack the tools and abilities critical to evaluate information effectively, in part due to their relatively limited development and life experience compared to adults (Flanagin & Metzger, 2008). In fact, research demonstrates that youth often approach online information evaluation suboptimally (Kafai & Bates, 1997; Livingstone, Bober, & Helsper, 2005; Shenton & Dixon, 2003; Walraven, Brand-Gruwel, & Boshuizen, 2010). The goal of this research is therefore to better understand the critical factors that contribute to young people's success in evaluating the credibility of online information.

Credibility has a long history in communication research and is defined as the *believability* of information and sources, as evaluated by an information receiver (Fogg, 2003). While a growing body of research addresses youths' Internet use, most research tends to focus on technology adoption and safety, rather than on online information evaluation. Even within the digital information literacy literature, the emphasis is on finding information rather than on how young people evaluate it. To address the dynamics of information evaluation, the present study focuses on the attitudes of youth (aged 11–18) toward information credibility, their information evaluation practices, and the effects of developmental and demographic differences and information literacy training on young people's information evaluation skills.

Factors Affecting Young People's Information Evaluation Skills and Practices

Among studies of young people's critical evaluation of online information, most find youth to be largely uncritical or reliant on inappropriate criteria when seeking information online. For example, in a study of children's information-seeking behaviors, Shenton and Dixon (2003) asked participants to describe instances where they sought information for school or personal use. Despite sometimes expressing dissatisfaction with what they felt to be questionable information, none of the 188 students they interviewed reported doing anything to assess the accuracy of the information they found. Shenton and Dixon concluded that much of the time young people "do not even realize the need for such scrutiny" (p. 1041).

Young information-seekers also often attribute altruistic intent to authors based on surface qualifications without considering possible bias, and trust top results yielded by search engines without considering why the results received high rankings (Brem, Russell, & Weems, 2001; Julien & Barker, 2009). For instance, Kafai and Bates' (1997) study of elementary students found that children based selection of one website over another on volume ("it had lots of information") or on a vague value judgment ("it had good information"). Eastin, Yang, and Nathanson (2006) similarly found that children judged websites to be similarly credible regardless of whether the sites contained useful source information, were dominated by advertising, or simply offered dynamic features (e.g., animation). Young people also have a tendency to rely heavily on author credentials or titles without considering the truthfulness of their claims (Brem et al., 2001).

Thus, research indicates that many young people are not fully or properly evaluating the information they find online, and some may not even be aware of the need to do so. Consequently, this study focuses on the information evaluation dimension of digital information literacy by investigating two specific yet distinct aspects of it: children's *awareness* of potential credibility problems and their *skill* in using online information evaluation practices.[1] By exploring these factors, we seek to understand what leads young people to be more or less critical consumers of online information. Research suggests several potential contributing factors to young people's digital information literacy skills and practices: children's cognitive development, demographic characteristics, individual differences in cognitive style, and exposure to training or education efforts in the domain of digital literacy are all promising candidates for impacting young people's awareness of credibility problems and their online information evaluation strategies. Each of these factors is considered in turn.

Cognitive development. Studies demonstrate that as children mature they engage with information in increasingly sophisticated ways. Livingstone, Haddon, Görzig, and Ólafsson (2010), for example, found that about 40 per cent of children aged 11–12 years report knowing how to compare information across websites to determine accuracy, which increases to around 60 per cent of teens aged 13–16 years. This is consistent with the theory of mind perspective, which argues that during early childhood children are typically unaware of others' thinking or the potential for others to view the same event differently (Kuhn, 2002). In these early years, information is taken at face value and children often assume that everyone shares their perspective (Selman, 1980). As children move toward early adolescence, they become better able to consider the context of information use and coordinate their evaluation strategies accordingly.

Indeed, during adolescence, children begin to engage in multiple, simultaneous, and mutual perspective-taking (John, 1999; McAlister & Cornwell, 2009; Selman, 1980); demonstrate a capacity for formal reasoning involving abstract principles (Piaget, 1971); increase their ability to use context-appropriate strategies for knowledge development (Kuhn, 2002); make more sophisticated comparisons, noting differences (Selman, 1980); and also begin to understand the use of evidence in educational contexts (Kuhn, 2002). Between the critical ages of 11–18, adolescents learn to coordinate these skills when approaching information resources, likely applying, for example, their awareness of multiple perspectives to their evaluation of author purpose. During this developmental phase, older adolescents are finally able to consider omissions and differences in light of their contextual implications when evaluating information (John, 1999; Piaget, 1971).

As children get older, they also encounter more opportunities to develop their cognitive and information skills through deliberate practice. For example, the frequency of school assignments involving Internet research has been found to correlate positively with proficiency in skills that map directly onto credibility evaluation (Bulger, 2009). Given evidence that young people's interaction with their information environments increases in complexity and coordination as they develop through time, we advance Hypothesis 1:

> H1: Age positively predicts young people's awareness and skill in evaluating the credibility of online information.

Demographics. Demographic characteristics may also influence the information evaluation skills and practices of youth, above and beyond developmental factors. In a study of 25,000 European children aged 9–16, Livingstone, Haddon, Görzig, and Ólafsson (2011) found that young people's movement from engaging in basic activities when using the Internet to more creative and participatory interaction is related to their socioeconomic status (SES). These differences in engagement are also apparent in information-seeking practices, with youth from higher SES homes more likely to report seeking information about politics and current events (Lenhart, Purcell, Smith, & Zickuhr, 2010) and youth from lower SES backgrounds more likely to use the Internet for entertainment purposes (Peter & Valkenburg, 2006).

Information evaluation behaviors are partly a matter of access, but are also determined by diversity of use (Hargittai, 2010) and the context in which this use occurs (Livingstone et al., 2011). Livingstone and Helsper (2010) found that SES was positively related to the extent to which adolescents were able to take advantage of online information-seeking opportunities and that higher SES affords adolescents greater access

to the Internet from a younger age. Hargittai (2010), moreover, found that college students from higher SES backgrounds demonstrate more familiarity with web terms and fact-checking processes than students from lower SES backgrounds.

Based on these findings, we posit that adolescents with higher SES may experience an advantage in the context of information evaluation online. This advantage afforded by higher SES in terms of greater access, participation, and experience with information seeking, fact-checking, and risky behavior avoidance might manifest in both greater awareness of and skill in evaluating the credibility of information online, as we propose in Hypothesis 2:

> H2: Socioeconomic status positively predicts adolescents' awareness and skill in evaluating the credibility of online information.

Individual differences in thinking style. While developmental stages may influence the overarching strategies that young people use to evaluate information, research finds that children of the same age sometimes use different problem-solving strategies (Bransford, Brown, & Cocking, 2000), suggesting that individual differences might also drive young people's credibility evaluation attitudes and behaviors. More specifically, individual differences that describe children's cognitive orientation or their message-processing propensity are likely to contribute directly to young people's information evaluation practices.

Cognitive dispositions or "thinking styles" have been shown to influence how people approach information. Among these, *need for cognition* (NFC) (Cacioppo & Petty, 1982) reflects the degree to which people engage in and enjoy thinking deeply about problems or information and, thus, are willing to exert effort on information acquisition, reasoning, and problem solving. People high in NFC are more likely to seek, scrutinize, and use relevant information from their surroundings and environment to solve problems, form conclusions, and make decisions (Berzonsky & Sullivan, 1992) and are less likely to rely on simple cues when evaluating information (Cacioppo & Petty, 1982). They also tend to be more receptive to different kinds of information than those low in NFC (Cacioppo & Petty, 1982).

Flexible thinking is another thinking disposition that has implications for rational information processing. Flexible thinkers are people who seek out and consider options and beliefs that disconfirm their own opinions, and they are willing to change their beliefs in the face of contradictory evidence (Baron, 1988). Flexible thinkers value having accurate beliefs more than they value holding onto the beliefs that they already have (Stanovich & West, 1997). This thinking style thus suggests an openness to seek out and consider multiple perspectives, which is a key aspect of appropriate information evaluation in many situations.

Other thinking style traits may contribute to irrational information processing, and therefore lead young people to misjudge the credibility of information online. For example, *faith in intuition* refers to a tendency to make decisions based on first impressions, instincts, and feelings (Jung, 1968). Shen, Monahan, Rhodes, and Roskos-Ewoldsen (2009) found that faith in intuition is negatively associated with perceived message bias, indicating that people who rely on their feelings to make decisions may not always see the big picture or perceive nuanced information in messages, and thus may be more persuadable.

Finally, the dispositional propensity toward *trust in others* is also relevant in the assessment of information credibility. The propensity to trust is an individual difference that

refers to a general tendency to be willing to depend on or become vulnerable to others (McKnight, Kacmar, & Choudhury, 2004), and to attribute benevolent intentions to others, for example, by assuming that most people are fair, honest, and have good intentions (Costa, McCrae, & Dye, 1991). Grabner-Kräuter and Faullant (2008) found that propensity to trust applies not only to people but also to technology-oriented objects such as websites and online banks.

Among adults, propensity to trust has been positively linked to perceived website quality and willingness to explore an Internet advice website (McKnight et al., 2004), suggesting that those who have a high propensity to trust others may be more likely to believe information found online than individuals with lower trust in others. The propensity to trust others begins in early childhood (Erikson, 1968) and develops further as people accumulate life experience. By mid-adolescence, children accumulate enough experience and exposure to develop a somewhat stabilized sense of social trust (Flanagan & Stout, 2010).

Given prior research on dispositional factors including NFC, flexible thinking, faith in intuition, and trust in others, we propose Hypotheses 3_{a-d}:

$H3_{a-b}$: (a) Need for cognition and (b) flexible thinking style positively predict young people's awareness and skill in evaluating the credibility of online information.

$H3_{c-d}$: (c) Faith in intuition and (d) trust in others negatively predict young people's awareness and skill in evaluating the credibility of online information.

Credibility evaluation training. Evaluating the credibility of information—either online or offline—is an essential component of both media and digital information literacy (Hobbs, 2010).[2] Most digital information literacy training programs take place in schools or libraries and consist of explicit instruction in the critical evaluation of online sources and messages. These interventions typically focus on teaching students to evaluate the *accuracy* of online information (e.g., the degree to which a Web site is free from errors or whether the information can be verified offline), *authority* of the source (e.g., who authored the site or indicators of the author's credentials, qualifications, and affiliations), *objectivity* of the information provided (e.g., identifying the purpose of the site and whether the information provided may be biased), as well as information *currency* (e.g., whether the information is up to date), and *coverage* (e.g., whether the breadth and depth of the information provided on a website is appropriate) (Metzger, 2007). Schools and libraries are not the only place that such training takes place, as informal digital and media literacy instruction occurs in the home as well (Hobbs, 2010; Koltay, 2011).

Although there is a large literature on the effectiveness of both media and information literacy interventions, there is only scant evidence that pertains specifically to online credibility evaluation. In fact, the bulk of this literature concerns the need for, and design of, credibility evaluation programs rather than actually measuring program effectiveness, and most of the research focuses on college students rather than children or adolescents. Yet several studies have found positive associations between exposure to information literacy instruction and evaluation skills, including analyzing information sources by deploying a greater range of learned evaluation criteria in a more sophisticated way compared to a control group (Walton & Hepworth, 2011; see also Johnson, Anelli, Galbraith, & Green, 2011), more critical evaluation of sources (Hoffmann & LaBonte, 2012),

and greater awareness of the criteria to use when evaluating web sources (Walton & Archer, 2004), as well as awareness of message or author bias (Samson, 2010). Although less plentiful, studies focusing specifically on adolescents have found similar results (though for an exception, see Leu et al., 2008). Newell's (2010) study of middle-school students, for example, showed that an intervention aimed to improve students' understanding of information literacy concepts and practices resulted in increases in students' abilities to judge the accuracy, relevance, and completeness of both offline and online sources. In a review of the literature on digital literacy and health information, Brown and Bobkowski (2011) found that involvement in digital literacy curricula stimulated adolescent critical thinking skills when evaluating information from a commercial source.

There are also strong theoretical reasons to expect that literacy training can lead to increased skill in critical evaluation of information. For example, most theories of both information and media literacy hypothesize that, by emphasizing the importance of, and teaching the skills for, critical thinking about information encountered in one's environment, literacy programs prompt active consideration of message intent, content, and effects, which ultimately should improve the quality of information-related judgments (Grassian & Kaplowitz, 2009; Martens, 2010). Both theory and research thus suggest that training in credibility evaluation literacy practices should improve adolescents' skills in evaluating digital media messages and sources, as proposed in Hypothesis 4:

H4: Exposure to credibility evaluation training positively predicts adolescents' awareness and skill in evaluating the credibility of information.

Academic performance. Finally, academic performance may be another important factor in credibility evaluation. Studies by Coiro and Dobler (2004, 2007) found that successful comprehension (including evaluation) of Internet-based information requires incorporating prior knowledge, applying inferential reasoning strategies, and self-regulated reading processes, and that more skilled Internet readers invoked each of these strategies more often than lower skilled readers. Additionally, Coiro (2011) found that offline reading comprehension scores (including dimensions of critically evaluating online information) were the best predictor of online reading comprehension scores among middle schoolers. More generally, others have found a positive correlation between academic performance (measured by GPA) and critical thinking abilities (Facione & Facione, 1997; Hawkins, 2012; Tiessen, 1987). These studies suggest that academic performance, when viewed as a proxy for varying levels of mastery of critical thinking abilities, may be positively related to online information evaluation (after controlling for age), as proposed in Hypothesis 5:

H5: Academic performance positively predicts adolescents' awareness and skill in evaluating the credibility of online information.

Method

A representative survey of young people with Internet access in the U.S. fielded by the research firm Knowledge Networks was employed to analyze the hypotheses. The sample was drawn from a combination of random digit dialing and address-based probability sampling methods. After securing parental permission and household demographic information, the child participants took the survey online from home. A total of 2,747 valid

responses were obtained from children between the ages of 11–17 years plus 18-year olds still residing with their parents. Responses were weighted to correct demographic discrepancies between the U.S. population of Internet households and Knowledge Networks' online panel.

Respondents consisted of 53 per cent males and 47 per cent females, with an average age of 14.33 (SD = 2.28). Of them, 75 per cent were white; 9 per cent were black, non-Hispanic; 12 per cent were Hispanic; 0.4 per cent were other, non-Hispanic; and 4 per cent reported being mixed race, non-Hispanic. Household annual income ranged from less than $5,000 to more than $175,000, with an average income of between $60,000 and $85,000. Most families (88 per cent) had between 3 and 5 members living in the household, and the average number of children living at home was 2.25 (SD = 1.39). Participants came from all U.S. geographic areas: the Midwest (31 per cent), Northeast (19 per cent), South (28 per cent), and West (23 per cent).

Measures

Two rounds of pilot testing involving focus groups and interviews of children between 9 and 17 years old were conducted to aid survey development. Children in the focus groups were asked to discuss their understandings of the key variables in this study and how they learned how to evaluate credibility online. Children in the interviews discussed each question on the survey instrument. Researchers probed any problems with comprehension or misunderstanding of items and discussed alternative wording with participants. The survey instrument was then revised to incorporate the suggested changes to enhance valid responses. Throughout the survey, credibility was operationalized in terms of "believability," as suggested by past credibility research and as validated by pilot tests during the instrument development stage of the research.[3]

Awareness and skill in evaluating the credibility of online information. Given the complexity of this multidimensional variable, awareness and skill in evaluating the credibility of online information was measured in three distinct ways. The first measure captured the degree to which young people use more rigorous methods to determine whether to believe information they encounter online and how much they think about the credibility of information on the Web. Research in cognitive psychology and adolescent judgments and decision-making indicates that adolescents approach information either analytically or heuristically when making decisions (Jacobs & Klaczynski, 2005). Analytic processing involves effortful and deliberate consideration of information, whereas heuristic decisions are made more quickly, with less cognitive effort and scrutiny. As this study was interested in young people's use of rigorous credibility evaluation strategies, respondents were asked to indicate how often they use various analytic (rather than heuristic) methods, following Klaczynski's dual-processing model of adolescent development and decision-making (Jacobs & Klaczynski, 2005; Klaczynski, 2001). Items adapted from Scott and Bruce's (1995) decision-making style scale asked participants: "When you decide what information to believe on the Internet, do you:" (1) give careful thought to the information, (2) look at several things to figure out whether you should believe it or not, (3) double check your information to be sure you have the right facts, (4) gather as much information as you can to help you decide, and (5) make

decisions in a careful, well thought-out way? Answers ranged on a 5-point scale from "never" to "very often."

A similar set of items asked respondents about their use of specific strategies to evaluate the credibility of information online, for example, whether they placed more or less importance on certain credibility "cues" or elements found on websites on a 5-point scale ranging from "not at all important" to 5 "very important." Factor analyses with Varimax rotation detected three strategies: evaluating credibility via social confirmation (e.g., consulting others and looking to see if information is from expert sources), evaluating credibility via information quality (e.g., looking at the currency and completeness of the information), and evaluating credibility via Web site design (e.g., considering the site's appearance). The survey also asked participants how often they think about whether they should believe the information they find when they go online on a 5-point scale anchored at "never" to "very often."

A composite measure was then created from the items described above that included (a) young people's use of the analytic decision-making style when evaluating the credibility of online information, (b) evaluating credibility by examining cues pertaining to the quality of the information, and (c) how often they think about whether information online is believable as an indicator of their skepticism or awareness of credibility problems in the online environment. Cronbach's alpha for the composite scale was .70.

Young people's credulity toward Internet information is another means of gauging their awareness and skill at evaluating online information, and so the second measure of youth's credibility evaluation awareness and skill assessed the degree to which participants typically believe what they see online. Eight items were used to measure credulity, including (a) how likely youth are to believe six types of information they find online, including health, news, commercial, and entertainment information, information for schoolwork, and information from other people you meet online (answers ranged from "not at all likely to believe it" to "very likely to believe it"); (b) how much of the information available on the Internet they think is believable (from "none of it" to "all of it"); and (c) how believable they feel information on the Internet is (from "not at all" to "a whole lot"). Cronbach's alpha for the scale was .78.

The third measure of credibility awareness and evaluation skill took advantage of a hoax website stimulus that was embedded in the survey. A screenshot of one of the two "hoax" sites slightly modified from existing hoax sites available on the Web was presented randomly to each participant within the survey. To avoid any influence on respondents from the survey questions dealing with credibility, this portion of the survey was presented first in the study. One hoax site detailed "the first male pregnancy," and the other was devoted to the cause to "save the rennets," described as small hamster-like rodents who are used in the production of cheese (Figure 1). Tests showed that these two hoax sites did not differ in terms of their overall believability so the data were pooled. After viewing the hoax site, participants were asked "How much do you believe the information on this website?" Responses indicated those believing the information "not at all" and those believing "at least some" or more of the information.[4] Any participants who indicated that they "had seen or heard of this website before today" or that they looked up any information about it on the Internet after seeing the site during the study ($n = 282$) were excluded from the analyses.[5] Unlike the first two measures of the dependent variable described above, this measure provided a direct means of assessing young people's accuracy at evaluating the credibility of information online.

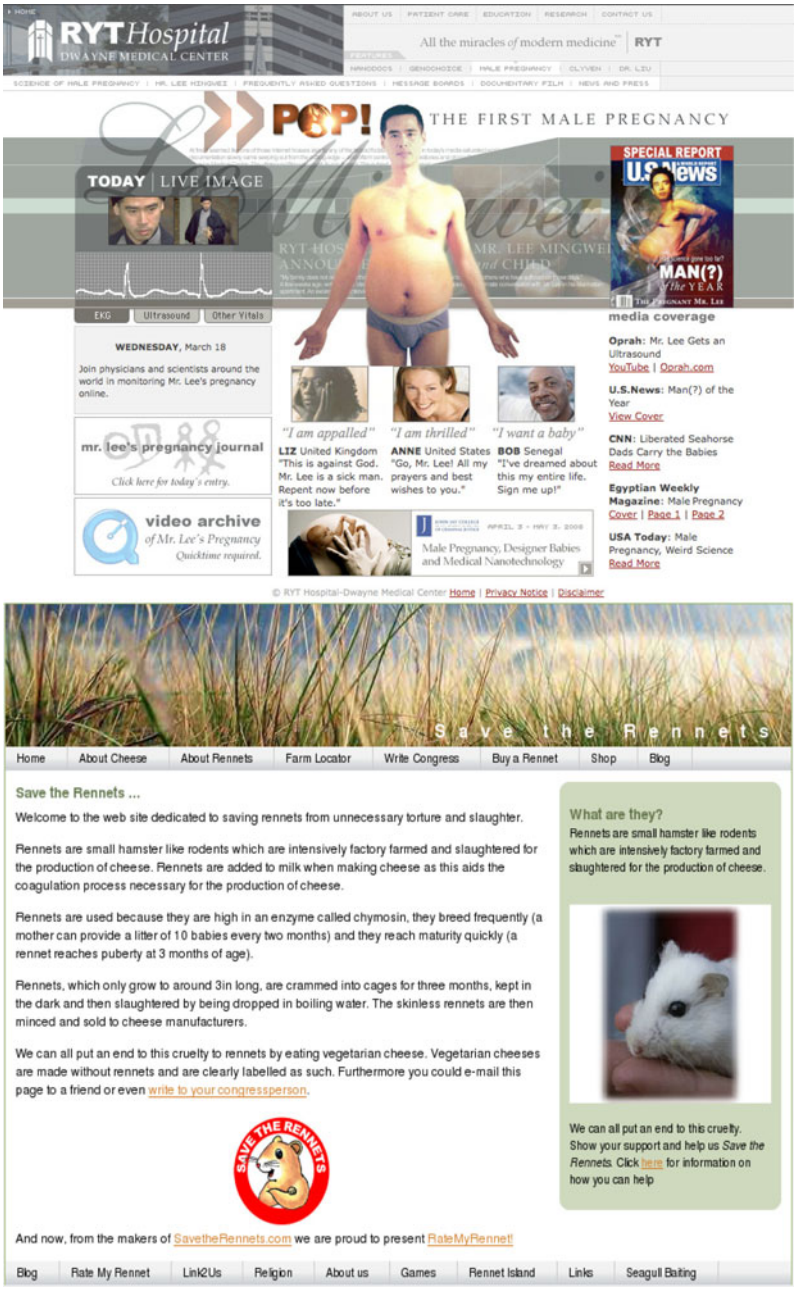

FIGURE 1
Screenshots of hoax websites (male pregnancy at top and rennets at bottom)

Individual differences in thinking style. Items comprising the need for cognition, flexible thinking, and faith in intuition scales were adapted from standard measures of these concepts (Cacioppo & Petty, 1982; Epstein, Pacini, Denes-Raj, & Heier, 1996; Kokis, MacPherson, Toplak, West, & Stanovich, 2002). *Need for cognition* was measured with nine

Likert-scale items with response options ranging from strongly agree to strongly disagree. This nine-item scale was adapted specifically for children by Kokis et al. (2002) from Cacioppo and Petty's standard 18-item adult need for cognition scale. Sample items include, "I like to do things that make me think hard," "I like to spend a lot of time and energy thinking about something," and "I like to do things where I don't have to think at all" (reverse coded). As mentioned earlier, each item on the survey was pretested with a sample of child participants to ensure that it could be understood appropriately. Cronbach's alpha for the scale was .82.

Ten likert-scale items from the Rational-Experimental Inventory (REI; see Epstein et al., 1996) were used to measure *flexible thinking*. Sample items included, "Even after I've made up my mind about something, I am always willing to consider a different opinion," "I often change what I believe when I find new information or evidence," and "I feel that thinking about other points of view is a waste of time" (reverse coded). Cronbach's alpha for the flexible thinking scale was .71. *Faith in intuition,* also from the REI, was measured with five items. Sample items included, "I can usually feel when something is right or wrong even if I can't explain how I know," "I trust my initial or first feelings about things," and "When it comes to trusting, I can usually rely on my gut feelings." Cronbach's alpha for the faith in intuition scale was .75.

The *trust in others* measure was taken from the item on the General Social Survey (GSS) used to measure social trust. The question asked, "In general, would you say that most people can be trusted or not?" Response options included, "Most people can almost never be trusted," "Most people usually cannot be trusted," "Most people can usually be trusted," and "Most people can almost always be trusted."

Exposure to credibility training. An item asking respondents whether they have "ever had someone (like a teacher, parent, librarian, or friend) teach you ways to decide what information from the Internet you should believe?" was used to measure exposure to credibility training. Answers options included "no," "yes," and "I don't know" ($n = 298$, coded as missing data).

Academic performance. Academic performance was measured by participants' response to the question, "What kinds of grades do you usually get in school?" Answers ranged from "mostly Fs" "mostly Ds and Fs," "mostly Ds," etc. to "Mostly As." Participants were also offered "I don't know" and "My school does not give letter grades" options, which were treated as missing data.

Demographic variables. Participants reported their age in years on a drop-down menu. Following the guidelines of the National Center for Education Statistics, SES was measured with two proxy items, education and income. Parents provided the data for these items. Parents reported the head of household's highest level of education obtained and they reported their annual household income using a list of income increments from "$0–$5,000" up to "$175,000 or more."

Control variables. Two items asking participants whether they or anyone they knew had a bad experience because of false information found on the Internet in the past, as well as whether they had ever heard a news report about someone who had a bad experience because of false information found on the Internet. Past negative experiences with online

information likely impact young people's perceptions of credibility online by influencing their level of skepticism. Thirty-two per cent of participants in the current study reported that they, or someone they know, had a bad experience due to false information found on the Internet or through email, and 62 per cent reported that they had heard a news report about someone who had a bad experience because of false information online. These variables were controlled in all analyses.

Results

Multiple regression analyses were used to test Hypotheses 1–5. Each of the three dependent measures of credibility awareness and skill were analyzed: use of analytical means of credibility evaluation, credulity, and belief in the hoax site. Hierarchical OLS regressions were used for the first two measures, but due to the dichotomous nature of the belief in the hoax site measure, logistic regression was used in the third instance. In each case, the predictor variables were entered into the regression equation in separate blocks as follows: (1) control variables, (2) whether participants received training in credibility evaluation, (3) demographic variables including age and SES variables, (4) the cognitive style variables (need for cognition, flexible thinking, and faith in intuition) and social trust, and finally (5) academic performance. Results of each regression analysis appear in Tables 1–3. Descriptive statistics for the main variables in the study are provided in Table 4.

Hypothesis 1 predicted that as children increase in age, they would demonstrate increased levels of awareness and skill in evaluating the credibility of online information. The data predominantly support this hypothesis. As shown in Tables 1 and 3, age was a significant predictor of analytical means of credibility evaluation ($B = .018$, $p < .01$) and believing the hoax sites ($B = -.084$, $p < .01$), but did not predict credulity toward online information. Hypothesis 2, which proposed that higher SES would predict higher awareness

TABLE 1
Effects of predictor variables on children's use of analytic credibility evaluation strategies

Variables	*B*	SE *B*	*β*
Step 1: control variables			
Had bad experience with false information in past	.060	.030	.050*
Heard news reports of others' bad experience	.063	.029	.055*
Step 2: information literacy training			
Received training in credibility evaluation	.104	.031	.084**
Step 3: development and demographic variables			
Age	.018	.006	.070**
Parent's highest educational attainment	−.001	.009	−.004
Household income	−.009	.004	−.056*
Step 4: cognitive style variables			
Need for cognition	.138	.027	.150***
Flexible thinking	.285	.032	.252***
Faith in intuition	.166	.024	.168***
Trust in others	−.012	.023	−.012
Step 5: academic performance			
Academic performance (school grades)	.049	.011	.122***

Notes: $F = 36.91$, d$f = 11, 1359$, $p < .001$, $R^2 = .23$. $R^2 = .02$ for Step 1, $\Delta R^2 = .01$ for Step 2, $\Delta R^2 = .01$ for Step 3, $\Delta R^2 = .18$ for Step 4, $\Delta R^2 = .01$ for Step 5. *$p < .05$, **$p < .01$, ***$p < .001$.

TABLE 2
Effects of predictor variables on children's credulity toward online information

Variables	*B*	SE *B*	*β*
Step 1: control variables			
Had bad experience with false information in past	−.069	.033	−.059*
Heard news reports of others' bad experience	−.003	.032	−.003
Step 2: Information literacy training			
Received training in credibility evaluation	.036	.034	.029
Step 3: development and demographic variables			
Age	.004	.007	.015
Parent's highest educational attainment	.019	.010	.054
Household income	.004	.005	.023
Step 4: cognitive style variables			
Need for cognition	−.115	.029	−.125***
Flexible thinking	.048	.035	.043
Faith in intuition	.175	.026	.178***
Trust in others	.130	.026	.134***
Step 5: Academic performance			
Academic performance (school grades)	.012	.012	.004

Notes: $F = 9.23$, d$f = 11, 1359$, $p < .001$, $R^2 = .07$. $R^2 = .003$ for Step 1, $\Delta R^2 = .001$ for Step 2, $\Delta R^2 = .01$ for Step 3, $\Delta R^2 = .06$ for Step 4, $\Delta R^2 = .000$ for Step 5. *$p < .05$, ***$p < .001$.

and skill in credibility evaluation, was not supported by the results. Interestingly, income was significantly but *negatively* related to using analytical methods of credibility evaluation ($B = -.056$, $p < .05$). SES did not appear to impact young people's credulity or believing the hoax sites, as no significant relationships were found for either of these variables.

Hypothesis 3_{a-d} aimed to understand whether individual differences in need for cognition, flexible thinking, faith in intuition, and trust in others predict young people's

TABLE 3
Effects of predictor variables on children's belief of the hoax websites

		95 per cent CI for exp *b*		
Variables	***B* (SE)**	**Lower**	**exp *b***	**Upper**
Step 1: control variables				
Had bad experience with false information in past	.087 (.121)	.861	1.091	1.382
Heard news reports of others' bad experience	.089 (.116)	.870	1.093	1.373
Step 2: information literacy training				
Received training in credibility evaluation	.257* (.124)	1.013	1.293	1.650
Step 3: development and demographic variables				
Age	−.084** (.025)	.876	.920	.965
Parent's highest educational attainment	.035 (.037)	.962	1.035	1.114
Household income	−.021 (.017)	.947	.980	1.014
Step 4: cognitive style variables				
Need for cognition	−.170 (.106)	.686	.844	1.038
Flexible thinking	−.065 (.130)	.726	.937	1.209
Faith in intuition	−.005 (.097)	.822	.995	1.204
Trust in others	−.073 (.096)	.771	.930	1.122
Step 5: academic performance				
Academic performance (school grades)	−.042 (.044)	.881	.957	1.045

Notes: Model $\chi^2(11) = 25.87$, $p < .01$. $R^2 = .02$ (Hosmer & Lemeshow), .02 (Cox & Snell), .03 (Nagelkerke). *$p < .05$, **$p < .01$.

TABLE 4
Descriptive statistics for main variables of study

Continuous variables	***M***	**SD**	**Range**
Age	14.64	2.30	11–18
Parent's highest educational attainment	10.96	1.62	1–14
Household Income	13.22	3.58	1–18
Need for cognition	3.15	.60	1–5
Flexible thinking	3.30	.48	1–5
Faith in intuition	3.52	.56	1–5
Trust in others	2.67	.58	1–4
Grade level in school	9.62	2.35	1–16
Academic performance (school grades)	7.56	1.40	1–9
Use of analytic credibility evaluation strategies	3.35	.57	1.24–5
Credulity	3.13	.55	1–4.88
Categorical variables	**N**	**Per cent of sample**	**Range**
Had bad experience with false information in past			0–1
Yes	1212	49.1	
No	552	22.4	
Don't know/don't recall	681	27.6	
Heard news reports of others' bad experience			0–1
Yes	1175	47.7	
No	756	30.7	
Don't know/don't recall	514	20.9	
Received training in credibility evaluation			0–1
Yes	1543	62.6	
No	611	24.8	
Don't know/don't recall	298	12.1	
Belief in hoax site			0–1
Not at all	1213	49.2	
At least some	1243	50.4	
Don't know/don't recall	10	.4	

Notes: Mean household income interval was $60,000–$74,999 (with the majority of the sample's income falling between $35,000 and $124,999); participants' average grade level in school was 9; and children in the sample on average reported getting "mostly Bs" in terms of their.

awareness and skill in credibility evaluation. Results were mixed. Participants with higher scores on need for cognition demonstrated greater use of analytical strategies when evaluating credibility ($B = .150$, $p < .001$) as predicted by H3a. Consistent with H3b, they also were less credulous of online information ($B = -.125$, $p < .001$). However, need for cognition was unrelated to believing the hoax sites. Flexible thinking positively and significantly predicted use of analytical means of credibility evaluation ($B = .252$, $p < .001$), but was not a significant predictor of either credulity or belief in the hoax sites.

Faith in intuition and trust in others were expected to negatively impact young people's awareness and skill in evaluating the credibility of online information. Again there was mixed support for the hypotheses. Contrary to H3c, faith in intuition *positively* predicted participants' use of analytical credibility evaluation strategies ($B = .168$, $p < .001$), but also positively predicted their credulity of online information ($B = .178$, $p < .001$), which is consistent with the rationale underlying H3c. Trust in others did not predict young people's use of analytic evaluation strategies, but higher social trust did predict greater credulity ($B = .134$, $p < .001$), which is again consistent with H3's prediction

that more trust in others would result in less skepticism toward online information. Neither faith in intuition nor trust in others was related to believing the hoax sites.

The fourth hypothesis predicted that having had prior credibility evaluation training would increase young people's awareness and skill in evaluating the credibility of information online. Results indicate that exposure to credibility evaluation training positively predicted use of analytical evaluation methods ($B = .104$, $p < .01$) as expected by H4, and did not impact how credulous youth are toward online information. The fact that no relationship was found between evaluation training and credulity does not contradict H4. Most important, however, the data indicate that having had training in credibility evaluation leads to *greater* belief in the hoax sites ($B = .257$, $p < .05$), which is contrary to H4.

Results for H5 found that academic performance positively predicted young people's use of more analytical strategies for evaluating the credibility of information online ($B = .122$, $p < .001$), but did not predict either credulity toward online information or belief in the hoax sites. Thus, H5 was partially supported.

Discussion

Research on children and adolescents has indicated reason to be skeptical of young people's ability to locate and discern high-quality information online. Consequently, this study sought to understand how various characteristics of young online information consumers impact their ability to evaluate the credibility of information found on the Internet appropriately and accurately. Although the results tended to support our hypotheses, they were also somewhat surprising, often contradicting past findings on young people's information evaluation practices.

The first set of hypotheses focused on the question of whether developmental and demographic characteristics lead young people to be more effective information evaluators. With regard to cognitive development, the data from our study suggest that the answer is largely yes. Older children in the study reported using more analytic credibility evaluation strategies, including being more aware of credibility as a potential problem of online information, and were less likely to believe the hoax sites compared to younger children. These results are consistent with prior theory and research showing that, as children mature, they become more sophisticated information consumers and are better able to use contextual cues to evaluate information (e.g., Kuhn, 2002; Livingstone et al., 2010; John, 1999). The implications of these results for digital information literacy training argue against a one-size-fits-all approach, and suggest that the most effective interventions should be designed with developmental theory in mind, such that they begin simply by sensitizing preadolescents (ideally elementary age students) to the issue of credibility online and the importance of being a critical information consumer, and then increase in sophistication and specificity through the teenage years.

In terms of demographics, SES (education and income) had little impact on the three measures of credibility awareness and skill, which is in contrast to other research that has found a connection between these variables and information evaluation, at least in adults. One possible explanation is lack of variance on SES in the sample. Parental education for nearly everyone in the sample ranged only from high school diploma to Bachelor's degree, and most of the participants reported their household income to be between $40,000 and $125,000 annually. A sample selected for its diversity, rather than for its generalizability

to U.S. Internet households, may be necessary to uncover any impact of SES on online information evaluation.

The second set of hypotheses examined whether differences in cognitive style contribute to better awareness and skill in evaluating information online. Across all outcomes except believing the hoax websites, the thinking style variables—including need for cognition, flexible thinking, and faith in intuition—emerged as the strongest predictors of young people's awareness of credibility problems and information evaluation skill. Overall, and as predicted, being open to various and conflicting perspectives and liking to think hard about problems lead to higher reported use of more effortful credibility evaluation tactics, while faith in intuition and trusting others lead young people to be more trusting of online information. These results are consistent with the prior theory and research on thinking styles as described earlier (e.g., Berzonsky & Sullivan, 1992; Cacioppo & Petty, 1982; McKnight et al., 2004). Interestingly, higher faith in intuition was also associated with using more analytic credibility evaluation strategies, which may reflect a reciprocal relationship between these variables, such that using these strategies imparts confidence in one's ability to evaluate information that is internalized and then reflected in answers to questions about the ability to trust one's own gut-level judgments. That said, none of the thinking style variables predicted belief in the hoax sites.

The last set of hypotheses sought to understand if having had formal training in how to evaluate information on the Internet and degree of mastery of academic skills helps young information consumers better navigate credibility issues online. As predicted, academic performance was associated with children's heavier use of analytic credibility evaluation strategies. But perhaps the most interesting, and most disconcerting, finding of the study is that youth who reported having been exposed more to online credibility evaluation training were also *more likely to believe the hoax sites*, even as they were more likely also to use analytic evaluation strategies. This suggests that although such explicit training does appear to lead kids to do the right things to evaluate online information (i.e., use more analytic evaluation strategies), doing so does not necessarily lead them to the right conclusions about digital information (i.e., disbelieving hoax sites).

Similar surprising results from a digital literacy standpoint have been found by other researchers. For example, Leu et al. (2008) found that, even immediately after receiving training in information evaluation, many 7th-graders identified as their schools' "most proficient online readers" failed to distinguish fake from legitimate information online. Nearly all believed the information on a hoax Web site advocating the protection of the Pacific Northwest tree octopus, with 96 per cent of the students rating the site as "very credible" and recommending the site to others. Moreover, even after learning that the site was a fake, these children had difficulty indicating why this was the case, in spite of clear cues present on the site. Others have similarly found that interventions related to critical approaches to mediated messages often do not work in the long-term (Ey & Cupit, 2011; Kuhn, 2002).

Together, these findings suggest that young people might be using the evaluation techniques they have learned they should use (or perhaps just reporting that they use these techniques) without understanding their purpose. Kuhn (2002) argues that critical thinking instruction is usually a "do this" kind of checklist approach, which is ineffective in the long term because it does not address the metacognitive thinking underlying critical ability. In other words, typical training does not talk to kids about *how* they think and does not

address at the metacognitive level how to modify their thinking processes to improve their skills. As a consequence, youth may blindly apply the strategies they have been told to use, without understanding how those strategies are meant to help them evaluate information effectively. If true, this calls for a different approach to digital literacy training, with a stronger focus on the *purpose* for evaluation, rather than teaching a specific set of practices for evaluation.

Meola (2004) makes a similar argument against "checklist" models of online information evaluation, which he says encourage a mechanistic method of evaluation that is at odds with critical thinking, and thus can account for findings like ours where information consumers may do the right things according to the checklist, yet still come up with faulty evaluations. He proposes a contextual approach using three techniques: using peer- and editorially-reviewed resources, comparison, and corroboration. While the checklist model focuses on criteria internal to a specific web site being evaluated, the contextual approach uses information external to the target site to help users make reasoned judgments of information quality based on a more holistic and situated assessment of the information in question.

Contributions and Limitations of the Study

This study is among the largest and most extensive ever conducted to examine young people's credibility beliefs and evaluation practices specifically, rather than their more general Internet use. Results offer new insight into young Internet users' level of digital information literacy, including factors thought to affect their ability to discern credible from unreliable information online. For example, the data reveal a previously unexamined but apparently robust relationship between cognitive thinking styles and digital information literacy skills and practices, which could be used as a means to identify kids who may be more or less in need of literacy training. This study is also the first to apply the literature on adolescent decision-making to the area of credibility evaluation, and as such extends the scope of dual-processing models of adolescent development and decision-making to the context of digital information literacy, as well as opens new avenues of research in both the communication and decision-making literatures.

While this study benefits our understanding of young people's information behavior, future data collection could target a more diverse sample to better assess the impact of SES, as well as other variables related to digital divide issues, including Internet access and use. Incorporating such variables is important because it could help researchers tease out the relationships between them and the dependent variables in this study, including the degree to which Internet access and use might mediate the effects of SES or age on critical evaluation of Internet content. A younger sample would also be useful to shed light on exactly *how* and *when* critical evaluation skills unfold developmentally. Including more sensitive measures of cognitive development (beyond age) would be helpful as well in future studies of credibility evaluation.

In addition, because all surveys are inherently limited to self-reports of attitudes and behavior, it is important that future research on digital literacy utilize other methods of gauging young people's actual critical evaluation skill. This could be done through less obtrusive means, as well as by observational studies or think-aloud techniques. It is also important to develop more sophisticated measures of credibility evaluation training, as the use of a single item, self-report measure in this study provides a limited understanding

of how online information literacy training, or certain aspects of such training, may impact young people's credibility skills and practices. For example, research could isolate the specific source of the training (e.g., teacher, parent, librarian, friend, etc.), its nature and depth, and its timing relative to the present time or a specific information evaluation task. Nonetheless, a feature of the present study is that critical evaluation skill was measured in a variety of ways. Indeed, the hoax site stimulus arguably provided a more honest measure of young people's information evaluation skill than prior studies, and as it was presented to participants first in the study, it is unlikely to have been affected by social desirability or self-report biases.

Related to this, this study adds nuance to the literature on young people's information evaluation in that different predictor variables emerged for each of the three measures of critical engagement with online information. For example, use of analytic strategies to evaluate credibility was predicted by formal evaluation training, age, thinking styles, and overall academic skill mastery, whereas credulity was predicted mostly by thinking styles. Belief in the hoax site was only predicted by age and having had formal credibility training (though not as hypothesized). This suggests that greater attention to measures of credibility evaluation awareness and skill is needed in the research literature, as results to some extent hinge on the specific concepts invoked.

Recent research has revealed the prevalence of heuristic processes in credibility evaluation in adult populations (Hilligoss & Rieh, 2008; Metzger, Flanagin, & Medders, 2010; Sundar, 2008), yet little is known about how young information consumers employ heuristic strategies to evaluate the credibility of online information. Although the current study focused on the predictors of analytic rather than heuristic strategies for credibility decision-making as a means to better understand cases of successful information evaluation, studying the predictors of heuristic evaluation cues and processes is an important complement to this understanding. To date, however, no studies have focused on children's use of heuristics in online information processing and credibility evaluation, even though heuristics no doubt also play a key role in the development of digital information literacy among kids. Studies that endeavor to more fully explore such "dual process" models of information evaluation should also examine the complex and critical issue of *motivation* underpinning such perspectives. Studies might, for instance, explore the interaction of analytic and heuristic information assessment strategies and developmental stages, the relative use and success of analytic and heuristic strategies as information domains vary by topic, or differences in strategies as information presentation methods vary by factors such as interactivity (Sundar, 2008).

Relatedly, theorizing in the media literacy arena has recently called attention to the use of both rational and heuristic decision-making criteria among information consumers. Specifically, the Message Interpretation Process Model (MIPM; see Pinkleton, Austin, Chen, & Cohen, 2012) says that adolescents employ a series of both logic- and affect-based decision-making steps as they interpret media messages. Thus, applying the MIPM to the context of online information evaluation would seem a promising avenue for advancing both theory and empirical research in this domain.

Finally, the greatest practical contribution this study makes is to suggest that traditional literacy intervention techniques may not be working as intended and thus should perhaps be reimagined. Future research should focus on increasing the effectiveness of digital information literacy educational interventions, and on

corresponding curriculum needs and policy solutions to help young people improve their critical evaluation abilities, which is a challenge that is now more important than ever.

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NOTES

1. Digital information literacy refers to an individual's ability to find, evaluate, and use digital information effectively (Jeffrey et al., 2011). This study focuses on the information evaluation dimension of digital information literacy, investigating two specific aspects of it as follows: (1) awareness of credibility as a potential problem with digital information and (2) skill in evaluating the credibility of online information. *Awareness* refers to the extent to which young people have mindful cognizance of the potential for information they find online to be inaccurate or biased in some way (i.e., not credible). *Skill* refers to the actual actions they perform to evaluate information and the likelihood of these actions resulting in successful outcomes. These concepts may be related since being aware of potential problems with online information might prompt people to perform a more critical and perhaps successful evaluation of the information.
2. The skills and need to evaluate information to determine its credibility, or believability, is a central component of many types of "literacies," including media literacy, information literacy, and digital literacy (Jeffrey et al., 2011; Koltay, 2011; Kymes, 2011; Lau, 2013; Lee & So, 2014; Tyner, 1998). For example, information literacy is defined by the American Association of School Librarians as the "ability to access, evaluate and use information in a variety of forms," and media literacy is defined by the National Association for a Media Literacy Education as the "ability to access, analyze, evaluate, and communicate information in a variety of forms, including print and non-print messages" (Kymes, 2011). While media literacy developed primarily in the fields of communication and psychology, and has tended to focus on teaching people to critically evaluate messages emanating from the mass media, information literacy developed in the fields of education and information and library science with an emphasis on evaluating information from textual sources. The appearance of the Internet blurred this boundary, and both media and information literacy now include textual- and video-based digital information within their purview (Kymes, 2011; Livingstone, 2004). That said, one difference between them is that "one is more concerned with research skills, while the other is linked with critical analysis of media products" (Lee & So, 2014, p. 143). Given the current study's focus on credibility

evaluation in the context of online information seeking, rather than on mass media messages, the following section draws from research in the information literacy and digital information literacy traditions, despite the substantial overlap with media literacy.

3. From its inception, credibility has been defined as the *believability* of a speaker, message, or the interaction between the speaker and message (Hovland, Janis, & Kelley, 1953; Tseng & Fogg, 1999). Results of pilot tests conducted prior to the main study using an additional convenience sample of 40 children indicated that believability was a clearer term than credibility.
4. Respondents in the former group indicated that they believed the information "not at all." Those in the latter group indicated that they believed from "at least some" to "a whole lot" of the information. The sample was nearly evenly divided (49 and 50 per cent) between these groups.
5. These respondents were omitted from the analyses to replicate situations where a person encounters information for the first time with no preconceived notions about or prior knowledge of it. This is both a common situation and an important one from the perspective of information literacy. Hence, omitting participants who already knew that the site was a hoax, or who confirmed that online before answering the stimulus post-exposure questions, mimicked this type of real-world situation. Nonetheless, identical analyses were also performed with the full sample, with nearly identical results (specifically, one control variable was no longer a significant predictor of use of analytic evaluation strategies and income becomes only a marginally significant predictor of credulity).

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