



**University of
Zurich**^{UZH}

**Zurich Open Repository and
Archive**

University of Zurich
University Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2018

Shortcuts to well being? Evaluating the credibility of online health information through multiple complementary heuristics

Klawitter, Erin ; Hargittai, Eszter

Abstract: Relying on the think-aloud method, this article explores how a diverse group of American adults seek health information online. Analyzing over 350,000 words of interview material and over 43 hours of video screen shots, the study identifies the specific strategies users rely upon in the health-information seeking context. People simultaneously deploy multiple complementary heuristics rather than engage in intensive systematic processing of online information despite the high-stakes nature of these searches. The results contribute nuanced understanding of how diverse adults find and evaluate online information in the important domain of health.

DOI: <https://doi.org/10.1080/08838151.2018.1451863>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-168117>

Journal Article

Published Version

Originally published at:

Klawitter, Erin; Hargittai, Eszter (2018). Shortcuts to well being? Evaluating the credibility of online health information through multiple complementary heuristics. *Journal of Broadcasting and Electronic Media*, 62(2):251-268.

DOI: <https://doi.org/10.1080/08838151.2018.1451863>



Shortcuts to Well Being? Evaluating the Credibility of Online Health Information through Multiple Complementary Heuristics

Erin Klawitter & Eszter Hargittai


To cite this article: Erin Klawitter & Eszter Hargittai (2018) Shortcuts to Well Being? Evaluating the Credibility of Online Health Information through Multiple Complementary Heuristics, Journal of Broadcasting & Electronic Media, 62:2, 251-268, DOI: [10.1080/08838151.2018.1451863](https://doi.org/10.1080/08838151.2018.1451863)

To link to this article: <https://doi.org/10.1080/08838151.2018.1451863>



Published online: 03 May 2018.



Submit your article to this journal 



Article views: 63



View Crossmark data 

Shortcuts to Well Being? Evaluating the Credibility of Online Health Information through Multiple Complementary Heuristics

Erin Klawitter and Eszter Hargittai

Relying on the think-aloud method, this article explores how a diverse group of American adults seek health information online. Analyzing over 350,000 words of interview material and over 43 hours of video screen shots, the study identifies the specific strategies users rely upon in the health-information seeking context. People simultaneously deploy multiple complementary heuristics rather than engage in intensive systematic processing of online information despite the high-stakes nature of these searches. The results contribute nuanced understanding of how diverse adults find and evaluate online information in the important domain of health.

For two decades, scholars have sought to understand whether and how users evaluate the quality of information they find online (Flanagin & Metzger, 2000; Fogg et al., 2003; Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010; Marchionini, 1997; Menchen-Trevino & Hargittai, 2011; Metzger, 2007; Rieh, 2014; Rieh & Danielson, 2007; Walther, Wang, & Loh, 2004; Wathen & Burkell, 2002; Westerwick, 2013). These studies continue a long tradition in the social sciences regarding how people appraise credibility (e.g., Berlo, Lemert, & Mertz, 1969; Chaiken, 1980; Hovland, Janis, & Kelley, 1953; Hovland & Weiss, 1951; Petty & Cacioppo, 1986). Emerging means of online participation such as social media generate even more questions regarding online credibility assessment.

In a review of literature concerning credibility evaluation online, Metzger (2007) asserted the need for increased research into the topic arguing that “a research agenda for the issue of Internet credibility must include studies of information evaluation using a greater variety of research methods, on a greater

Erin Klawitter (Ph.D., Northwestern University) is a graduate of Media, Technology and Society Program at Northwestern University. Her research focuses on how individuals achieve beneficial economic outcomes by participating in online peer-to-peer markets. Her current project examines independent artists' use of social media and e-commerce Web sites to promote and sell their handmade creative goods.

Eszter Hargittai (Ph.D., Princeton University) is a professor at the Institute for Mass Communication and Media Research at the University of Zurich. Her research examines how people may benefit from their digital media uses and how differences in people's Web-use skills influence what they do online. Her recent work on digital inequality is especially focused on what explains varying levels of online participation.

variety of Internet users, performing a greater variety of search tasks than has been done to date" (p. 2,086). This study responds to this call by analyzing rich qualitative data about how a diverse set of Internet users performed and discussed searches for and evaluation of online health-related content, the accuracy of which is critical.

Gaining a better understanding of how users evaluate online health information is imperative for several reasons. First, using online health information can have tangible and even life-altering consequences, positive and negative (Rieh & Danielson, 2007). Second, nationally representative survey data show that individuals are indeed searching for and using such information, sometimes without input from medical professionals (Fox & Duggan, 2013). Nearly three-quarters (72%) of U.S. adult Internet users have looked for health information online (Fox & Duggan, 2013), an activity similarly popular in other national contexts (e.g., Dutton & Helsper, 2007). More than half (60%) of users, or more than one-third (35%) of all U.S. adults, have looked online for information to help them make a medical diagnosis for themselves or someone else. Additionally, an experimental study of U.S. adults showed that the greater the perceived health risk, the more likely individuals would be to seek sources of health information that would allow them to remain anonymous, such as sources found online (Rains & Ruppel, 2013). People engage in these practices even though the information they find may not be expertly vetted. Thus, examining how Internet users assess the credibility of online health content can uncover how people interface with such content absent professional medical advice.

Through inductive coding of a rich data set collected using multiple qualitative methods, including think-aloud task completions, observations, and follow-up interviews, we find that participants rely on more than 20 strategies to evaluate health content online. Additionally, we find that people execute these strategies through the nuanced application of five cognitive heuristics (Metzger, Flanagin, & Medders, 2010). Our multifaceted approach fulfills key criteria for studying online credibility assessment: we use a variety of methods to study a variety of users performing a variety of tasks. Our method also allows for a more nuanced investigation of the way users evaluate credibility in a high-consequence decision-making context (Rieh, 2014). In sum, this study provides a nuanced understanding of how users process online information by fleshing out the strategies participants use to apply heuristics in the context of online health-information seeking behavior.

Credibility and Heuristic Processing of Information

Literature in the digital age has continued the long tradition of communication about how people become persuaded of information's credibility (Flanagin & Metzger, 2000; Fogg et al., 2003; Rieh, 2014; Rieh & Danielson, 2007; Wathen & Burkell, 2002). Models of persuasion called dual-processing models (Chaiken, 1980; Petty & Cacioppo, 1986) suggest that people show greater trust

in the veracity of information based on source expertise and trustworthiness (Hovland et al., 1953; Hovland & Weiss, 1951), which they evaluate based on the extent to which they find the source of information to be safe and qualified (Berlo et al., 1969). Dual-processing models of persuasion integrate this large body of work to describe how, why, and under what conditions users might decide some information is credible while other information is not (Metzger, 2007). Such models theorize how and why individuals' attitudes or beliefs might change (Chaiken, 1980). They propose that people are more likely to engage in the first, *systematic*, mode of processing, which involves the comprehensive analysis of all potentially useful information, when they have more at stake. Alternatively, when people anticipate less risk they engage in the second, *heuristic*, mode of processing, using "simple decision-rules used to mediate persuasion" (Chaiken, 1980, p. 752).

The Internet provides a fruitful context for extending scholarship into the systematic and heuristic ways people process information. The opportunities the Internet presents for asynchronous and anonymous communication as well as for user-generated content can impact information-seeking strategies (Marchionini, 1997) and result in the conflation of source, message, and medium, traditional theoretical constructs (Rieh & Danielson, 2007). Empirical studies show that users rely on various criteria to determine the credibility of information they find online. Attributes including accuracy, source expertise, and professionalism of design tend to persuade users to trust information (Banning & Sweetser, 2007; Hargittai et al., 2010; Pan et al., 2007), although users often rely on verification procedures that are easier to perform (Flanagin & Metzger, 2000). Such work extends theoretical models of credibility assessment in the offline context by demonstrating the importance of various characteristics of the source providing the information (e.g., expertise) the person evaluating the information (e.g., familiarity with information), and the information itself (e.g., genre) to credibility assessment.

Qualitative analysis of focus group data (Metzger et al., 2010) ascertained five cognitive heuristics people use to assess credibility: *reputation*—recognizing the "reputation or name recognition of Web sites or source"; *endorsement*—validating content based on other people or brands associated with the Web site or source; *consistency*—checking multiple Web sites to see if they present similar information; *expectancy violation*—evaluating online information based on whether it meets expectations; and *persuasive intent*—perceiving content as calling them to some action, such as purchasing a product. Although this study filled an important gap in the literature by soliciting detailed accounts of users' credibility assessment practices rather than relying solely on survey or experimental data, it relied on users' recollection of their cognitive processes during past events rather than observing their behavior searching for information in the present. In addition, it considered credibility assessment in general rather than in a specific high-stakes domain, such as health. These are the areas in which our study advances the literature.

Evaluating the Credibility of Online Health Information

Research focusing specifically on the credibility of online health information has investigated the accuracy of such content as well as how users come to trust such information, and whether they invest the time required to verify the information they seek (Eysenbach, Powell, Kuss, & Sa, 2002; Hu & Sundar, 2010; Sillence, Briggs, Fishwick, & Harris, 2004; Sillence, Briggs, Harris, & Fishwick, 2007; Westerwick, 2013). Studies have also demonstrated that some users lack confidence and skills when it comes to evaluating online health information (Chan & Kaufman, 2011; Knapp, Madden, Wang, Sloyer, & Shenkman, 2011; Lau & Coiera, 2008; Van Der Vaart, Drossaert, De Heus, Taal, & Van De Laar, 2013; Van Deursen & Van Dijk, 2011). An experimental study showed that participants assign lower believability ratings to user-generated content regarding health than they did to traditional media content about health, and believed traditional media content regarding health more than traditional media content regarding news, consumer products, or travel (Rieh, 2014).

Our project advances existing scholarship in this domain by including information about a more diverse group than do most prior studies and avoiding inaccuracies from recall after the fact. Given the prevalence of health-information seeking online and the importance of assessing the credibility of such information accurately, we use a rich data set to answer the following research question: What specific strategies do users employ to assess the credibility of health information online?

Methods

Data Collection

We met in person, one-on-one, with 76 diverse adult Internet users recruited from both urban and suburban areas in the Midwestern United States (see Table 1 for information about study participants). We posted flyers in cafes, office buildings, and libraries as well as advertising on the regional Craigslist job board. We paid \$40 for participants to come to our lab on campus where they met with a researcher. First, using surveys, background information (demographics, Internet skills, health literacy) about participants was collected. Next, participants were asked to use a network-connected desktop to perform nine tasks online. These tasks started with an open-ended question about a recent health search experience to propel participants to feel invested in their online search, followed by eight hypothetical questions (see Appendix I).

All information-search actions on the screen both in video (Hypercam) and still shot (IE Capture) format were recorded, in addition to audio recordings of everything the respondents said during the sessions. Participants were prompted to talk through and articulate their online actions (Ericsson & Simon, 1985; Eveland & Dunwoody, 2000; Wirth, Böcking, Karnowski, & Von Pape, 2007); they were not asked questions about their actions

Table 1
Participant Background

	N
Women	35
Men	41
Age (range 19–75)	76
Race and ethnicity	
African American, non-Hispanic	14
Asian American, non-Hispanic	7
Hispanic	6
White, non-Hispanic	49
Highest level of education	
Without college degree	21
College degree	40
Graduate degree	15
Health status	
Excellent	19
Very good	36
Good	18
Fair	3

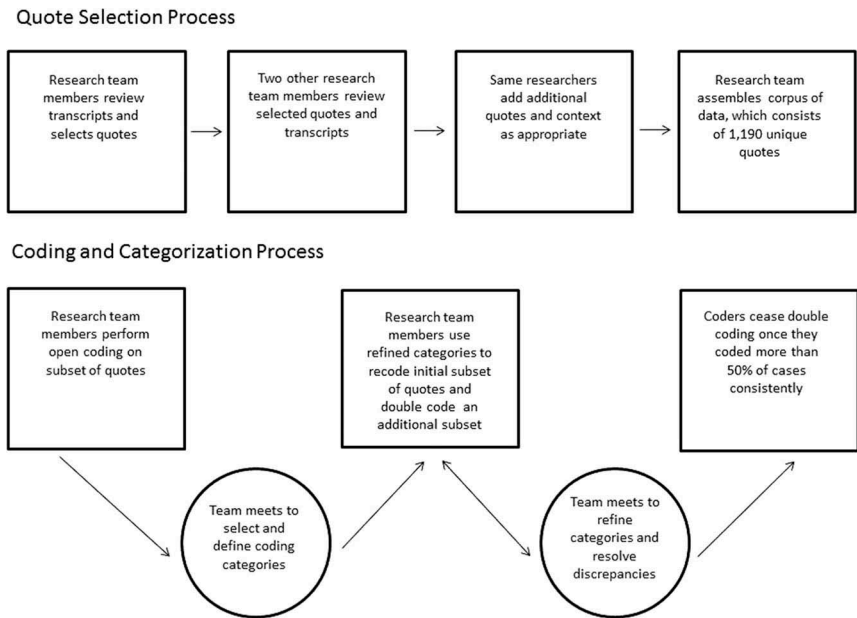
during this session. After participants had performed all tasks, a “post-observation interview” was conducted, during which participants were asked about specific decisions they made during the session. The observation sessions and subsequent interviews yielded 1,160 single-spaced pages of transcripts, comprising 355,477 words. More than 43 hours of screen action video and 4,583 screenshots of the Web pages visited by participants were recorded. These data served as the basis for our analyses.

Coding and Analysis

We analyzed the entire corpus of transcripts to identify quotes from participants that revealed their cognitive processes as they executed the various health-information seeking tasks. Figure 1 illustrates the process of selection, category development, and coding. The iterative selection process yielded 1,190 unique quotes capturing the entirety of the participants’ thoughts as articulated in the transcript.

Three researchers and two trained research assistants performed open coding (Corbin & Strauss, 2008) on an initial subset of quotes to develop inductive categories for the ways participants articulated the process of searching for health information (Figure 1). Following the initial round of coding, the research team met to select and define the set of final categories. Researchers double-coded a portion of the data set to ensure the internal validity of these categories. One quote could be coded as signifying multiple strategies.

Figure 1
Data Analysis



Through this process, we developed 23 categories of credibility assessment approaches. After all of the data were coded, we linked these credibility assessment strategies to the five broad heuristics categories identified as important by prior work (Metzger et al., 2010) to examine precisely how users deploy heuristic strategies during online credibility assessment.

Findings

Think-aloud task completions and post-observation interviews reveal specific strategies (Table 2) that people use in the online health-information seeking context: reputation, endorsement, consistency, expectancy violation, and persuasive intent. Most notably, adding important nuance to prior findings, our analyses show that users often rely on multiple complementary and intersecting heuristic strategies to compensate for what they may perceive as their inability to verify or validate information they find online. In the absence of efficient opportunities to engage in systematic processing, users combine cognitive heuristics to justify their judgment of

Table 2
Heuristic Strategies

Heuristic	Strategies
Reputation	Assess institutional reputation & expertise <ul style="list-style-type: none">• Brand credibility• Citation credibility• Professional expertise• Personal experience revealed in user-generated content Draw on previous experiences <ul style="list-style-type: none">• Prior Web site experience• Prior knowledge Identify geographic reputation
Endorsement	<ul style="list-style-type: none">• Recognize social endorsement• Heard of it from others• Popularity• Ratings• Consider sponsor endorsement• Rely on algorithmic endorsement• Search engine ranking
Consistency	<ul style="list-style-type: none">• Research consistency• Cross-reference content
Expectancy Violation	<ul style="list-style-type: none">• Voice design expectations• Domain name• Appearance• Amount of content• Consider content expectations• Name of site• Search results• Search term familiarity• Medical terms• Date• Rely on information expectations• Personal health experience• Confirmation bias
Persuasive Intent	<ul style="list-style-type: none">• Acknowledge commercial content• Advertising recognition• Question hidden purposes• Motives

information trustworthiness. Next, we discuss the five main heuristics. Due to space constraints, we highlight just one or two quotes that exemplify participants’ use of heuristics. Our examples are representative of similar comments by others in the study. In some cases, we have slightly edited the quotes to improve clarity while still preserving the integrity of the participant’s intended meaning.

Reputation

When people rely on the reputation heuristic, they rely on recognizing the name or understanding of the reputation of a Web site or source of information to assess credibility rather than verifying the accuracy of the information or the expertise of the author (Metzger et al., 2010). Our data support this finding and indicate that users look to a variety of reputational indicators, including institutional reputation, citation credibility, geographic origin of content, and signals of content author expertise when they evaluate the credibility of content.

Participants suggested that online health information appeared to be more credible if published by institutions with some form of established expertise. In general, participants found Web sites published by health care institutions or health-focused Web sites to be more credible than other sites. For example, one of our participants, a 29-year-old, White female with a college degree, provided a clear articulation of assessing institutional reputation for expertise, or brand credibility, while talking through the open health search task. She said, "the first searches that come up, if it was something that sounds legit, like this is Mayo Clinic or Cleveland Clinic, so that's pretty legit, so I'd probably click this [clicks on Google search result for clevelandclinic.org]."

Our data reveal that some participants also weighed the credibility of the sources a Web site cited. While reflecting on her search for information regarding a red spot on an eyeball during the post-observation interview, a 33-year-old, college-educated, White, female human resources specialist said that she evaluates a Web site's credibility based on who they quote in their articles. She said, "usually they [About.com] tend to quote doctors in these articles so I guess I trust them a little bit more." Indeed, this participant used the information she found on About.com to provide her response to the task assignment.

Participants showed an interest in evaluating the expertise of health information authors. They evaluated the credibility of information based on either the author's professional expertise or personal experience revealed through user-generated content. A 39-year-old White female librarian emphasized the importance of an author's professional expertise while searching for information regarding a red spot on an eyeball. "[Clicks on About.com search result and notices O.D. after author's name.] It's an eye doctor so he's probably fairly credible [copies term 'subconjunctival hemorrhage' from Web page and uses it to begin a search for more information.]" This participant found a medical diagnosis to be more credible because she noted that it appeared to be authored by an optometrist. However, she did not verify that the author held the degree he claimed.

Participants indicated that they relied on what they knew about an organization's services and reputation before searching for health information online. For example, a 46-year-old female African American administrative assistant with some college education relied on prior knowledge of health information to help her give advice to a friend seeking access to emergency contraception. She said, "I know CVS and I was trying to find where could I find the next day pill. Where do I buy it? Of course

you go to a pharmacy or a drugstore.” Reliance on prior knowledge of an organization’s existence and reputation guided her search for trustworthy health information.

Finally, our data show that several participants made a link between the credibility of information and its geographic location of origin. For example, during the red ant task, a 52-year-old White, college-educated, male engineer stated, “Texas A&M. Now I would trust this because fire ants are predominantly in the Southeast and West.” He assigned expertise regarding red ants to Texas A&M because of its geographic location. While the use of geographic origin of content as a heuristic strategy was not widely applied by our participants, the users who did relied on it to make important credibility evaluations.

These observations support Metzger and colleagues’ (2010) finding that users rely on reputational factors to assess online information. We extend their definition of the reputation heuristic by showing that perceptions of institutional credibility, citation credibility, author expertise, and even geographic location of origin inform perceptions of reputation. While some of these strategies may appear to indicate a more systematic form of processing, the behaviors of the participants show that they do not often verify reputational or expertise cues.

Endorsement

Endorsement means that users rely on other people or brands to signal the trustworthiness of information. Our study shows that users rely on multiple forms of social endorsement (validation from other people), sponsor endorsement (validation by brands), and, in a notable extension of prior literature on online health-information seeking, algorithmic endorsement, or search engine rankings.

Users often evaluated content based on whether they had heard of it from others, if the content of a Web site was popular, or if the content had received ratings from other users. One participant, a 22-year-old, college-educated woman, demonstrated that participants connected hearing about Web sites from others and credibility. She said, “I’ve heard about [WebMD.com] from multiple people, a lot of people use this one, so I should by default go to it because of its credibility.” Additionally, participants said that a Web site’s popularity enhanced credibility. A 21-year-old, college-educated Asian male, described constructing his search queries with popular sites in mind. “I sometimes even put Yahoo! Answers in my Google search because I think that [it] is the best one because of the number of people using it. That’s the only thing [the site’s popularity] I think that’s legitimizing these aggregate answering Web sites.” Finally, participants relied on user-generated reviews and ratings to evaluate the quality of information they found. While searching for a location to get an HIV test during one of the tasks, a 21-year-old African American female student said, “I’m gonna go to the number one [search result]. It says Test Positive Aware Network. It’s in Edgewater, and it’s got 7 reviews with the highest number of stars, which is five stars.” Thus, people use social and design cues to ascertain whether others endorse content. By noting whether they have heard of a site, perceive it as popular, or use ratings supplied by other users,

participants in our study show that social endorsement is a powerful way to evaluate health content.

Participants also judged content by sponsoring brands. While reflecting on the Web site *babycenter.com* during the post-observation interview about whether to recommend a glass of wine to a pregnant friend, a 22-year-old Asian, female marketing intern with some college education said, "The Web site seemed legitimate. It has sponsors like Johnson & Johnson so it's got to be a good site for moms." This exemplar highlights the importance of brand endorsement to legitimizing the health content users find online.

Finally, participants relied on search engine rankings, or what we call algorithmic endorsement, to select Web sites to help them complete a variety of tasks. For example, when the researcher asked a participant, a 39-year-old White, college-educated female librarian, why she chose to visit a Web site to learn more about antibiotics, she said, "It came up first on Google or it was near the top." Like many other participants, she used algorithmic endorsement to guide her as she searched for credible health information. Although prior research has highlighted this heuristic processing (Hargittai et al., 2010; Pan et al., 2007), it has not been discussed much in the important domain of health.

Consistency

Our data show support for the consistency heuristic; users cross-reference various sources to determine whether information is trustworthy. While this particular heuristic seems closely related to systematic processing, we found participants sought to match information rather than searching out quality sources of information. For example, during completion of the open task, a 41-year-old African American male mechanic described his information seeking habits: "I usually like to, after reading that [WebMD article], go to another URL like *eMedicineHealth* for instance. I like to get three or four different articles so I can see if some of the symptoms are common." Thus, participants check for consistency between various Web sites; however, they stop short of actively evaluating the quality of the consistent information they find.

Expectancy Violation

Internet users evaluate the credibility of online information negatively when it violates their expectations (Metzger, 2007). Our data are consistent with such findings; when participants found their expectations for design, content, or information violated, they tended to judge the material unfavorably. If what they found satisfied their expectations for these elements, they tended to evaluate credibility positively. In particular, domain names, aesthetic appearance, and amount of content on a Web site or page influenced how users judged health content.

Generally, participants evaluated Web sites with a .org or .gov ending favorably (despite the fact that there are no more regulations on who gets to own a .org domain name than

there are for .com domains). During the post-observation interview, a 21-year-old African American male campaign worker with some college education said: "To me, it just seemed that anything basically with a dot-org is purely legit. It's basically a good source to go from, rather than [a] wiki." Participants also relied on their expectations regarding Web site appearances. During the eye search task, a 58-year-old White, college-educated female consultant said she chose eMedicineHealth.com because, "it appeared to be a decent, legitimate site, and I based that on appearance, too. It's like you judge people. Sad but true."

Additionally, participants voiced expectations regarding the amount of content they thought a Web site should have. For example, a female participant responded to our query regarding her perceptions of the HIV test location information she found on Google Places: "I don't know anything about the Phoenix [a result for HIV testing listed in her search with very little information about it on the search results page.]. I wasn't so impressed because there wasn't a Web site, there wasn't much information on there, and there were no reviews, so I myself wouldn't go there." This reflection shows that users expect to find a certain amount of content regarding a topic or an organization.

Participants revealed certain expectations for search engine result content, including the name of the Web site, search result description, search term familiarity, medical terms, and date of content. Participants looked to this kind of information to select from a search results page of information. During the open health search task, a 22-year-old White female college student said, "I'm looking for a name that I've heard of or something that just looks more reputable. Like if it's a very concise term like, this one's *veganhealth.org*. When someone purchases that kind of domain name, usually it's a company or something that has more invested interest in it than just someone who created a Web page in their spare time." Additionally, participants looked to the brief description provided in many search engine results to guide them to trustworthy information. During the post-observation interview, we asked a 34-year-old college-educated White male manager how he chose which search engine result to pursue. He responded, "Top to bottom. And if I see a good summary talking about what I put in, I'll do that." Participants also found that matching "query terms" to terms in the results helped them decide which content to review. While performing the open search task, a 21-year-old, female African American student said, "That's the only reason why I clicked Facebook. Because it actually did mention [name of condition she searched for in the open task.]"

The presence of medical terms helped participants evaluate credibility. A 25-year-old college-educated White male reflected on why he clicked a search result during the task about a red spot on the eyeball. He said, "The first one I chose because the name subconjunctival hemorrhage registered as something that has to do with the eye. Obviously they knew what they were talking about if they used proper medical terminology." During the open search task, a 41-year-old African American male said: "Sometimes they have dates on them so I try to look for something more current. You know, for instance this 130 hours ago, maybe someone updated information."

Participants also evaluated content in light of similar previous health experiences or based on their expectations of accuracy. While searching for information about a red

spot on an eyeball, a 24-year-old, college-educated African American male participant said, "I would say that was a blood vessel that popped in the eye, because I have a friend that that happened to. So I would probably assume that and then I would just think that it's a blood vessel. But now I know by searching online, it's called a subconjunctival hemorrhage." Since the descriptions the participant found matched the experience of his friend, he positively evaluated the content.

We found several instances of confirmation bias or the tendency to rely on information that confirms one's already-held opinions; these clustered in the task regarding consuming wine while pregnant. Indeed, most participants selected search results and affirmed the credibility of information that was consistent with the widespread belief that women should not drink alcohol during pregnancy. A 20-year-old, female African American undergraduate student found information that suggested it is fine for the hypothetical pregnant friend to drink. She responded: "But I just wouldn't. I don't know. I would pick the one that says 'no' because that's what I believe." Thus, findings regarding expectations and expectancy violations reveal that users rely on previously learned information (accurate or not) and *a priori* beliefs to assess the credibility of online health information

Persuasive Intent

Our data reveal that users recognize a variety of potentially persuasive motives for publishing information. While chief among these is commercial advertising, participants also unfavorably regarded any content they perceived as having a hidden agenda. Conversely, they were more likely to trust content they perceived to be published without such intent. Some users simply disregarded any content they perceived to have commercial intent, including paid search engine results. While searching during the open health search task, a 25-year-old, college-educated White male participant said, "So I went home to Google. I looked for probiotics, and I looked for the first non-advertised result." On the other hand, participants positively regarded Web sites that they did not perceive to have commercial motives. While reflecting on her findings during the open search task, a 20-year-old African American female undergraduate student said, "No [familyeducation.com] just looks like a social services type of Web site. So they try to help parents with their children if they have questions." She attributed positive intent to the site, rightly or wrongly, which helped her evaluate it favorably.

In addition to disregarding advertising content because of its persuasive intent, participants also evaluated Web sites' motives. For example, during the pregnancy task, a 22-year-old college-educated Asian female marketing intern said that she felt that babycenter.com had "a little skewed perspective because obviously a baby kind of Web site is gonna do the most kind of extreme view and tell you to steer clear of alcohol. But I guess a lot of Web sites are gonna be biased so finding one with a pretty neutral tone would have been a little harder and would have required more research." This example points to participants' awareness that some Web sites may

present biased information. When that information appears to be independent of commercial motives, however, participants tended to regard it more favorably.

Intersections, Complementarity, and Vulnerability

Notably, participants often deployed multiple heuristic strategies as they evaluated online health information. While the way we present our findings here might imply that heuristic strategies are both separate practices and constructs, our data show that users combine heuristics in creative, overlapping, and intersecting ways. For example, in the post-observation interview regarding the red spot on eyeball task, we asked one participant, a 43-year-old White female lecturer, if she had ever visited a particular Web site before. In reply she said:

The layout of it looks familiar to me. I mean I have looked for health information a few times. I've looked at a little bit about this site. I liked the fact that it had various articles about it. I like that it had the Harvard Medical School stuff on it. If I was really worried, it did have ads at the top so it's obviously having some sponsorship involved in it of some sort. It looked okay as a start for this kind of an issue. If it was like a big health issue, like if I thought I was going to die, I would probably cross check across a couple different sites. It had the look and feel to me of a site that I would generally think would have decent reputable information.

In this complete description of the user's cognitive processing, we identify the presence of the following heuristic strategies: previous experience of Web site (reputation); institutional expertise (reputation); sponsor credibility (endorsement); advertising (persuasive intent); cross-referencing (consistency); and appearance (expectancy violation). Thus, in a single description of evaluating a single Web site during a single information-seeking task, this participant relied on multiple strategies to deploy all five cognitive heuristics in order to arrive at the conclusion that "it looked okay as a start for this kind of an issue."

The above quote points to a trend in our data: participants attempted to engage multiple forms of heuristic processing because they were seeking health information specifically. The participant quoted above notes that the Web site "looked okay" for what she perceived as a minor health issue. She says that she might apply the consistency heuristic more intensively by cross-checking information in a more extreme circumstance, such as "if I thought I were going to die." Participants described evaluating information so carefully because the tasks they performed concerned their health, a particularly critical context. Users seemed more willing to engage in more intensive heuristic processing when they perceived the stakes of the search to be higher.

Discussion

While our findings generally support the cognitive heuristics framework of credibility assessment online, our study makes several contributions to existing literature. First, despite prior work suggesting that in high-stakes contexts people will be more likely to rely on systematic processing of material, we find that even in the serious domain of health content, users very much rely on heuristic processing of online information.

Second, we find that algorithmic endorsement plays an important role in how people evaluate content even though few participants can articulate accurately why the top few results might be more credible than the rest. Rather, in line with prior related work (Hargittai et al., 2010; Pan et al., 2007), we show that users rely on search engine rankings as a proxy for information credibility, even in the high-stakes context of health-information seeking.

Third, we find that users often rely on various heuristics simultaneously as they assess the credibility of online health content. Prior work has not identified the complementary role that heuristics play in this process. For example, users do not rely simply on reputation—they assess various markers of expertise and weigh them. They do not look solely to endorsement—they balance the various characteristics of the source information and the endorsement provided by such non-human agents as search engine algorithms. Users often use multiple complementary and intersecting heuristic strategies to compensate for what they may perceive as their inability to verify or validate information they find online.

While the richness of our data set allows us to provide nuanced detail and support for our findings, like every study, ours also has limitations. Although we made every effort to mitigate the Hawthorne effect (Landsberger, 1958), we recognize that some participants may have modified their discourse or behavior because of a researcher's presence. Additionally, this study does, to some extent, rely on participants' ability and willingness to articulate their thoughts and behavior as they are performing challenging tasks. While we believe that the think-aloud method provides more precise insight into the cognitive strategies users rely on while searching for online information than several other data collection methods often used to study these questions, including log data and recollections of past behavior, this methodology does not fully replicate people's search behavior in a natural setting. Future research should strive to blend different methods of data collection to address those limitations.

Conclusion

This study's think-aloud design incorporates discursive and behavioral data from a diverse group of American adults as they perform a wide variety of health-information-seeking tasks online. It finds support for the broad framework of heuristics by directly observing people's online actions rather than relying on their recollection of

past perceptions and behaviors. In detailing the strategies users deploy in health-information-seeking contexts, the study also shows that people use multiple complementary heuristics rather than engage in intensive systematic processing of online information in the important domain of health. The findings contribute nuanced understanding of the way people evaluate online information and provide evidence that can be compared with processes of credibility assessment in other contexts. The study takes no shortcuts, even as it demonstrates that users seeking health information most certainly do.

Acknowledgments

The authors acknowledge Justin Hatfield, Elizabeth Friedman, and Jenna Lebersfeld for their assistance with the completion of this study. They are grateful to Eden Litt for her helpful feedback on the paper.

Funding

The authors appreciate the support of a Google Research Award that made this project possible.

References

- Banning, S. A., & Sweetser, K. D. (2007). How much do they think it affects them and whom do they believe?: Comparing the third-person effect and credibility of blogs and traditional media. *Communication Quarterly*, 55, 451–466. doi:10.1080/01463370701665114
- Berlo, D. K., Lemert, J. B., & Mertz, R. J. (1969). Dimensions for evaluating the acceptability of message sources. *Public Opinion Quarterly*, 33, 563–576. doi:10.1086/267745
- Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*, 39, 752–766. doi:10.1037/0022-3514.39.5.752
- Chan, C. V., & Kaufman, D. R. (2011). A framework for characterizing eHealth literacy demands and barriers. *Journal of Medical Internet Research*, 13(4), e94. doi:10.2196/jmir.1750
- Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.). Thousand Oaks, CA: Sage.
- Dutton, W. H., & Helsper, E. J. (2007). *Oxford Internet survey 2007 report: The Internet in Britain*. Oxford, UK: Oxford Internet Institute, University of Oxford.
- Ericsson, K. A., & Simon, H. A. (1985). *Protocol analysis*. Cambridge, MA: MIT Press.
- Eveland, W. P., Jr., & Dunwoody, S. (2000). Examining information processing on the World Wide Web using think aloud protocols. *Media Psychology*, 2, 219–244. doi:10.1207/S1532785XMEP0203_2
- Eysenbach, G., Powell, J., Kuss, O., & Sa, E. R. (2002). Empirical studies assessing the quality of health information for consumers on the World Wide Web—A systematic review. *Journal of the American Medical Association*, 287, 2691–2700. doi:10.1001/jama.287.20.2691

- Flanagin, A. J., & Metzger, M. J. (2000). Perceptions of Internet information credibility. *Journalism and Mass Communication Quarterly*, 77, 515–540. doi:[10.1177/107769900007700304](https://doi.org/10.1177/107769900007700304)
- Fogg, B. J., Soohoo, C., Danielson, D. R., Marable, L., Stanford, J., & Tauber, E. R. (2003). *How do users evaluate the credibility of Web sites?: A study with over 2,500 participants*. Proceedings of the 2003 Conference on Designing for User Experiences, San Francisco, CA.
- Fox, S., & Duggan, M. (2013). *Health online 2013*. Washington, DC: Pew Research Center's Internet & American Life Project.
- Gwizdka, J. (2008). Revisiting search task difficulty: Behavioral and individual difference measures. *Proceedings of the American Society for Information Science and Technology*, 45, 1–12. doi:[10.1002/meet.2008.1450450249](https://doi.org/10.1002/meet.2008.1450450249)
- Hargittai, E., Fullerton, L., Menchen-Trevino, E., & Thomas, K. (2010). Trust online: Young adults' evaluation of Web content. *International Journal of Communication*, 4, 468–494.
- Hovland, C. I., Janis, I. L., & Kelley, H. H. (1953). *Communication and persuasion; Psychological studies of opinion change*. New Haven, CT: Yale University Press.
- Hovland, C. I., & Weiss, W. (1951). The influence of source credibility on communication effectiveness. *Public Opinion Quarterly*, 15, 635–650. doi:[10.1086/266350](https://doi.org/10.1086/266350)
- Hu, Y., & Sundar, S. (2010). Effects of online health sources on credibility and behavioral intentions. *Communication Research*, 37, 105–132. doi:[10.1177/0093650209351512](https://doi.org/10.1177/0093650209351512)
- Knapp, C., Madden, V., Wang, H., Sloyer, P., & Shenkman, E. (2011). Internet use and eHealth literacy of low-income parents whose children have special health care needs. *Journal of Medical Internet Research*, 13(3), e75. doi:[10.2196/jmir.1697](https://doi.org/10.2196/jmir.1697)
- Landsberger, H. A. (1958). *Hawthorne revisited. Management and the worker: Its critics, and developments in human relations in industry*. Ithaca, NY: Cornell University Press.
- Lau, A. Y. S., & Coiera, E. W. (2008). Impact of Web searching and social feedback on consumer decision making: A prospective online experiment. *Journal of Medical Internet Research*, 10(1), e2. doi:[10.2196/jmir.963](https://doi.org/10.2196/jmir.963)
- Marchionini, G. (1997). *Information seeking in electronic environments* (Vol. 9). Cambridge, UK: Cambridge University Press.
- Menchen-Trevino, E., & Hargittai, E. (2011). Young adults' credibility assessment of wikipedia. *Information, Communication & Society*, 14, 24–51. doi:[10.1080/13691181003695173](https://doi.org/10.1080/13691181003695173)
- Metzger, M. J. (2007). Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research. *Journal of the American Society for Information Science and Technology*, 58, 2078–2178. doi:[10.1002/asi.20672](https://doi.org/10.1002/asi.20672)
- Metzger, M. J., Flanagin, A. J., & Medders, R. (2010). Social and heuristic approaches to credibility evaluation online. *Journal of Communication*, 60, 413–439. doi:[10.1111/j.1460-2466.2010.01488.x](https://doi.org/10.1111/j.1460-2466.2010.01488.x)
- Pan, B., Hembrooke, H., Joachims, T., Lorigo, L., Gay, G., & Granka, L. (2007). In Google we trust: Users' decisions on rank, position, and relevance. *Journal of Computer-Mediated Communication*, 12, 801–823. doi:[10.1111/j.1083-6101.2007.00351.x](https://doi.org/10.1111/j.1083-6101.2007.00351.x)
- Petty, R. E., & Cacioppo, J. T. (1986). The Elaboration Likelihood Model of Persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 123–203). New York, NY: Academic Press.
- Rains, S. A., & Ruppel, E. K. (2013). Channel complementarity theory and the health information-seeking process: Further investigating the implications of source characteristic complementarity. *Communication Research*, 43, 232–252. doi:[10.1177/0093650213510939](https://doi.org/10.1177/0093650213510939)
- Rieh, S. Y. (2014). Credibility assessment of online information in context. *Journal of Information Science Theory and Practice*, 2(3), 6–17. doi:[10.1633/JISTaP.2014.2.3.1](https://doi.org/10.1633/JISTaP.2014.2.3.1)
- Rieh, S. Y., & Danielson, D. R. (2007). Credibility: A multidisciplinary framework. *Annual Review of Information Science and Technology*, 41, 307–364. doi:[10.1002/aris.2007.1440410114](https://doi.org/10.1002/aris.2007.1440410114)
- Sillence, E., Briggs, P., Fishwick, L., & Harris, P. (2004). *Trust and mistrust of online health sites*. Proceedings from SIGCHI Conference on Human Factors in Computing Systems. Vienna, Austria: ACM.

- Sillence, E., Briggs, P., Harris, P., & Fishwick, L. (2007). How do patients evaluate and make use of online health information? *Social Science & Medicine*, 64, 1853–1862. doi:10.1016/j.socscimed.2007.01.012
- van der Vaart, R., Drossaert, C., de Heus, M., Taal, E., & van de Laar, M. (2013). Measuring actual eHealth literacy among patients with rheumatic diseases: A qualitative analysis of problems encountered using health 1.0 and Health 2.0 applications. *Journal of Medical Internet Research*, 15(2), e27. doi:10.2196/jmir.2428
- van Deursen, A., & van Dijk, J. (2011). Internet skills performance tests: Are people ready for eHealth? *Journal of Medical Internet Research*, 13(2), e35. doi:10.2196/jmir.1581
- Walther, J. B., Wang, Z., & Loh, T. (2004). The effect of top-level domains and advertisements on health Web site credibility. *Journal of Medical Internet Research*, 6(3), e24. doi:10.2196/jmir.6.3.e24
- Wathen, C. N., & Burkell, J. (2002). Believe it or not: Factors influencing credibility on the Web. *Journal of the American Society for Information Science and Technology*, 53, 134–144. doi:10.1002/(ISSN)1532-2890
- Westerwick, A. (2013). Effects of sponsorship, Web site design, and Google ranking on the credibility of online information. *Journal of Computer-Mediated Communication*, 18, 194–211. doi:10.1111/jcc4.12006
- Wirth, W., Böcking, T., Kamowski, V., & von Pape, T. (2007). Heuristic and systematic use of search engines. *Journal of Computer Mediated Communication*, 12, 778–800. doi:10.1111/jcmc.2007.12.issue-3

Appendix I. Task List

Think of a health question you recently came across. How did you search for the answer? What led you to begin this search, and did you find the information you needed? Try to replicate the search online. If you have not recently come across a health question, formulate one now, and search for the answer using the Internet.

Suddenly you notice a red spot on your eyeball. You have no idea what it is. How do you figure it out, and what is it?

Your cousin is concerned about her health and wants to get an HIV test. She is not a student at any school, but lives in Chicago. Can you help her find a place to get such a test? Where is the location of such a place, and at what times are they open for this service?

[SHOW RESPONDENT TOOTH MOLD] Your tooth hurts and you call your dentist to tell her about it. This is the tooth. [POINT TO TOOTH.] You don't know what it's called. What is the name of the tooth?

A friend of yours is concerned that he might be overweight. What information do you need from him to find out if he is overweight? [IF RESPONDENT ASKS, GIVE WEIGHT AS 205 LBS (93 kg), HEIGHT AS 6'2" (1.88 m)] Based on this information, can you say whether he is overweight or not?

Your pregnant friend decides to have a glass of wine. Should this be a concern? Why or why not?

You are at home in the middle of the summer. A friend calls you frantically on Friday at midnight. The condom broke while she was with her boyfriend. What can she do to prevent pregnancy? She lives in South Bend, Indiana.

A friend has just called you from the Southern United States where she is on a hiking trip. She tells you that she has just stepped into an anthill of small red ants and has a large number of painful bites on her leg. She wants to know what species of ants they are likely to be, how dangerous they are, and what she can do about the bites. What will you tell her? (adapted from Gwizdka, 2008).

Your doctor prescribes a two-week antibiotic for an infection that you have. He insists that you finish taking the entire bottle, even if the infection subsides before the two weeks are up. Why is this? [WAIT FOR RESPONDENT TO RESPOND.] What can happen when patients stop taking antibiotics before they are finished?