ASIAN COMMUNICATION RESEARCH
December 2022, Vol. 19, No. 3, pp. 119-138
e-ISSN 2765-3390, p-ISSN 1738-2084
https://doi.org/10.20879/acr.2022.19.3.119

Original Research

Design Matters in Web Credibility Assessment: Interactive Design as a Social Validation Tool for Online Health Information Seekers

Wonchan Choi[1], Sang-Yeon Kim[2], and Manman Luo[1]

[1] School of Information Studies, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin, USA

[2] School of Media and Communication, Kwangwoon University, Republic of Korea

Corresponding to
Sang-Yeon Kim
School of Media and Communication, Kwangwoon University, 20 Gwangun-Ro, Nowon-Gu, Seoul 01897, Republic of Korea
Email: sangkim9@kw.ac.kr

Disclose statement
The present research was supported by the Research Grant of Kwangwoon University in 2022. All authors contributed to the design of the study.

Received
15 June 2022
Revised
12 September 2022
Accepted
1 December 2021

ABSTRACT

This study explored what makes users perceive a website as a credible source of health information and how web credibility assessment, in turn, influences their health information-seeking behaviors. Exploratory factor analysis was conducted with survey responses from college students ($N = 141$) who assessed credibility markers of a website they normally visit to address health concerns. A 4-factor solution emerged as the best summary of the data: (a) content, (b) interaction design, (c) information design, and (d) source. Identified components were used in a linear model to explore the effects of different web credibility types on perceptual, attitudinal, and behavioral outcomes. Alongside content-related attributes (e.g., recency of the information), interaction design-related elements (e.g., ability to interact with other users) were significantly associated with most dependent variables examined in the study (e.g., trust in the information on the site, willingness to follow the advice, and willingness to recommend the site to others). Current results imply that users count on not only content-related cues or heuristics, but also interactive design features as helpful tools for mobilizing social resources (e.g., fellow users) to validate online health information. Theoretical and practical implications of the study findings and future research directions are discussed.

KEYWORDS

web credibility, credibility assessment, information credibility, online health information, design, social validation

Reaching almost 93% of the American adult population (Pew Research Center, 2021), the internet has become a primary source of information on everyday topics, particularly health. In 2019, about 73% of American adults went to the internet as the first place to look for information about health and medical topics, whereas only 16% turned to their doctors or health care providers as the first source of health information (National Cancer Institute, 2019).

Locating reliable health information online, however, remains challenging for most lay individuals due to the lack of knowledge or experience needed to independently evaluate the quality, relevance, or both of web content (Lederman et al., 2014; Lee & Lee, 2021; Lucassen et al., 2013; Wathen & Burkell, 2002). For those who are not familiar with online information systems and services (e.g., websites, social media), health information seeking on the web may be an even more challenging task (Miller & Bell, 2012; Zulman et al., 2011). Also, depending on the intended goal of or motivation for seeking health information, users may bypass the cognitive process of evaluating the quality and relevance of the health information (Hilligoss & Rieh, 2008; Metzger, 2007). Instead, users often rely on simple *cues* (Petty & Cacioppo, 1986)—secondary information surrounding the main content, such as source credentials and look of the website—or *cognitive heuristics* (Chaiken, 1980)—guidelines for processing information and making a decision with a reduced cognitive load, such as the bandwagon heuristic (i.e., online contents endorsed by a majority; Sundar, 2008)—to assess the presented health information.

Web credibility refers to the perceived quality of a website, reflecting the expertise and trustworthiness of the website as a source of information (Danielson, 2006; Fogg, 2003). This definition adopts the view of persuasion scholars (Hovland et al., 1953; Petty & Cacioppo, 1986) positing that (a) message recipients tend to rely on source credibility when unable or unwilling (or both) to process the presented information, and (b) perceived source expertise (i.e., "Does the source know the truth?") and trustworthiness (i.e., "Is the source willing to tell the truth?") constitute two primary attributes used to assess source credibility. Web credibility is thus an extension of source credibility applied to a human–computer interaction in the web context wherein a user attempts to infer the quality of information based on the characteristics of the website, as opposed to directly evaluating information quality (Choi & Stvilia, 2015). Adopting the view of existing models on trust formation (e.g., Johnson et al., 2015), perceived website credibility can be an antecedent to users' trust in the information presented on the site, forming a positive belief or expectation that the information will be reliable and valid (Chopra & Wallace, 2003). Also, web credibility is known to influence users' selection of sources in seeking health information online (Wang et al., 2021), intention to revisit a health-related website (Hong, 2006), and adaptation of health information for self or others (Choi, 2020; Freeman & Spyridakis, 2009; Hu & Sundar, 2010). Thus, credibility is an important concept to understand perceptual, attitudinal, and behavioral characteristics of users addressing health-related concerns online.

Factors Affecting Credibility Assessment of Online Health Information

Among many theoretical frameworks for web credibility, Fogg's (2003) framework that classifies various web elements into three categories—operator, content, and design—has been widely adopted by both theoretical (Choi & Stvilia, 2015; Sun et al., 2019) and empirical (Chang et al., 2021; Choi, 2020; Wu et al., 2020) investigations to identify the sources of crediblity cues and heuristics in the web context. The first category, operator, involves the perceived ability and willingness of the source to provide high-quality health information online. The source can be either the personal or organizational agent who runs the health-related website or the author who is responsible for the presented content (e.g., an author of an answer on a social question-and-answer site). For example, domain type may be an important factor affecting perceived web credibility. Specifically, websites run by government agencies (.gov) or educational institutions (.edu) tend to be perceived as more

credible than those owned by pharmaceutical companies (.com) due to the belief that for-profit companies prioritize financial gains over public interest (Choi, 2013; Liu & Shi, 2021). On social media, recognizable experts or celebrities enjoy higher credibility than an anonymous source via perceived authority (Cooley & Parks-Yancy, 2019; Djafarova & Trofimenko, 2019).

The second category, content, considers the perceived quality of the presented health information, assessed based on cues and heuristics, allowing users to infer such attributes as accuracy, semantic and structural completeness, or recency. For instance, the presence of grammatical or typological errors can serve as a cue decreasing the credibility of the content or website (Choi, 2020; Jiaying et al., 2021). The presence of proper citations and the use of clear and succinct language can hint at the credibility of the presented health information (Cunningham & Johnson, 2016; Scantlebury et al., 2017). In addition, one common finding in the literature on online health information credibility is that people often rely on what others think and do when assessing the credibility of health information on the web (Borah & Xiao, 2018; Lederman et al., 2014; Rueger et al., 2021). The influences of others on the credibility assessment of online health information are supported by well-established heuristics in the credibility literature, such as the bandwagon heuristic (i.e., people perceive information as credible if others do; Sundar, 2008), the endorsement heuristic (i.e., people perceive the information as credible when it is recommended by a source they trust; Hilligoss & Rieh, 2008), and the consistency heuristic (i.e., people perceive the information as credible when the same information is found from different sources; Metzger et al., 2010).

Design constitutes the last category of web credibility elements. Design is not limited to the aesthetic quality (e.g., professional look) of the website. Functional elements account for much of this category, encompassing the ease of understanding the hierarchy of the content (i.e., information design), maintenance of the basic interface to remain operant (i.e., technical design), and accessibility of additional information through the interface (i.e., interaction design; for a comprehensive review, see Fogg, 2003). Empirical findings largely indicate that health-related websites with a more comprehensible information architecture and interactive or easier-to-use interface have higher web credibility (Johnson et al., 2015; Machackova & Smahel, 2018; Rowley et al., 2015; Song et al., 2021).

In addition to such intrinsic attributes of web resources, user characteristics (e.g., demographic background, domain knowledge, attitudes toward information seeking and processing, and technology proficiency) and contextual factors (e.g., urgency, goals, or motivations in the moment) are known to affect credibility assessments of web-based health information (Chen et al., 2018; Choi, 2020; Eastin, 2001; Kim & Syn, 2016; Wang et al., 2021; Yu & Han, 2018). Therefore, it is important to consider these variable factors when examining people's credibility assessments of web-based health information (Sbaffi & Rowley, 2017).

Outcomes of Credibility Assessment of Online Health Information

Research has indicated that the outcome of web credibility assessments is multidimensional, encompassing cognitive, attitudinal, and behavioral domains. For example, Stvilia et al. (2007, 2009) reported that credibility was among the most highly ranked attributes, along with accuracy and reliability, contributing to the perceived quality of health information on the web and the degree of usefulness for dealing with a given health issue. Rowley et al. (2015) found that credibility was the most influential factor affecting users' trust in online health information among eight factors examined in the study, such as brand, content, ease of use, recommendation,

style, usefulness, and verification.

Empirical studies reported that the perceived credibility of a health-related website affects users' online health information behavior (for a review and meta-analysis, see Wang et al., 2021). Specifically, credibility is known to influence users' selection of a website over others in search engine results (Haas & Unkel, 2017), intention to revisit a health-related website (Hong, 2006), and adaptation of health information for self or others (Choi, 2020; Freeman & Spyridakis, 2009; Hu & Sundar, 2010). Marketing research shows that credibility is associated with consumer attitudes toward e-commerce websites or products being sold online and purchase intention (Cooley & Parks-Yancy, 2019; Kim et al., 2015).

Study Objectives

Past research has explored various web elements related to the characteristics of the operator (or author), content, and design of the site as potential cues and heuristics influencing users' credibility assessments of online health information (Sbaffi & Rowley, 2017; Sun et al., 2019). However, what remains relatively less examined is which elements (a) represent the construct (i.e., web credibility) better than others in the context of online health information and (b) better establish the users' perceptions, attitudes, and behaviors toward the website and the health information it presents. In other words, we aimed to provide a synthetized view of what makes users perceive a website as a credible source of health information and how web credibility assessment, in turn, influences their health information behavior on the web. The significance of the present study involves two aspects. First, the study examined relative impacts of different web elements (i.e., operator, content, and design) on online health information seekers' web credibility assessments and associated outcomes (e.g., perceptual, attitudinal, and behavioral outcomes) based on well-established theoretical frameworks in the credibility literature (Fogg, 2003; Hovland et al., 1953). Second, the study focused on health as the target domain, in which web credibility matters, in the context of addressing various health-related concerns in users' everyday lives, as opposed to in controlled experimental settings. This research goal led to two research questions (RQs):

RQ1: What types of elements affect the perceived credibility of a health-related website?

RQ2: What are the relative impacts of the types of web elements on the user's cognitive, attitudinal, and behavioral reactions to health-related websites?

METHOD

Participants

College students (N = 141) attending a university in the United States completed a cross-sectional online survey in exchange for extra credit. Participants were recruited from information studies and communication classes. All participants were 18 years old or older, spoke English, and had sought for health information online at least once during the preceding 6 months. They read and signed the informed consent before completing the survey. The survey instrument received institutional review board approval.

Participants were 26 years old on average (SD = 7.5 years). About 54% were women and 73% were Caucasian. In terms of education, 61.7% were undergraduates, 35.5% had a 2-year associate or 4-year bachelor's degree, and 2.8% had a master's degree. Mean daily internet use was 7.8 hours (SD = 3.7). All but one participant reported having more than 5 years of experience using the internet.

Survey Questionnaire Development

We developed an online questionnaire focusing on health as an important subject domain for web credibility assessment in four stages. In the first stage, we searched three online databases—ACM Digital Library, IEEE Xplore, and Web of Science—to establish a comprehensive list of elements known to affect users' web credibility assessments in the literature. We identified previous studies that (a) were published in peer-reviewed journals or conference proceedings, (b) were written in English, and (c) used data collection methods that directly involved human subjects, such as surveys, interviews, and experiments. This third criterion was used to select user studies investigating the target audience's cognitive and behavioral characteristics in the process of assessing credibility of web-based resources, as opposed to secondary analysis of existing data (e.g., tweets, questions and answers posted on social platforms), which often aim to develop a predictive model of popular content (e.g., retweets, best answers) using machine learning techniques. After removing articles that did not meet the inclusion criteria, 105 relevant articles remained, from which we extracted 407 elements. It should be noted that we adopted the search flow suggested by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009), which identifies identification, screening, eligibility, and inclusion phases, to facilitate the database search process. However, we did not intend to conduct a systematic review or meta-analysis using the full PRISMA process.

In the second stage, we examined individual elements to group them into more general, higher-level categories. For example, similar items from different sources—"The site content offers precise and detailed information with source references and dates" (Robins & Holmes, 2008) and "The site has articles containing citations and references" (Fogg et al., 2003)—were combined: "The site post has sources, references, and dates." As a result, 65 unique markers remained.

In the third stage, each credibility marker was phrased as a statement following the format: "When you look for health information regarding your health concerns or questions, to what extent

Table 1. *Design of the Survey Questionnaire*

Section	Solicited information	Number of questions
Internet use and experience	· Hours of internet use per day · Years of internet experience · Names of up to three health-related websites used in health information seeking	3
Involvement with online health information seeking	· Degree of interest in health topics · Frequency of seeking health information online	4
Web credibility assessment	· Impacts of web elements on perceived credibility of health-related websites	65
Outcomes of web credibility assessment	· Perceptions · Attitudes · Behavior	5
Demographic background	· Age · Gender · Income · Marital status · Education · Race	6

do you consider each of the following statements important in your credibility assessment of health-related websites?" The final wordings of the items included in the questionnaire are shown in the Appendix. In the online questionnaire, the order of the credibility questions was randomized to remove the potential order effect.

In the fourth stage, we pretested the questionnaire with eight graduate research assistants. They reviewed the survey to cross-check the readability of the items and overall survey length. They confirmed that all questions were easy to understand and the overall length was adequate (Choi et al., 2020). Table 1 shows the design of the questionnaire.

We note that the survey was designed to explore what affects users' credibility assessments of health-related websites that they use in their everyday lives as opposed to having them evaluate a particular website preselected or manipulated by the researcher in a controlled environment. To establish a commonality regarding what participants would think of as a health concern or health-related website, participants received an identical definition denoting what health information meant in the current study: "Health information refers to a wide range of topics including infectious diseases, injuries, mental and physical health, substance use, nutrition, or anything else related to health." Then, they listed up to three health websites they would visit to address a health concern that fit the definition before taking the survey. The same approach was used in Fogg et al.'s (2001) seminal survey study on web credibility, in which participants answered questions by drawing on their cumulative experience using the web rather than evaluating certain types of websites given by the researcher.

Measurements

Internet Use Experience

We measured respondents' internet use experience with two subscales—daily internet usage and years of internet use. Daily internet use was measured by a single question: "On average, how many hours a day do you use the internet?" (approximate number). Years of internet use was measured by a single question: "How long have you been using the internet?" (1 = *less than 6 months*, 2 = *between 6 months and 1 year*, 3 = *more than 1 year, but less than 3 years*, 4 = *more than 3 years, but less than 5 years,* and 5 = *more than 5 years*).

Involvement With Health Information Seeking

Respondents' involvement with health information seeking was measured by two subscales—degree of interest in health topics and frequency of seeking health information online. Degree of interest in health topics was measured by a single question: "How interested are you in keeping up to date on health-related topics?" (1 = *not at all interested*, 2 = *slightly interested*, 3 = *moderately interested*, 4 = *very interested*, and 5 = *extremely interested*). Frequency of seeking health information online was measured by a single question: "How often do you seek health information online?" (1 = *never*, 2 = *less often than yearly*, 3 = *yearly*, 4 = *monthly*, 5 = *weekly*, and 6 = *daily*).

Web Credibility Markers on Health-Related Websites

We used 65 questions to measure respondents' perceptions of credibility of health-related websites. As mentioned in the Survey Questionnaire Development section, each question was phrased as a statement following the format: "When you look for health information regarding your health concerns or questions, to what extent do you consider each of the following statements important in your credibility assessment of health-related websites?" Respondents answered each question using a 5-point Likert scale (1 = *not at all important* to 5 = *extremely important*).

Outcomes of Web Credibility Assessment

The dependent measures in this study were the outcomes of web credibility assessments. Respondents answered how much they would agree or disagree with five statements on a 5-point Likert scale (1 = *strongly disagree*, 2 = *somewhat disagree*, 3 = *neither agree nor disagree*, 4 = *somewhat agree*, and 5 = *strongly agree*): "I would return to the site to find necessary health," "I will recommend the site to other people," "I would follow the recommendations and advice the site provides to improve my health," "I will trust health information on this site," and "I will find the site to be favorable to use." We analyzed responses to each question individually, considering them as distinct outcomes of credibility assessment of health-related websites.

Data Analysis Plan

Sources of online health information mentioned by respondents were analyzed using frequency and percentages. An exploratory factor analysis (EFA) was conducted using 65 items regarding credibility cues to identify the latent structure of perceptions of web credibility. Factors were extracted using maximum likelihood estimation and varimax rotated for interpretation. A hierarchical linear regression followed to observe the impacts of the types of web credibility markers identified by the EFA from context by adding potential covariates into the equation. Specifically, participant demographics (i.e., age, sex, education, annual income) constituted the first block. The second block included measures of internet use (i.e., everyday internet use at home, at workplace, in public spaces, and via mobile devices). The third featured measures of involvement with health information seeking (i.e., level of interest in health topics, frequency of seeking health information online). The final two models included types of web credibility markers identified by the EFA. This same hierarchical model repeatedly predicted each of the five outcome measures in case the pattern of effects changed. All statistical analyses were conducted using R version 4.0.3.

RESULTS

Sources of Online Health Information

Among 141 participants, 136 participants (96.5%) provided at least one health source that they had used to obtain health information online. In total, 67 sources were mentioned 296 times (about two sites per participant). WebMD was most popular (26.7%), followed by the Mayo Clinic (13.9%) and the Centers for Disease Control and Prevention (7.1%). Some participants mentioned websites not specific to health issues such as Google (10.5%), YouTube (2%), and Wikipedia (2%). Table 2 presents the 10 most frequently mentioned sources of online health information.

Exploratory Factor Analysis

EFA was used to examine RQ1, exploring the latent structure of 65 elements presumed to

Table 2. *Ten Most Frequently Mentioned Sources of Health Information Online*

Source	*n*	%
WebMD	79	26.7
Mayo clinic	41	13.9
Google	31	10.5
Centers for disease control and prevention	21	7.1
Healthline	18	6.1
National institutes of health	13	4.4
Wikipedia	6	2.0
YouTube	6	2.0
Health.com	4	1.4
Aurora health center	4	1.4

represent web credibility. Factors were extracted using maximum likelihood estimation and then varimax rotated for interpretation. Seventeen factors had an eigenvalue exceeding 1.00, and the scree plot showed no clear point where the diminishing return began. Alternatively, Horn's parallel analysis (Horn, 1965; Parsons, 2007) was adopted to make the decision. This approach creates a random dataset equivalent with the one studied in terms of the number of variables and observations, establishes a correlation matrix employing a Monte Carlo simulation, and puts the data into the same EFA. To the extent that the data were created randomly, the eigenvalues stemming from such data should provide little information to determine the coherence of the factor structure. Therefore, a factor solution with an eigenvalue below that of the same solution from the parallel analysis-created random data should be rejected for adding no meaningful information. Fit indexes also considered the 4-factor solution as a sufficient summary of the data, explaining 40.9% of the variance in the dataset, $\chi^2(1{,}826, N = 141) = 2{,}454.03$, $p < .001$; RMSEA = .049, 90% CI [.045, .055]. Results from a simulation study (de Winter et al., 2009) indicate that the current sample size was sufficient to produce reliable outcomes under various conditions of EFA.

Table 3 specifies the items representing their respective factors, item statistics, and standardized

Table 3. *Results of Exploratory Factor Analysis*

Item	*M*	*SD*	*a*	F1	F2	F3	F4	h^2
Provides timely info	4.30	0.87	.88	.671	.145	.154	.049	.497
Provides info of potential side effects	4.44	0.78		.635	.084	.241	.082	.476
Provides source reference dates	4.36	0.86		.612	.122	.043	.099	.401
Gains good reputation	4.28	0.84		.597	.004	.077	.347	.484
References to those responsible for authorizing content	4.04	1.02		.587	.156	.198	.189	.443
Provides links to original docs	3.74	1.14		.581	.299	.097	.249	.499
Displays links to other sites with same health info	3.73	1.04		.567	.361	.178	.138	.502
Provides explanation to medical terms	4.27	0.89		.544	.049	.093	.161	.333
Adheres to medical guidelines	4.34	0.90		.536	-.063	.301	.112	.394
References scientific publications	4.03	0.97		.513	.216	.061	.147	.335
Provides contents with statistics	4.13	0.91		.503	.109	.235	.021	.321
Adjustable font size	2.60	1.39	.78	.018	.661	.126	-.027	.454
Sharing option	2.85	1.38		.069	.619	.070	.166	.420
Ability to interact with other visitors	2.55	1.22		-.030	.609	.071	.165	.404
Facilitates access for different languages	3.37	1.27		.299	.570	.122	-.011	.429
Ability to seek help and support thru live chat	3.40	1.30		.294	.532	.179	.261	.470
Can return to homepage easily	3.66	1.22	.82	.174	.285	.662	.165	.576
Ability to move around site easily	4.14	0.87		.346	.080	.652	.097	.560
Uses appropriate line spacing	3.60	1.06		.084	.348	.637	.203	.575
Uses appropriate line breaks bullets	3.70	0.98		.104	.062	.627	.272	.482
Forward and backward function	3.57	1.15		.116	.191	.589	-.014	.397
Run by organization lasting for reasonable period	3.91	1.00	.83	.305	-.028	.157	.681	.582
Offered by educational institution	3.77	1.16		.225	.096	.148	.653	.508
Won awards in health topics	3.21	1.20		.166	.159	.103	.591	.413
Offered by disease-specific organization	3.65	1.06		.245	.146	.118	.557	.405
Offered by government	3.23	1.24		.104	.173	.117	.547	.354
Offered by nonprofit organization	2.97	1.29		.098	.243	.102	.512	.341

Note. $N = 141$. F1 = content, F2 = interaction design, F3 = information design, F4 = source.

Cronbach's alpha for each factor. Cross-loaded items were identified and removed from further analysis when the absolute distance between the first and second largest loadings fell below .20 (Stamper & Masterson, 2002). Remaining items that loaded onto a common construct by more than .50 were considered unidimensional and averaged to create composite indexes. Internal consistencies were acceptable, ranging between .78 and .88.

Current results partially match Fogg's (2003) theoretical framework, and the four extracted factors can be labeled content, interaction design, information design, and source. Content items appear to measure the extent to which the presented health information is recent, unbiased, and evidence based. Interaction design items represent the site's affordance of user interaction with the constructed environment (e.g., customizability) and other users. Information design items seem to involve the efficiency of information organization and the navigation system of the site. Source-related items assess perceived reputation and unbiasedness of the source, particularly as oriented toward the public interest.

Hierarchical Linear Regression

To examine RQ2, analysis determined the relative impacts of the four components of web credibility on the outcomes of interest in three domains—attitude, belief, and behavior. Specifically, a hierarchical linear model was established with five blocks. Participant demographics (i.e., age, sex, education, annual income) constituted the first block. The second block included measures of internet use. The third featured measures of involvement with health information seeking. Finally, the fourth and fifth blocks included the content-related (i.e., content and source) and design-related (i.e., information design

Table 4. *Results of Hierarchical Regression Analysis*

	Willingness to Return to Site					*Willingness to Recommend*					*Willingness to Follow Advice*				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Age	.05	.04	.00	.00	.01	.20*	.21*	.09	.09	.08	.08	.10	.03	.01	.01
Sex	-.12	-.13	-.08	-.11	-.11	-.14	-.20	-.03	-.06	-.03	-.06	-.07	.01	.04	.08
Education	.16**	.16*	.14*	.13*	.12*	.02	-.01	-.05	-.06	-.01	-.01	.00	-.04	-.04	.02
Income	-.05	-.05	-.04	-.01	-.02	-.13	-.08	-.06	-.03	-.02	.01	.03	.03	.07	.08
Internet per day		.05	.03	.00	.00		.17*	.09	.06	.07		.08	.04	.01	.02
Internet use (home)		-.04	-.04	-.05	-.05		.02	.01	.00	-.01		-.07	-.06	-.08	-.09
Internet use (work)		-.01	.00	-.02	-.02		-.01	.04	.01	.00		-.08	-.05	-.07	-.08
Internet use (public)		-.11	-.10	-.05	-.04		-.09	-.07	-.02	-.04		-.01	.00	.04	.01
Internet use (mobile)		.00	-.02	-.07	-.07		-.01	-.07	-.13	-.15*		.03	.00	-.06	-.09
Interest in health topics			.14*	.00	.02			.42***	.26**	.23**			.27**	.15	.13
Seek health info online			-.07	-.01	-.02			-.13	-.06	-.03			-.18*	-.11	-.07
Content				.31***	.33***				.35***	.30***				.20*	.16
Source				-.05	-.03				-.04	-.06				.11	.09
Information design					-.03					-.05					-.07
Interaction design					-.05					.24**					.26**
R^2	.21	.24	.28	.40	.41	.22	.26	.40	.50	.54	.03	.05	.14	.22	.29
F		1.22	2.84	10.65***	0.59		1.74	16.02***	9.93***	5.09**		0.64	6.07**	5.47**	4.73*
p		.305	.063	< .001	.556		.132	< .001	< .001	.008		.670	.003	.006	.011
df_1, df_2		5, 104	2, 102	2, 100	2, 98		5, 104	2, 102	2, 100	2, 98		5, 104	2, 102	2, 100	2, 98

Table 4. *Results of Hierarchical Regression Analysis (Continued)*

	Trust Health Information					*Find Site Favorable*				
	1	2	3	4	5	1	2	3	4	5
Age	.13	.15	.08	.08	.08	.07	.08	.04	.04	.03
Sex	-.23	-.25	-.16	-.20	-.18	-.18	-.20	-.16	-.18	-.18
Education	.11	.14	.10	.09	.12	.18**	.20**	.18**	.17**	.18**
Income	.03	.05	.06	.08	.09	-.06	-.04	-.04	-.01	.00
Internet per day		.06	.02	.00	.01		.04	.02	-.01	.00
Internet use (home)		-.01	-.01	-.01	-.02		.02	.02	.01	.02
Internet use (work)		-.14	-.11	-.12	-.13		-.11	-.09	-.11	-.11
Internet use (public)		-.02	-.01	.03	.01		-.08	-.07	-.03	-.03
Internet use (mobile)		.03	.00	-.04	-.05		.04	.02	-.03	-.02
Interest in health topics			.28***	.17	.15			.15*	.01	-.01
Seek health info online			-.18*	-.14	-.12			-.09	-.04	-.03
Content				.26**	.22*				.30***	.27***
Source				-.08	-.10				-.05	-.07
Information design					-.02					.05
Interaction design					.17*					.07
R^2	.09	.12	.22	.28	.31	.16	.20	.24	.35	.36
F		1.02	7.21**	4.16*	2.14		1.34	2.74	8.56***	1.06
p		.409	.001	.018	.123		.253	.069	< .001	.350
df_1, df_2		5, 104	2, 102	2, 100	2, 98		5, 104	2, 102	2, 100	2, 98

Note. $N = 115$. Values (standardized path coefficients) in bold indicate significant associations between study variables at the $\alpha = .05$ level. *$p < .05$. **$p < .01$. ***$p < .001$.

and interaction design) web credibility items, respectively. This same hierarchical model was used to predict each outcome measures (Table 4). Analysis showed that the multicollinearity remains relatively low, with generalized variance inflation factors ranging between 1.16 and 2.01 for the full model involving all predictors. This demonstrates a relatively minor distortion in the vector space of the predictors and therefore, the estimated parameters can be considered reliable (see Fox & Monette, 1992). The normality of the residuals and the level of homoscedasticity were also checked based on a visual inspection. The residuals approximating a normal curve in a QQ plot and no apparent pattern of residuals across the fitted values indicate no substantial violation of the major assumptions of regression analysis. The visuals used for the diagnostics can be obtained from the corresponding author.

Willingness to Return to Site

Content-related attributes solely constituted a significant and powerful predictor of willingness to return, $\beta = .31$, $p < .001$; $\Delta R^2 = .12$; $F(2, 100) = 10.65$, $p < .001$. Adding the source- and design-related cues did little to improve the model. Education had a significant effect on willingness to return to the site across the five models.

Willingness to Recommend

Individual level of interest in health topics predicted willingness to recommend most powerfully, $\beta = .42$, $p < .001$; $\Delta R^2 = .14$; $F(2, 102) = 16.02$, $p < .001$. Its impact, however, tended to decline—$\beta = .26$, $p = .003$ and $\beta = .23$, $p = .009$, respectively—when the model expanded to incorporate content quality, $\beta = .35$, $p < .001$, and interactivity by design, $\beta = .24$, $p = .002$. Results indicate both features (i.e., content

quality, interactivity by design) helped explain unique variance in the outcome measure, ΔR^2 = .10, $F(2, 100) = 9.93$, $p < .001$ and ΔR^2 = .04, $F(2, 98) = 5.09$, $p = .008$, respectively. Current results demonstrate that people who visit websites to attain health information tend to consider not only content-related attributes but also communication attributes—that is, interactivity with the content, source, and other users—when deciding whether to recommend the website to others who may need similar health information.

It also should be noted that neither source credibility (β = -.04, $p = .632$ in Model 4 and β = -.06, $p = .429$ in Model 5) nor design elements related to the organization of information or navigability of the site (β = -.05, $p = .546$) contributed to predicting the dependent measure. The trivial effect of source credibility, alongside the significant effects of individuals' interest in health topics (β = .23, $p = .009$), content credibility (β = .30, $p < .001$), and interactivity (β = .24, $p = .002$), seems to represent the particularity of the current research context. Before deciding whether to recommend a health website to others, involved users who cannot independently comprehend the information seem to mobilize social resources instead of blindly counting on the source expertise as advertised. Also, efficient information design seems to be a commonality, yet does not necessarily improve user perceptions.

Willingness to Follow Advice

A similar pattern of results followed. Individual level of interest in health topics continued to dominate, albeit at a smaller magnitude, β = .27, p = .003; ΔR^2 = .09; $F(2, 102) = 6.07$, $p = .003$. The frequency of seeking health information online also inversely predicted the willingness to follow advice, β = -.18, $p = .030$, implying that people who frequently visit health related websites tend to become skeptical about the validity of the content provided.

As in the previous analysis, perceived credibility of content (β = .20, $p = .039$) improved the model, ΔR^2 = .08, $F(2, 100) = 5.47$, $p = .006$. Its magnitude, however, deteriorated (β = .16, p = .109) with the addition of interactivity by design, β = .26, $p = .003$, which further improved the explanatory power of the model, ΔR^2 = .07, $F(2, 98) = 4.73$, $p = .011$. Interactivity, potentially as a means of social validation, reemerged as an important criterion for evaluating health-related websites.

Trust the Health Information

Similarly, level of interest in health topics (β = .28, $p < .001$) and frequency of visiting websites for health information (β = -.18, $p = .018$) jointly contributed to model improvement, ΔR^2 = .10, $F(2, 102) = 7.21$, $p = .001$. Content (β = .26, p = .006 in Model 4 and β = .22, $p = .018$ in Model 5) and interaction design (β = .17, $p = .044$) further enhanced the predictive power of the model, ΔR^2 = .06, $F(2, 100) = 4.16$, $p = .018$ and ΔR^2 = .03, $F(2, 98) = 2.14$, $p = .123$, respectively. The impact of the interactivity consideration, however, remained relatively low compared to willingness to recommend or follow advice.

Find the Site Favorable

Level of interest in health topics weakly but significantly predicted attitudes toward the website, β = .15, $p = .041$. The third block, however, failed to explain additional variance in the dependent measure, ΔR^2 = .04, $F(2, 102)$ = 2.74, $p = .069$. Among the four components of web credibility, content alone made a substantive contribution to improving the model, β = .30; ΔR^2 = .11; $F(2, 100) = 8.56$, $p < .001$. Its magnitude dropped only slightly, β = .27, $p < .001$, when adding design elements to the model. The design block (β = .05, $p = .472$ for usability; β = .07, p = .328 for interactivity) failed to deliver additional power to the model, ΔR^2 = .01, $F(2, 98) = 1.06$, $p = .350$. The current pattern of data roughly replicates the results found with willingness to return or trust.

DISCUSSION

Principal Results

The participants in the present study were asked to list a few websites they used to find health-related information in their everyday lives before rating each cue or heuristic in terms of its importance in judging the credibility of the health information found on the sites. Therefore, the participants' ratings could have been provided in the context of how they would normally evaluate the importance of credibility cues and heuristics on favored websites and validate their judgments using interactive and social cues. Based on the three modes of college students' credibility judgments—predictive, evaluative, and validation judgments (Rieh & Hilligoss, 2008)—our findings can be understood in the context of the last two modes, excluding the first mode, in which users predict a site's credibility as a criterion to determine whether they should pursue further interaction.

Current findings show that web credibility in the context of health information seeking is a construct featuring four components playing different roles depending on which outcome of web credibility is at stake. Overall, the current factor solution (Table 3) captured all three major types of web credibility cues and heuristics—operator (or author), content, and design (Fogg, 2003). Interaction design elements, which represent the ability to interact with the site or share information with others, had particularly strong effects on behavioral outcomes, such as willingness to follow advice and recommend the website to others (Table 4). We interpret this finding as indicating that individuals who cannot yet need to process online advice regarding their health problems are unlikely to count on only the perceived quality of the content or perceived expertise of the source. Especially when having to act on the information, such users might want to mobilize a secondary source (e.g., communicating with others) to validate the information, and such motivations could be achieved via interaction design. In particular, such processes appear to require at least three forms of validation when considering the items composing the interaction design factor identified in the present study (Table 3): (a) interaction with the content provider (e.g., requesting additional information or answers to an inquiry); (b) interaction with other users, or so-called "social validation" (e.g., sharing information, personal experiences, and opinions); and (c) interaction with the content (e.g., manipulating the web environment to make the information more accessible).

Such interactive design features help promote the open and collaborative nature of the current web environment, enabling users to interact with other users (e.g., via liking, commenting) or the site operator or moderator (e.g., via flagging, using the "contact us" feature) to reach a consensus or collective knowledge on a given topic (Chun & Lee, 2022). In the context of web credibility assessment, the fact that a site provides such interactive features may influence the user's perception of the site as having the intent or ability, or both, to facilitate an open and collaborative process for providing high-quality information. Therefore, the interactive design features may serve as means for users to exchange ideas and opinions regarding a topic.

Social validation has been identified as an important factor influencing web credibility assessments in the literature (Borah & Xiao, 2018; Jucks & Thon, 2017; Lederman et al., 2014; Rueger et al., 2021). In particular, social validation happens commonly among young adults in cyberspace. Cues implying collective endorsement and popularity of the given information (e.g., likes, ratings, or comments from fellow users) prompt the bandwagon heuristic (Hilligoss & Rieh, 2008; Sundar, 2008), which helps reduce uneasiness about acting on the information. Studies have indicated that social validation can be as powerful as source expertise

among young adults or adolescents when assessing health information online (Jucks & Thon, 2017; Rueger et al., 2021).

Of note, recent studies comparing the relative impacts of credibility cues and heuristics have shown that design constitutes the least powerful predictor of web credibility (e.g., Chang et al., 2021; Wu et al., 2020). Such results, however, may not be conclusive for at least two reasons. The first involves external validity—specifically, the observations were made in a controlled experiment (Chang et al., 2021); in topic domains where participants' involvement remains relatively low, such as weather, shopping, and education (Al-Omar, 2016; Djafarova & Trofimenko, 2019; Wu et al., 2020); or among participant groups with relatively lower information technology proficiency (Choi, 2020). Thus, it is questionable whether the same pattern would be expected among experienced online users seeking information to address actual health concerns. The second involves conceptual unclarity—design, especially concerning interactivity, remains either limited to features enabling communication with the source (Al-Omar, 2016; Chang et al., 2021) or conflated with related yet disparate constructs, such as navigability and source credentials (Djafarova & Trofimenko, 2019). The construct may have different effects if further distilled or situated in a more relevant context.

Content-related cues or heuristics (e.g., unbiasedness, recency) had a substantial impact across all outcomes (Table 4). This finding is in line with well-established research evidence in the literature—see reviews on content-related criteria for assessing the credibility or quality of online health information (Sbaffi & Rowley, 2017; Sun et al., 2019).

Credibility cues or heuristics involving source characteristics or the efficiency of information design (e.g., organization of information, navigation features) had little impact across all outcomes. Presumably, these features are expected by most visitors to health-related websites today. That is, most websites on health issues now present quality content by reputed sources—at least in the eyes of lay users—in a user-friendly manner. To the extent that such features are perceived as a required minimum, their presence is unlikely to boost the credibility of the website. However, their absence may result in a substantial decline in credibility. It is well established in health domains that websites failing to satisfy user expectations tend to lose credibility (Metzger et al., 2010).

Limitations and Future Studies

This study was limited by its content domain and population and therefore, current findings may explain the attitudes and behaviors of college students seeking health information online but may not be applicable to other populations visiting websites for different purposes. Results from future replication studies would demonstrate the stability of the current findings.

The current study solely attempted to identify a comprehensive list of elements constituting perceived web credibility. Its factor structure was not fully explored and remains unknown. Future studies should conduct a confirmatory factor analysis to determine the structure among the factors identified by this investigation. Consistent results would improve the validity of the current conclusions.

CONCLUSION

We conducted an online survey study to examine what affects college students' credibility assessments of health-related websites and how their perception of web credibility is associated with different outcomes such as trust in the health information, positive attitude toward the site, and willingness to revisit the site, act on the health information on the site, or share the information with others. We compiled existing measurements

of perceived web credibility, identified the underlying structure of the construct (RQ1), and tested these components in a hierarchical linear model in the context of health information seeking on the web (RQ2).

Our findings reveal that content-related attributes, such as unbiasedness or recency of the information, were associated with most dependent variables examined in the study. Interaction design-related elements, such as the ability to interact with other users or get help from the site operator, predicted the users' willingness to recommend the site to others, follow advice provided on the site, and trust the information on the site. However, credibility cues related to operator (source) or information design (e.g., organization of information, navigation features) were not useful factors to predict the users' perceptual, behavioral, or attitudinal outcomes. Among audience factors, education was positively associated with willingness to return to the site and favorable attitude toward the site.

The significant associations between content-related credibility markers and various outcome variables examined in the study show that consumers of online health information care about information quality when dealing with their health-related problems. However, unable to assess information quality independently as lay individuals, they seem to mobilize social resources as a secondary tool to validate the information. The current findings imply that interactive design features encourage such motivations and raise the credibility of websites as an information source. Participants in the present study, who were experienced online users (daily internet use = 7.8 hours; more than 5 years of experience with the internet), did not rely on source credentials or a website's "professional" look to decide whether to accept or reject the health information they found on the internet.

The present study has both theoretical and practical implications. First, the four-factor model of web credibility identified by EFA (Table 3) covered all three types of web credibility—operator (or source), content, and design—identified in the original framework of web credibility that guided the present study (Fogg, 2003). We highlight that two of the four factors included in our model were related to design features—interaction design and information design—and the interaction design factor was the most powerful predictor of the perceptual and behavioral outcomes of web credibility assessments examined in the study, alongside content-related elements (Table 4). These findings warrant further investigation of the effects of design on users' web credibility perceptions and associated behaviors, which have been relatively less studied in the literature when compared to source- or content-related credibility cues and heuristics. Second, the current evidence suggests that web creators should incorporate interactivity in their architecture to raise credibility. Health-related websites may be expected to serve as an open place that invites active communication regarding their content, the site operators, and other site users, rather than remaining a closed system of information.

REFERENCES

Al-Omar, K. (2016). Credibility evaluation of online distance education websites. *International Journal of Advanced Computer Science and Applications*, *7*(12), 356–362. https://doi.org/10.14569/IJACSA.2016.071246

Borah, P., & Xiao, X. (2018). The importance of 'Likes': The interplay of message framing, source, and social endorsement on credibility perceptions of health information on Facebook. *Journal of Health Communication*, *23*(4), 399–411. https://doi.org/10.1080/10810730.2018.1455770

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*(5), 752–766. https://doi.org/10.1037/0022-3514.39.5.752

Chang, Y.-S., Zhang, Y., & Gwizdka, J. (2021). The effects of information source and eHealth literacy on consumer health information credibility evaluation behavior. *Computers in Human Behavior*, *115*, 106629. https://doi.org/10.1016/j.chb.2020.106629

Chen, X., Hay, J. L., Waters, E. A., Kiviniemi, M. T., Biddle, C., Schofield, E., Li, Y., Kaphingst, K., & Orom, H. (2018). Health literacy and use and trust in health information. *Journal of Health Communication*, *23*(8), 724–734. https://doi.org/10.1080/10810730.2018.1511658

Choi, W. (2013). What makes online health information credible for older adults? An exploratory study. In W. E. Mackay, S. Brewster, & S. Bødker (Eds.), *CHI '13 extended abstracts on human factors in computing systems* (pp. 2671–2676). Association for Computing Machinery. https://doi.org/10.1145/2468356.2479491

Choi, W. (2020). Older adults' credibility assessment of online health information: An exploratory study using an extended typology of web credibility. *Journal of the Association for Information Science and Technology*, *71*(11), 1295–1307. https://doi.org/10.1002/asi.24341

Choi, W., Luo, M., & Kim, S. (2020). Validating an extended typology of web credibility assessment. *Proceedings of the Association for Information Science and Technology*, *57*, e357. https://doi.org/10.1002/pra2.357

Choi, W., & Stvilia, B. (2015). Web credibility assessment: Conceptualization, operationalization, variability, and models. *Journal of the Association for Information Science and Technology*, *66*(12), 2399–2414. https://doi.org/10.1002/asi.23543

Chopra, K., & Wallace, W. A. (2003). Trust in electronic environments. *Proceedings of the 36th Annual Hawaii International Conference on System Sciences, 2003*. https://doi.org/10.1109/HICSS.2003.1174902

Chun, J. S., & Lee, S.-S. (2022). How do we accept YouTube channels? An analysis of sequential acceptance of a shared platform. *Asian Communication Research, 19*(2), 15–36. https://doi.org/10.20879/acr.2022.19.2.15

Cooley, D., & Parks-Yancy, R. (2019). The effect of social media on perceived information credibility and decision making. *Journal of Internet Commerce*, *18*(3), 249–269. https://doi.org/10.1080/15332861.2019.1595362

Cunningham, A., & Johnson, F. (2016). Exploring trust in online health information: A study of user experiences of patients.co.uk. *Health Information & Libraries Journal*, *33*(4), 323–328. https://doi.org/10.1111/hir.12163

Danielson, D. R. (2006). Web credibility. In C. Ghaoui (Ed.), *Encyclopedia of human computer interaction* (pp. 713–721). Idea Group Reference.

de Winter, J. C. F., Dodou, D., & Wieringa, P. A. (2009). Exploratory factor analysis with small sample sizes. *Multivariate Behavioral Research*, *44*(2), 147–181. https://doi.org/10.1080/00273170902794206

Djafarova, E., & Trofimenko, O. (2019). 'Instafamous' – Credibility and self-presentation of micro-celebrities on social media. *Information, Communication & Society*, *22*(10), 1432–1446. https://doi.org/10.1080/1369118X.2018.1438491

Eastin, M. S. (2001). Credibility assessments of online health information: The effects of source expertise and knowledge of content. *Journal of Computer-Mediated Communication*, *6*(4), JCMC643. https://doi.org/10.1111/j.1083-6101.2001.tb00126.x

Fogg, B. J. (2003). *Persuasive technology: Using computers to change what we think and do*. Morgan Kaufmann.

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. *DUX '03: Proceedings of the 2003 Conference on Designing for User Experiences* (pp. 1–15). https://doi.org/10.1145/997078.997097

Fogg, B. J., Swani, P., Treinen, M., Marshall, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., Paul, J., Rangnekar, A., & Shon, J. (2001). What makes web sites credible? A report on a large quantitative study. *CHI '01: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 61–68). https://doi.org/10.1145/365024.365037

Fox, J., & Monette, G. (1992). Generalized collinearity diagnostics. *Journal of the American Statistical Association, 87*(417), 178–183. https://doi.org/10.1080/01621459.1992.10475190

Freeman, K. S., & Spyridakis, J. H. (2009). Effect of contact information on the credibility of online health information. *IEEE Transactions on Professional Communication, 52*(2), 152–166. https://doi.org/10.1109/TPC.2009.2017992

Haas, A., & Unkel, J. (2017). Ranking versus reputation: Perception and effects of search result credibility. *Behaviour & Information Technology, 36*(12), 1285–1298. https://doi.org/10.1080/0144929X.2017.1381166

Hilligoss, B., & Rieh, S. Y. (2008). Developing a unifying framework of credibility assessment: Construct, heuristics, and interaction in context. *Information Processing & Management, 44*(4), 1467–1484. https://doi.org/10.1016/j.ipm.2007.10.001

Hong, T. (2006). Contributing factors to the use of health-related websites. *Journal of Health Communication, 11*(2), 149–165. https://doi.org/10.1080/10810730500526679

Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika, 30*(2), 179–185. https://doi.org/10.1007/BF02289447

Hovland, C. I., Janis, I. L., & Kelley, H. H. (1953). *Communication and persuasion: Psychological studies of opinion change*. Yale University Press.

Hu, Y., & Sundar, S. S. (2010). Effects of online health sources on credibility and behavioral intentions. *Communication Research, 37*(1), 105–132. https://doi.org/10.1177/0093650209351512

Jiaying, L., Song, S., & Zhang, Y. (2021, March 17). *Linguistic features and consumer credibility judgment of online health information*. iConference 2021 Proceedings. http://hdl.handle.net/2142/109674

Johnson, F., Rowley, J., & Sbaffi, L. (2015). Modelling trust formation in health information contexts. *Journal of Information Science, 41*(4), 415–429. https://doi.org/10.1177/0165551515577914

Jucks, R., & Thon, F. M. (2017). Better to have many opinions than one from an expert? Social validation by one trustworthy source versus the masses in online health forums. *Computers in Human Behavior, 70*, 375–381. https://doi.org/10.1016/j.chb.2017.01.019

Kim, H.-S., Brubaker, P., & Seo, K. (2015). Examining psychological effects of source cues and social plugins on a product review website. *Computers in Human Behavior, 49*, 74–85. https://doi.org/10.1016/j.chb.2015.02.058

Kim, S. U., & Syn, S. Y. (2016). Credibility and usefulness of health information on Facebook: A survey study with U.S. college students. *Information Research, 21*(4), paper 727. https://eric.ed.gov/?id=EJ1123245

Lederman, R., Fan, H., Smith, S., & Chang, S. (2014). Who can you trust? Credibility assessment in online health forums. *Health Policy and Technology, 3*(1), 13–25. https://doi.org/10.1016/j.hlpt.2013.11.003

Lee, E. H., & Lee, T. (2021). A socio-behavioral approach to understanding the spread of disinformation. *Asian Communication Research, 18*(3), 168–187. https://doi.org/10.20879/acr.2021.18.3.168

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLOS Medicine, 6*(7), e1000100. https://doi.org/10.1371/journal.pmed.1000100

Liu, L., & Shi, L. (2021). Does the ownership of health website matter? A cross-sectional study on Chinese consumer behavior. *International Journal of Medical Informatics, 152*, 104485. https://doi.org/10.1016/j.ijmedinf.2021.104485

Lucassen, T., Muilwijk, R., Noordzij, M. L., & Schraagen, J. M. (2013). Topic familiarity and information skills in online credibility evaluation. *Journal of the American Society for Information Science and Technology, 64*(2), 254–264. https://doi.org/10.1002/asi.22743

Machackova, H., & Smahel, D. (2018). The perceived importance of credibility cues for the assessment of the trustworthiness of online information by visitors of health-related websites: The role of individual factors. *Telematics and Informatics, 35*(5), 1534–1541. https://doi.org/10.1016/j.tele.2018.03.021

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*(13), 2078–2091. https://doi.org/10.1002/asi.20672

Metzger, M. J., Flanagin, A. J., & Medders, R. B. (2010). Social and heuristic approaches to credibility evaluation online. *Journal of Communication, 60*(3), 413–439. https://doi.org/10.1111/j.1460-2466.2010.01488.x

Miller, L. M. S., & Bell, R. A. (2012). Online health information seeking: The influence of age, information trustworthiness, and search challenges. *Journal of Aging and Health, 24*(3), 525–541. https://doi.org/10.1177/0898264311428167

National Cancer Institute. (2019). *Health information national trends survey (HINTS) 5, Cycle 3*. https://hints.cancer.gov

Parsons, M. M. (2007). Exploratory factor analysis. In M. Allen (Ed.), *Sage encyclopedia of communication research methods* (pp. 514–519). Sage.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In R. E. Petty & J. T. Cacioppo (Eds.), *Communication and persuasion* (pp. 1–24). Springer. https://doi.org/10.1007/978-1-4612-4964-1_1

Pew Research Center. (2021, April 7). *Internet/broadband fact sheet*. https://www.pewresearch.org/internet/fact-sheet/internet-broadband/

Rieh, S. Y., & Hilligoss, B. (2008). College students' credibility judgments in the information-seeking process. In M. J. Metzger & A. J. Flanagin (Eds.), *Digital Media, Youth, and Credibility* (pp. 49–72). The MIT Press.

Robins, D., & Holmes, J. (2008). Aesthetics and credibility in web site design. *Information Processing & Management, 44*(1), 386–399. https://doi.org/10.1016/j.ipm.2007.02.003

Rowley, J., Johnson, F., & Sbaffi, L. (2015). Students' trust judgements in online health information seeking. *Health Informatics Journal, 21*(4), 316–327. https://doi.org/10.1177/1460458214546772

Rueger, J., Dolfsma, W., & Aalbers, R. (2021).

Perception of peer advice in online health communities: Access to lay expertise. *Social Science & Medicine, 277*, 113117. https://doi.org/10.1016/j.socscimed.2020.113117

Sbaffi, L., & Rowley, J. (2017). Trust and credibility in web-based health information: A review and agenda for future research. *Journal of Medical Internet Research, 19*(6), e218. https://doi.org/10.2196/jmir.7579

Scantlebury, A., Booth, A., & Hanley, B. (2017). Experiences, practices and barriers to accessing health information: A qualitative study. *International Journal of Medical Informatics, 103*, 103–108. https://doi.org/10.1016/j.ijmedinf.2017.04.018

Song, S., Zhang, Y., & Yu, B. (2021). Interventions to support consumer evaluation of online health information credibility: A scoping review. *International Journal of Medical Informatics, 145*, 104321. https://doi.org/10.1016/j.ijmedinf.2020.104321

Stamper, C. L., & Masterson, S. S. (2002). Insider or outsider? How employee perceptions of insider status affect their work behavior. *Journal of Organizational Behavior, 23*, 875–894. https://doi.org/10.1002/job.175

Stvilia, B., Gasser, L., Twidale, M. B., & Smith, L. C. (2007). A framework for information quality assessment. *Journal of the American Society for Information Science and Technology, 58*(12), 1720–1733. https://doi.org/10.1002/asi.20652

Stvilia, B., Mon, L., & Yi, Y. J. (2009). A model for online consumer health information quality. *Journal of the American Society for Information Science and Technology, 60*(9), 1781–1791. https://doi.org/10.1002/asi.21115

Sun, Y., Zhang, Y., Gwizdka, J., & Trace, C. B. (2019). Consumer evaluation of the quality of online health information: Systematic literature review of relevant criteria and indicators. *Journal of Medical Internet Research, 21*(5), e12522. https://doi.org/10.2196/12522

Sundar, S. S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility. In M. J. Metzger & A. J. Flanagin (Eds.), *Digital Media, Youth, and Credibility* (pp. 73–100). The MIT Press.

Wang, X., Shi, J., & Kong, H. (2021). Online health information seeking: A review and meta-analysis. *Health Communication, 36*(10), 1163–1175. https://doi.org/10.1080/10410236.2020.1748829

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*(2), 134–144. https://doi.org/10.1002/asi.10016

Wu, D., Dong, J., Shi, L., Liu, C., & Ding, J. (2020). Credibility assessment of good abandonment results in mobile search. *Information Processing & Management, 57*(6), 102350. https://doi.org/10.1016/j.ipm.2020.102350

Yu, J., & Han, K.-H. (2018). The usage and credibility of information sources for cancer prevention: Cases of American and South Korean women. *Asian Communication Research, 15*(2), 8–24. https://doi.org/10.20879/acr.2018.15.2.8

Zulman, D. M., Kirch, M., Zheng, K., & An, L. C. (2011). Trust in the internet as a health resource among older adults: Analysis of data from a nationally representative survey. *Journal of Medical Internet Research, 13*(1), e19. https://doi.org/10.2196/jmir.1552

Appendix

Complied Measurement Items for Web Credibility Assessment and Instruction

Instruction: "When you look for health information regarding your health concerns or questions, to what extent do you consider each of the following statements important in your credibility assessment of health-related websites? (1 = not at all important, 5 = extremely important)" *"The website …"*
is offered by an **educational institution**
is offered by a **government institution**
is offered by a **nonprofit organization**
is offered by a **disease-specific organization** (e.g., American Cancer Society)
is affiliated with a **medical institution**
shows **photos of the members** of the organization
shows **photos of the authors** who posted articles on the site
provides the **contact information** of the site operator
is **ad-free**
provides **policy** on how information about users will be collected and stored
is **certificated** by a third-party organization (e.g., TRUSTe)
is run by an institution/organization that has **credentials** appropriate for given health topics
is run by an institution/organization that has **specialties** appropriate for given health topics
has won **awards** related to given health topics
displays **accreditation, credentials, awards**
is run by an institution/organization that has been **producing research-based medical evidence**
is run by an institution/organization that **has been around for a reasonable period of time**
has gained **good reputation** in the given health field
displays **links to other health-related sites providing the same health information**
provides **timely information and updates**
adheres to established **medical guidelines**
provides an **explanation to the medical terms**
uses terminology that is **easy to understand**
uses **concise and uncomplicated** sentence structures
uses **language that is serious but does not sound scary** to write the medical content
provides **links to original documents**
provides content that has **statistics** regarding the health-related topic
tries to cover all the **different approaches to a controversial issue**
provides **both professional and patient viewpoints** on a health topic
provides information about **potential side effects**
references scientific publications in their posts

provides **references to those responsible for authorizing the content**
is **free from typographical errors**
uses **appropriate line breaks and bullet points** to lay out the content
uses **appropriate line spacing** to lay out the content
provides **pathologic definition and clinical cases** in their posts
provides content at the **right level of complexity and depth** in the content
posts their **original works that are protected by copyright**
provides content that supports **local needs**
The site post has **sources, references, and dates**
uses **appropriate graphics** for the topics being covered
uses **consistent colors and icons**
uses the **same format** for the sub-pages consistently
uses alternate text and transcripts to **facilitate access for persons with a different primary language**
integrates **accessibility in the design** such as sufficient contrast and color blindness considerations
protects confidential areas by a login procedure
enables users to **differentiate ads from content** easily
presents a **secure message** when users access confidential information
is **always up and running**
enables users to **adjust the font size**
enables users to **enlarge the selected pictures**
has **high visual quality**
is **free from broken hyperlinks** (i.e., links that do not work properly)
provides a **site map**
enables users to **return to the homepage easily** during navigation
enables users to know their **current position** on the site easily
enables users to **move around the site easily** without being lost
enables users to **recognize whether the links are active or not**
helps users **seek help and support** through "Live Chat" or "Ask Us a Question" functions
enables users to make the **undo function** during an interaction with the site
provides **forward and backward functions** available
provides a **sharing option** for each page
looks professional
provides **places to interact and share with other site visitors**
enables users to **access to further details and sources easily**