Western Journal of Communication
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713721895

Seeking Health Information in the Information Age: The Role of Internet Self-Efficacy

Stephen A. Rains

Online Publication Date: 01 January 2008
To cite this Article: Rains, Stephen A. (2008) 'Seeking Health Information in the Information Age: The Role of Internet Self-Efficacy', Western Journal of Communication, 72:1, 1 - 18
To link to this article: DOI: 10.1080/10570310701827612
URL: http://dx.doi.org/10.1080/10570310701827612

Western Journal of Communication
Vol. 72, No. 1, January–March 2008, pp. 1–18

Seeking Health Information in the Information Age: The Role of Internet Self-Efficacy

Stephen A. Rains

The study reported here explored Internet self-efficacy in the process of acquiring health information on the World Wide Web. Internet self-efficacy was examined as a partial mediator of exogenous variables reflecting an individual's motivation to take action to manage his or her health and experience using the Web, and endogenous variables representing information-seeking behaviors and outcomes. The results show that Internet self-efficacy partially mediated the relationship between respondents' experience using the Web and their attitude about the quality of health information available online as well as the relationship between respondents' desire for informational involvement and their attitude about information quality. Internet self-efficacy completely mediated the relationships between respondents' Web experience and the perceived success of a recent information search as well as between respondents' desire for informational involvement and perceived search success.

Keywords: E-health; Health Communication; Information Seeking; Internet; Self-efficacy

The Internet and World Wide Web have become important resources for individuals attempting to acquire health information. As of 2006, 80% of adult Internet users, or around 113 million Americans, were estimated to have used the Web for health purposes (Fox, 2006). The Web is being used to gather information in preparation for (Diaz et al., 2002) or following (Broom, 2005) a doctor's visit, to acquire routine information such as drug dosages (Nettleton, Burrows, O'Malley, & Watt, 2004), and for self-diagnosis and care (Williams, Nicholas, & Hunginton 2003). Such uses of the Web are particularly noteworthy because information acquisition is a key coping strategy (Brashers, Goldsmith, & Hsieh, 2002). Information, which consists of

Correspondence to: Stephen A. Rains, Department of Communication, University of Arizona, Tucson, AZ 85721, USA. E-mail: srain@email.arizona.edu

ISSN 1057-0314 (print)/ISSN 1745-1027 (online)
DOI: 10.1080/10570310701827612

"stimuli from a person's environment that contribute to his or her knowledge or beliefs" (Brashers et al., p. 259), may serve to help individuals evaluate or make changes to their health behaviors (Afifi & Weiner, 2006; Goldsmith, 2001; Johnson & Meischke, 1993). Indeed, information acquired online has been reported to lead individuals to feel more empowered in managing their own health (Broom, 2005; Kivits, 2004), influence treatment decisions, and even encourage some individuals to change their approach to managing their health (Fox & Rainie, 2002).

Despite the potential offered by the Internet and Web, would-be information seekers must overcome a number of barriers to acquire medical information. Web use requires the successful operation of computer hardware and software. Further, with an estimated 70,000 to 100,000 sites (Cline & Hayes, 2001; Eysenbach, Sa, & Diepgen, 1999) offering health information—much of which is of suspect quality (Eysenbach, Powell, Kuss, & Sa, 2002)—navigating the Web can prove daunting for consumers (Monahan-Martin, 2004) and health care practitioners (Bennett, Casebeer, Kristofco, & Strasser, 2004). Recent research suggests that perceptions of one's Internet self-efficacy may play a key role in the information-seeking process (Hong, 2006; Nettleton et al., 2004). Internet self-efficacy, in this context, consists of one's perceived ability to use the Web to acquire health information. Such confidence, or a lack of it, can motivate or mitigate Web usage and the amount of effort put forth by an individual. Internet self-efficacy has been linked to the use (and disuse) of the Web to acquire medical information (Nettleton et al., 2004) and the effectiveness of health-related searches (Hong, 2006).

Given the potential importance of Internet self-efficacy, it is essential that scholars fully understand the broader role it likely plays in the information-seeking process. Accordingly, this manuscript reports a model in which Internet self-efficacy functions as a partial mediator of variables related to one's health and Web use and information-seeking processes and outcomes. The model is rooted in the notion that, even among those who are motivated to take an active role in managing their health, a sense of efficacy may influence an individual's use of the Web to acquire health information and likelihood of achieving positive health outcomes. In offering a detailed look at Internet self-efficacy in the context of acquiring health information, the model has the potential to inform both scholars and practitioners. In the following section, contemporary research on health information seeking and self-efficacy are reviewed to provide a foundation for the model.

Seeking Health Information Online

A number of theories have been used to explain and predict health information-seeking behavior. Johnson and Meischke's (Johnson & Meischke, 1993) comprehensive model of health information seeking (CMIS), Brashers's (2001) uncertainty management theory (UM), and Afifi and Weiner's (2004) theory of motivated information management (TMIM) are a few theories that present a systematic analysis of key factors that influence the information-acquisition process, such as uncertainty, experience with an illness, and expectations about the outcomes associated with

acquiring information. One important factor in both the CMIS and the TMIM is perceptions of self-efficacy. In the CMIS, perceptions of self and response efficacy predict one's perceptions of the utility of a particular medium (e.g., television, newspaper, etc.) to provide health information and, in turn, one's information-seeking behaviors. Individuals' assessments of three different types of efficacy (coping, communication, and target efficacy) are central elements of the evaluation phases in the TMIM.

Although none of the preceding three models examine uses of the Internet in particular, the importance of various types of efficacy in the CMIS and TMIM suggests that perceptions of one's Internet self-efficacy may be an important predictor of Internet use for medical information. Granted the central role of other forms of efficacy in theories of information seeking, this construct should be especially applicable to acquiring health information online. To fully understand Internet self-efficacy in this context, one must first consider the broader construct self-efficacy. A key component in social cognitive theory (Bandura, 1986, 1997), self-efficacy consists of an individual's belief that he or she can perform a particular behavior. Bandura (1997) is quick to note that self-efficacy does not concern the skills one possesses, but what one feels he or she can do with his or her skills. Perceptions of self-efficacy are critical to determine how much effort and persistence one is willing to put forth, thought patterns and emotional responses, and actions taken by an individual. Additionally, self-efficacy is domain-specific, varying across different circumstances and tasks.

The notion of self-efficacy has been applied to both computer (Compeau & Higgins, 1995; Marakas, Yi, & Johnson, 1998) and Internet (Eastin & LaRose, 2000) use. Computer self-efficacy consists of an individual's perception of efficacy in performing a computer-related behavior, whereas Internet self-efficacy concerns perceptions of one's ability to accomplish general Internet-related behaviors. Internet self-efficacy is more specific than computer self-efficacy and can be thought of as a sense of efficacy above and beyond using a computer (Easton & LaRose, 2000). Both types of efficacy have been found to be an important predictor of the use (Taylor & Todd, 1995), task performance (Compeau & Higgins, 1995), attitudes toward (Busch, 1995), and perceptions of (Igbaria & Ivari, 1995) computers and/or the Internet.

Acquiring health information on the Web is an activity that presents a number of unique barriers that underscore the potential importance of efficacy perceptions. Web use requires individuals to successfully operate a computer—which, especially for novice users, may represent a complex technology requiring training and experience (Marakas et al., 1998). Users must know how to start-up, run, and maintain computer hardware and software. The Internet and Web add a second layer of difficulty (Easton & LaRose, 2000). Beyond establishing and maintaining a connection to the Internet, prospective information seekers must be able to identify a search engine, select appropriate search terms, and evaluate the results of searches (Zeng, Kogan, Ash, Greenes, & Boxwala, 2002).

One of the most substantial challenges faced by consumers is locating high-quality information. A multitude of websites exist offering medical information and advice of widely varying quality. Eysenbach et al. (2002) conducted a meta-analysis of 79 studies that examined over 5,900 health-related websites, reporting that consumers

face "significant problems" locating accurate, complete, and quality health information websites (p. 2696). Both scholars (Cline & Haynes, 2001; Eysenbach, 2003; Morahan-Martin, 2004) and practitioners (Health Insight, 1999; Health on the Net Foundation, 2004; MedlinePlus, 2004) offer warnings to would-be information seekers encouraging them to critically evaluate information they find online. Beyond the quality of information available, health information seekers face challenges distinguishing advertisements from research (Cline & Haynes, 2001), locating credible sources (Anderson, 2004; Dutta-Bergman, 2003; Fox & Rainie, 2002), understanding medical information written in complex or technical language (Berland et al., 2001) and identifying appropriate search terms for illnesses or conditions (Wolfe & Sharp, 2005).

The challenges faced by health information seekers are evident in recent research. Nettleton et al. (2004) conducted an analysis of the different types of individuals who use the Web to seek medical information. They describe one class in particular as "hav[ing] an 'uneasy' relationship with the Internet . . . because they perceive that they lack the appropriate skills" (p. 538). These individuals also tend to view the Internet as a "last resort" for health information, venturing online only when other sources have failed. Further, Hong (2006) found that, when completing a challenging search task, individuals who felt a high degree of Internet self-efficacy were more successful at locating quality health websites than those lacking efficacy. As the results of these studies indicate, information seekers must feel a sense of efficacy in their ability to use the Web and find the information that they desire.

Modeling the Role of Internet Self-Efficacy in Information-Seeking Processes and Outcomes

The specific variables examined in this study are drawn broadly from the CMIS (Johnson & Meischke, 1993).[1] Of the theories that explain and predict information-seeking behavior, only the CMIS gives a great deal of consideration to the potential importance of the communication medium. The CMIS predicts that demographic and health-related factors influence perceptions of the utility of a medium and, in turn, media use. Applying the CMIS to the general process of acquiring health information on the Web, Internet self-efficacy is examined as a partial mediator of the relationship between health related and Web use variables and information-seeking processes and outcomes.

Four exogenous variables were included in the model. Three of the four variables reflect an individual's motivation to take action to manage his or her health. These variables correspond to the salience factor in the CMIS (Johnson & Meischke, 1993), which consists of the personal significance of a particular health condition. As opposed to focusing on one specific health condition, however, one's internal health locus of control, desire for informational involvement, and attitude toward behavioral involvement reflect an underlying drive to take an active role in one's health care. Health locus of control, in particular, refers to an individual's perception of control over his or her wellbeing (Wallston, Stein, & Smith, 1994; Wallston,

Wallston, & DeVellis, 1978); those with an internal locus of control, in particular, feel that their own actions can influence their health. Desire for informational and behavioral involvement reflect an individual's interest in playing an active part in his or her own medical care (Krantz, Baum & Wideman, 1980). Individuals with a with a high degree of desire for informational involvement want to be involved in medical decisions, while behavioral involvement refers to an individual's attitude toward engaging in self-treatment.

Individuals who have greater amounts of informational and behavioral involvement and an internal locus of control should have more positive perceptions of and experiences with the Web as a source for medical information. For those inclined to be involved in their health, the Web should be an appealing resource offering a plethora of medical information. Once online, those who want to take an active role in their health should also be more inclined to expend the time and effort necessary to find useful information and achieve other positive outcomes. Campbell and Nolfi (2005) grounded their study of elderly adult's Internet use in the assumption that there is a relationship between use of the Internet for health purposes and each of these three health-related factors. Further, Dutta-Bergman's (2004) research indicates that those who use the Internet as a primary source for health information are more health conscious, more concerned about their health, and more likely to engage in healthy behaviors than those who did not use the Internet as a primary information source.

The fourth exogenous variable examined in this study consists of one's experience using the Web. Direct experience is also included in the CMIS (Johnson & Meischke, 1993), although it is assessed as one's familiarity with a particular health condition. Granted the unique barriers faced by those using the Web to acquire health information, one's familiarity with the Web is likely an important predictor of Web use behavior and outcomes. Through relevant experiences individuals can gain the knowledge and skills required to successfully acquire health information online. There is evidence that experience using the Internet is related to perceptions of the quality of information on medical websites (Flanagin & Metzger, 2000; Hong, 2006).

The demographic and health-related factors identified in the CMIS (Johnson & Meischke, 1993) predict perceptions of a medium and, in turn, media use behavior. Following the form of the CMIS, the four exogenous variables are predicted to be directly associated with perceptions and use of the Internet to acquire health information. The particular endogenous variables examined in this study include attitudes about the quality of health information available online, perceived success of a recent information search, and intentions to use the Web again in the future.

Internet self-efficacy is predicted to serve as a partial mediator of the relationships between the preceding exogenous and endogenous variables. Internet self-efficacy should be increased by one's desire to be involved in one's health. Individuals who want to take an active role in their health care may feel more confident in their ability to use the Web to acquire health information because they feel that they can affect their health outcomes. Further, Internet self-efficacy should be increased by one's experience using the Internet; through relevant experiences individuals can gain confidence in their ability to acquire health information online. Internet self-efficacy, in

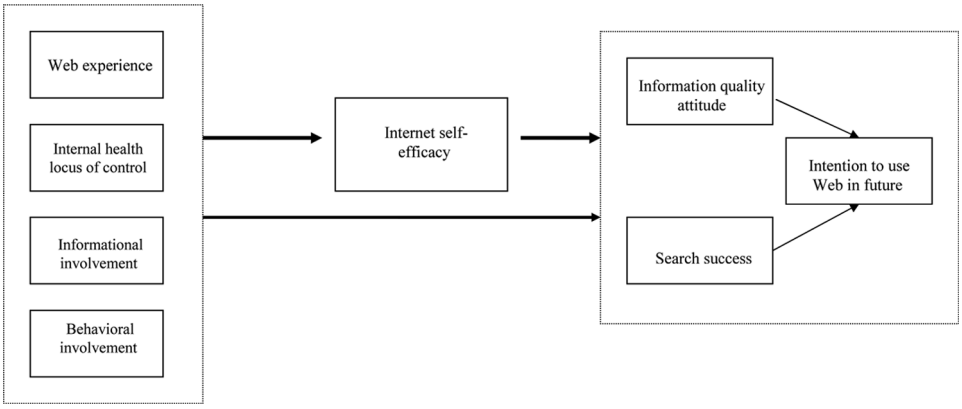

Figure 1 Hypothesized Model of Internet Self-Efficacy as a Partial Mediator of One's Motivation to be Involved in One's Health and Experience using the Web and Information Seeking Processes and Outcomes.

turn, should make one more likely to achieve positive health-related outcomes. Indeed, Hong (2006) reported that, when completing a challenging search task, participants who perceived a high degree of Internet self-efficacy were able to locate more credible medical websites than those who perceived a low degree of efficacy. Though not assessed by Hong, this increase in information seeking ability may also be reflected in one's perceptions of the quality of health information available online and future Web use. Those who feel a greater sense of efficacy might have more positive experiences finding information and hold more positive attitudes about the Web as a health resource.

The specific predictions of the model are as follows: The four exogenous variables (internal health locus of control, informational involvement, behavioral involvement, and Web experience) should be positively associated with the three endogenous variables (attitude about the quality of health information available online, perceived search success, and intentions to use the Web in the future for medical information). Additionally, attitudes about information quality and perceived search success should predict intentions to use the Web in the future. Internet self-efficacy is predicted to partially mediate the relationship between the exogenous and endogenous variables. It is predicted that one's motivation to be actively involved in one's health and experience using the Web will be positively associated with perceptions of Internet self-efficacy; in turn, Internet self-efficacy will be positively associated with the perceived success of a recent health inquiry, one's attitudes about the health information online, and one's intention to use the Web in the future. The general predictions of the model are depicted in Figure 1.

Method

Respondents and Procedure

To test the preceding model, data were collected using a questionnaire posted on a secure website. Students in a communication course at a large Southwestern

university were given extra-credit for soliciting respondents who were (a) at least 18 years of age, (b) not a student nor an employee of the university, and who (c) had used the Internet/Web during the previous 6 months to acquire health information. Students were sent a form e-mail message explaining the study and asked to forward it to potential respondents. The form e-mail message contained a link directing respondents to the study website. A total of 157 respondents completed the questionnaire. To ensure the validity of the sample, respondents reported their first name, contact information, and the name of the student who referred them to the study. An attempt was made to contact all respondents. Approximately two-thirds of the respondents ($n = 98$) verified that they completed the study. There were no statistically significant differences for any study variables between those who verified completing the study and those who did not return the follow-up message.[2]

More than half of the respondents were female (59%), and the mean age of the participants was 38.17 years ($SD = 15.25$). Respondents reported searching for health information a mean of 3.82 ($SD = 1.52$) times during the previous 6 months. Between one-quarter and one-half of respondents reported using the Web to search for information pertaining to one of the following issues: food and metabolism; general health and wellness; cancer; specific conditions or diseases; bones, joints, and muscles; reproduction and sexual health; or information about the digestive system. At least one-third of the sample reported using the Web to find health information because: someone whom they know was diagnosed with an illness or condition; they were dealing with an ongoing illness or condition; or they wanted to change their exercise and diet habits. In general, the sample is fairly representative of the broader population of Americans using the Web to acquire health information. Those using the Web to search for medical information are more likely to be female and go online to acquire health information for a variety of purposes (Rice, 2006).

Instrumentation

In addition to completing demographic items, participants completed measures assessing the eight variables included in the model. Unless otherwise noted, all ratings were made on seven-point scales with the anchors *strongly disagree* (1) and *strongly agree* (7).

Internal locus of control

Internal locus of control was assessed with six items from Walston et al.'s (1978) multidimensional health locus of control measure ($M = 4.88$, $SD = .81$, $\alpha = .71$). Those with an internal locus of control feel that their own actions can influence their health (Wallston et al., 1978, 1994). Sample items include: "The main thing which affects my health is what I myself do." and "I am in control of my health."

Desire for informational and behavioral involvement

Krantz's health opinion survey (HOS) (Krantz et al., 1980) assesses an individual's desire to be involved in his or her own health care. The HOS is comprised of two

sub-scales, and has been shown to perform adequately in tests of its discriminant validity (Smith, Wallston, Wallston, Foresberg, & King, 1984). Nine items were included to assess an individual's desire for behavioral involvement ($M = 4.13$, $SD = .83$, $\alpha = .75$), which reflects an individual's attitude toward self treatment and taking actions to improve his or her health. Sample items for this measure include: "It is better to rely on the judgments of doctors (who are the experts) than to rely on 'common sense' in taking care of your own body," "Learning how to cure some of your illnesses without contacting a physician may create more harm than good," and "It's almost always a better to seek professional help than to try to treat yourself." All three items were reverse-scored. Seven items were used to measure an individual's desire for informational involvement in his or her health care, which reflects a desire to be informed about one's health and involved in medical decisions ($M = 4.03$, $SD = .78$, $\alpha = .76$). Sample items from this subscale include: "Instead of my waiting for them to tell me, I usually ask the doctor or nurse immediately after an exam about my health," "I usually ask the doctor or nurse lots of questions about the procedures during a medical exam," and "I'd rather be given many choices about what's best for my health than to have the doctor make the decisions for me."

Experience using the web

Experience consists of an individual's perceived level of familiarity using the Web. Five items from previous research on Internet use (Flanagin & Metzger, 2000) were used to assess this variable ($M = 5.96$, $SD = 1.13$, $\alpha = .93$). Sample items include: "I go on the Internet/Web frequently." and "I have a great deal of experience using the Internet/Web."

Internet self-efficacy in acquiring health information on the web

Items from Eastin & LaRose's (2000) measure of Internet self-efficacy were adapted to the context of seeking health information. The adapted measure used in this study represents respondent's perceived self-efficacy in using the Web to acquire health information ($M = 5.14$, $SD = 1.09$, $\alpha = .93$). Respondents were asked to rate their confidence using the Web to accomplish eight different tasks related to using the Web to acquire health information. The tasks included the following: understanding different procedures for accessing health information, using different search engines to gather health information, evaluating the quality of different health websites, locating a variety of perspectives on a health topic, finding high quality health information, understanding how search engines work, locating high quality health websites, and learning how to use the Internet/Web to gather health information.

Attitude about the quality of health information on the web

Respondents' attitude about the quality of health information available on the Web was measured with eight items ($M = 4.96$, $SD = .81$, $\alpha = .86$). The items are similar to measures used in previous research assessing the credibility of information on the

Web (Dutta-Bergman, 2003; Flanagin & Metzger, 2000; Johnson & Kaye, 2002). Respondents completed eight items in which they were asked to rate their agreement with statements that health information on the Web is: high quality, believable, accurate, informative, correct, untrustworthy, biased, and low quality. The final three items were reverse scored.

Search success

A single-item measure was used to assess search success. Respondents were asked to rate the usefulness of information garnered during their most recent search for health information on the Web ($M = 5.33$, $SD = 1.18$). Ratings were made on a seven-point scale with the anchors *not very useful* (1) and *very useful* (7).

Intention to use the web in the future

A singe-item was used to assess intentions to use the Web. Respondents estimated their likelihood of using the Web to search for health information in the future ($M = 9.91$, $SD = 1.72$). Ratings were made on an 11-point scale with the anchors *definitely will not use* (0%) and *definitely will use* (100%); each point on the scale corresponded to a 10% increment (e.g., 10%, 20%, etc.)

Results

Preliminary Analyses

The data were first cleaned and screened following the recommendations established by Tabachnick and Fidell (2001). Three multivariate outliers were identified and removed from the data set. The value of Mahalanobis distance for three cases exceeded the limits established by Tabachnick and Fidell. Separate confirmatory factor analyses (CFAs) were conducted for each of the multi-item measures. The factor loadings for each measure and Hu and Bentler's (1999) dual criteria of a comparative fit index (CFI) value greater than or equal to .96 and a standardized root mean squared residual (SRMR) value less than or equal to .10 were used to evaluate each measure.

The factors loadings for the measures of internal locus of control (.30–.81), Web experience (.69–.96), Internet self-efficacy (.63–.89), and attitudes about information quality (.51–.74) were generally adequate.[3] The CFA models for internal locus of control, $\chi^2(df = 8) = 15.14$, $p = .06$, CFI = .96, SRMR = .05, Web experience, $\chi^2(df = 4) = 5.53$, $p = .24$, CFI = 1.00, SRMR = .02, Internet self-efficacy, $\chi^2(df = 16) = 20.90$, $p = .18$, CFI = 1.0, SRMR = .02, and attitudes about information quality, $\chi^2(df = 9) = 14.02$, $p = .12$, CFI = .99, SRMR = .03, fit the sample data. One CFA model was analyzed for the two components in the Kratnz et al.'s (1980) HOS measure. The factors loadings for informational involvement (.61–.84) and behavioral involvement (.36–.86) were acceptable and the alternate fit indices suggest that the model with two factors corresponding to informational and behavioral

Table 1 Correlations for All Variables Included in the Study ($N = 151$)

Variable	1	2	3	4	5	6	7	8
1. Internet self-edfficacy								
2. Web experience	.66*							
3. Search success	.49*	.18*						
4. Intention to use Web	.39*	.25*	.48*					
5. Information quality attitude	.45*	.20*	.40*	.56*				
6. IHLOC	.11	.00	.11	.14	.21*			
7. Informational involvement	.24*	.06	.19*	.13	.12	.19*		
8. Behavioral involvement	.00*	.06	.06	.10	.12	−.01	.22*	

Note. IHLOC = internal health locus of control. Ratings for all variables were made on a seven-point scale, with one exception. Ratings of intention to use the Web in the future to seek health information were made on an 11-point scale. Larger values indicate a greater amount of a variable.

*$p < .05$.

involvement fit the data adequately, $\chi^2(df = 86) = 117.76$, $p = .01$, CFI = .96, SRMR = .08. Correlations for all variables in this study are reported in Table 1.

The Role of Internet Self-efficacy in Acquiring Health Information Online

Structural equation modeling (Kline, 1998) was used to test the predicted relationships among the variables in the model. The presence of single-item measures made it impossible to account for measurement error and necessitated using an observed variable approach to conduct the analysis (Stephenson & Holbert, 2003). The observed variable approach is conceptually similar to traditional path analysis. Although this approach may result in attenuated effects, Stephenson and Holbert note that it is more conservative than other approaches to modeling (e.g., latent composite and hybrid modeling). Web experience, internal health locus of control, informational involvement, and behavioral involvement were specified as exogenous variables in the model. Each of these variables was antecedent to three endogenous variables: information quality attitude, perceived search success, and intentions to use the Web in the future. Additionally, information quality attitude and search success were both posited to directly influence intentions to use the Web in the future. Internet self-efficacy was specified as a partial mediator between the four endogenous variables and three endogenous variables. The model chi-square along with Hu and Bentler's (1999) dual criteria for alternate fit statistics were used to assess model fit.

Although the alternate fit indices approached the criteria established by Hu and Bentler (1999), the chi-square for the predicted model was statistically significant, $\chi^2(df = 7) = 20.05$, $p = .01$, CFI = .95, SRMR = .07. An inspection of the Lagrange Multiplier test indicated that allowing three of the exogenous variables related to the measures of one's motivation to take an active role in one's health care to co-vary would significantly improve model fit. Given the conceptual relationship between

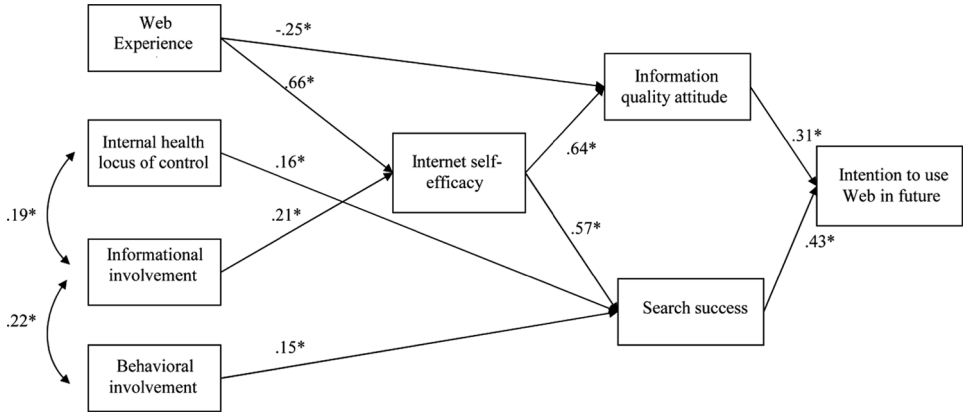

Figure 2 Final Model of Internet Self-Efficacy with Significant Path Coefficients ($N = 151$). $^{*}p < .05$. $\chi^2(df = 5) = 6.67$, $p = .25$, CFI = .99, SRMR = .03, RMSEA = .05, NNFI = .97. *Note.* CFI = Comparative Fit Index, SRMR = Standardized Root Mean-Square Residual, RMSEA = Root Mean-Square Error of Approximation, NNFI = Non-Normed Fit Index.

these constructs, error covariances were included between internal health locus of control and informational involvement and between informational involvement and behavioral involvement, and the model was re-run. The revised model fit the data adequately, $\chi^2(df = 5) = 6.67$, $p = .25$, CFI = .99, SRMR = .03. The revised model, displaying all significant paths, is depicted in Figure 2.

As illustrated in Figure 2, Web experience and informational involvement were both positively associated with Internet self-efficacy, which in turn was positively associated with information quality attitude and search success. Internal health locus of control and behavioral involvement, however, were not significantly associated with Internet self-efficacy. Additionally, Internet self-efficacy was not directly related to intentions to use the Web in the future. It is also noteworthy that, contrary to expectations, Web experience was negatively associated with information quality attitude.

Asymmetric distribution of products tests (MacKinnon, Lockwood, Hoffman, West & Sheets, 2002) were performed to examine the indirect effects and, thus, determine the role of Internet self-efficacy as a partial mediator of the exogenous and endogenous variables.[4] This test fits in the broader class of "products of coefficients" approaches for testing mediation and uses asymmetric confidence intervals (for a detailed review of this test, see MacKinnon et al., 2002 or MacKinnon, Lockwood, & Williams, 2004). In brief, *z*-statistics were computed for the paths from the exogenous variables to the mediator and from the mediator to the endogenous variables. The *z*-values were used to find upper and lower critical values in Meeker, Cornwell, and Aroian's (1981) table of critical values for the product of two random variables. These critical values were then used to construct the upper and lower limits of the 95% confidence interval around the indirect effect.[5] There is evidence of mediation when the confidence interval around the indirect effect does not include zero.

The results of the asymmetric distribution of products tests are displayed in Table 2. Internet self-efficacy served as a partial mediator of the relationships between two

Table 2 Test of Internet Self-Efficacy as a Partial Mediator between Health and Web Use Variables and Information Seeking Processes and Outcomes ($N = 151$)

Relationship	Unstandardized indirect effect	*95% CI*
Web experience-ISE-Information quality attitude	.30	.20/.41
Web experience-ISE-Search success	.38	.24/.54
Web experience-ISE-Intention to use Web	−.04	−.25/.17
IHLOC-ISE-Information quality attitude	.01	−.05/.09
IHLOC-ISE-Search success	.02	−.07/.10
IHLOC-ISE-Intention to use Web	.00	−.02/.01
Informational involvement-ISE-Information quality attitude	.11	.04/.18
Informational involvement-ISE-Search success	.13	.04/.24
Informational involvement-ISE-Intention to use Web	−.02	−.09/.06
Behavioral involvement-ISE-Information quality attitude	−.06	−.13/.02
Behavioral involvement-ISE-Search success	−.07	−.17/.04
Behavioral involvement-ISE-Intention to use Web	.01	−.03/.06

Note. ISE = Internet self-efficacy. IHLOC = internal health locus of control. Unstandardized indirect effects were computed by multiplying the unstandardized values for the exogenous variable-mediator and mediator-endogenous variable paths. Evidence for mediation is present when the confidence interval does not include zero.

exogenous variables and one of the outcome variables. In particular, the indirect effects from Web experience through Internet self-efficacy to information quality attitude and from informational involvement through Internet self-efficacy to information quality attitude were greater than zero. Additionally, the results show that Internet self-efficacy actually completely mediated the relationships between Web experience and perceived search success as well as between desire for informational involvement and perceived search success. As illustrated in Table 1, the zero-order correlations between these variables are statistically significant. Further, although the direct paths from both Web experience and informational involvement to search success were not significant, the indirect effects from these two variables through Internet self-efficacy to search success were greater than zero. These results demonstrate complete mediation. Finally, a number of the indirect effects were not significant. The indirect effects from internal health locus of control and behavioral involvement to the three endogenous variables through Internet self-efficacy were not different from zero. Additionally, the indirect effects from the four endogenous variables to intentions to use the Web in the future for health information through Internet self-efficacy were not different than zero.

Discussion

The results of this study provide evidence that Internet self-efficacy plays a noteworthy role in the use of the World Wide Web to acquire health information.

Internet self-efficacy partially or completely mediated the relationships between variables related to one's health and Web use and information-seeking processes and outcomes. In particular, Internet self-efficacy partially mediated the relationship between respondents' desire for informational involvement and their attitudes about the quality of information available online, and completely mediated the relationship between desire for informational involvement and perceived search success. An increased desire for informational involvement fostered feelings of Internet self-efficacy and, in turn, greater perceived search success and more positive attitudes about the quality of health information available online. The link between desire for informational involvement and Internet self-efficacy is important because the Web is especially well suited for those who are motivated to play an active role in their health care. The Web offers unparalleled control over the information-acquisition process (Brashers et al., 2002; Dutta-Bergman, 2004). Unlike passively receiving information from other media, individuals using the Web can actively manage the information to which they are exposed and acquire information specific to their unique situation or identify alternate (and even competing) perspectives. Internet self-efficacy makes it possible for those who want to be involved in their health to benefit from using the Web.

Additionally, Internet self-efficacy partially mediated the relationship between Web experience and respondents' attitudes about the quality of health information available on the Web, and completely mediated the relationship between experience and the perceived success of a recent information search. The former finding is particularly noteworthy because the direct path from Web experience to attitudes about information quality was significant and negative; those who had more experience had less positive attitudes about the quality of health information available online. However, when accounting for Internet self-efficacy, the indirect effect indicates that experience is positively related to perceptions about the quality of information available. Those who have experience using Web may achieve positive health outcomes—if they have confidence in their ability to use the Web.

Taken as a whole, this research provides some evidence of the important role perceived efficacy may play in Web use and, ultimately, patient empowerment. Simply having access to the Web or using it does not guarantee that individuals' will have a positive experience online or acquire useful information. Would-be health information seekers face a number of potential challenges when venturing online to acquire health information ranging from understanding how to operate a computer to successfully locating useful information on the multitude of websites available. Even for those who are experienced using the Web or have a desire to be involved in their health care, a sense of efficacy is critical in overcoming such barriers and achieving positive outcomes.

The results also suggest that it would be worthwhile to consider Internet self-efficacy in contemporary models of health information seeking like the CMIS (Johnson & Meischke, 1993) and the UM (Brashers, 2001). The CMIS was developed prior to the mass diffusion of personal computers and the Internet and has traditionally been applied to mass media such as magazines (Johnson & Meischke, 1993).

In adapting the CMIS to predict perceptions and use of new communication and information technologies like the Internet, individuals' sense of efficacy to use the technology may be especially important. One's confidence in one's ability (or a lack of it) could foster (or undermine) use of the technology for health information—despite a need to acquire health information and perceptions that the technology is a useful resource. Similarly, Internet self-efficacy may serve as a scope condition for Brashers's UM theory. A sense of Internet self-efficacy may be a pre-condition for one to venture online and be able to successfully find information that decreases or increases one's level of uncertainty.

For practitioners, Internet self-efficacy is a particularly critical issue to consider when advocating Web use. Efficacy perceptions may distinguish those who are and are not able to achieve positive outcomes from using the Internet. Moreover, the relationship between efficacy perceptions and the success of searches underscores the need for computer training. Especially for groups such as the elderly who have experienced difficulties using computers and the Internet (Adams, Stubbs, & Woods, 2005), training may be essential to foster efficacy perceptions and, thus, the potential for information seekers to feel a sense of control over and involvement in their health care.

In addition to examining the significant relationships in the model, it is also worthwhile to consider those instances when tests of Internet self-efficacy as a partial mediator were not significant. Although internal health locus of control and desire for behavioral involvement were directly associated with perceptions of search success, the indirect effects involving these variables and Internet self-efficacy were not significant. One difference between these two measures and the measure of desire for informational involvement is that the latter measure specifically taps one's desire to acquire information directly relevant to one's health. The other two measures are either substantially more general (as in internal health locus of control) or focused on taking action to care for one's self (as in desire for behavioral involvement). It also seems possible that the measure of informational involvement may, more so than other measures, reflect an individual's level of comfort with uncertainty. Additionally, Internet self-efficacy did not partially mediate the relationship between the four exogenous variables and intentions to use the Web in the future nor were any of the exogenous variables related to intentions to use the Web in the future. One explanation for this finding may be a restriction in range associated with the measure of behavioral intention; however, intentions to use the Web in the future were associated with both attitudes about information quality and perceived search success, suggesting that this may not be a major concern.

The limitations of this study also warrant consideration. Although the sampling procedure made it possible to gain access to a sample that is representative of the population of individuals using the Web to acquire medical information, the procedure was not random. This makes it difficult to make any definitive causal claims from these data. However, the model is rooted in previous research and theorizing concerning health information seeking and Internet self-efficacy. A second limitation is that search success and intentions to use the Web in the future were

measured with single items. Use of single-item measures prevents an estimate of internal consistency and raises questions about construct validity; yet, the items have face validity and Wanous, Reicher and Hudy's (1997) research suggests that the use of single items "should not be considered fatal flaws" (p. 251). A final limitation of this study worth noting is that only a limited set of factors that may influence, or be influenced by, Internet self-efficacy were included in this study. Additional variables that could be examined are discussed in the following section addressing directions for future research.

The results of this study suggest some important directions for future research on health information seeking and patient empowerment. First, scholars should examine behavioral outcomes of Internet self-efficacy in the context of acquiring health information on the Web. Perceptions of efficacy may play a role in the confidence individuals have about the information they find online. Those with a greater sense of efficacy may be more confident in the information they acquire online and, in turn, the information may have a greater influence on their health behaviors. Additionally, the results of this study underscore the importance of examining other potential barriers facing information seekers. It would worthwhile for scholars to explore issues associated with information overload and consumers' website evaluation skills. Both of these factors have the potential to create substantial challenges for patient empowerment (Cline & Haynes, 2001). Finally, it is likely that there are other factors that could influence, and be influence by, perceptions of Internet self-efficacy. Variables like one's perception of uncertainty (Brashers, 2001), the degree to which a health threat is salient (Johnson & Meischke, 1993), or the perceived outcomes associated with acquiring health information (Afifi & Weiner, 2006) play a central role in theories of health information acquisition and, as such, warrant consideration in future research on Internet self-efficacy.

Notes

[1] It should be noted that this study does not represent a formal test of the CMIS. Instead, the CMIS is used to inform the exogenous and endogenous variables examined in this study. Additionally, because the CMIS focuses on predicting media use in the context of one specific health condition, the variables used for this study were adapted to reflect a more general approach to health information-seeking behavior that is not tied to one specific health condition.

[2] It should also be noted that the Web-based survey tool made it possible to examine the time at which a respondent accessed the questionnaire, the time the questionnaire was completed, and the respondent's IP address. Each of these features was reviewed in an attempt to attempt to identify any suspicious questionnaires; none were found.

[3] Factor loadings for items in the health locus of control measure and behavioral involvement sub-scale were lower than desirable ($<.40$). However, these items were retained because both measures are well established and have been used fairly frequently in research related to health communication. Further, both of the measures fit the sample data adequately.

[4] Although Holbert and Stephenson (2003) recommend using the distribution of products analysis to test for mediation in SEM, the asymmetric distribution of products test was used in this study because it performs better in those situations where the two paths corresponding

to the mediating variable (exogenous variable-mediator, mediator-endogenous variable) are of different magnitudes (large, zero; small, large; etc.) (MacKinnon et al., 2002). In these instances, the differences between the Type I error rates for the asymmetric distribution of products test and the distribution of products test are quite substantial; the distribution of products test results in inflated Type I error rates. Given that the many of the paths in this study from the exogenous variables to the mediator and from the mediator to the endogenous variables are not of the same magnitude, the asymmetric distribution of products test provides a more conservative estimate of the mediating effects of Internet self-efficacy.

[5] Upper and lower confidence limits were constructed using the following formulae from MacKinnon et al. (2004):

Upper confidence limit $= \alpha^{*}\beta +$ Meeker Upper Limit $^{*}\sigma_{\alpha\beta}$

Lower confidence limit $= \alpha^{*}\beta +$ Meeker Lower Limit $^{*}\sigma_{\alpha\beta}$

α refers to the exogenous-mediator path, β refers to the mediator-endogenous path, and $\sigma_{\alpha\beta} = \sqrt{\alpha^2\sigma_\beta^2 + \beta^2\sigma_\alpha^2}$

References

Adams, N., Stubbs, D., & Woods, V. (2005). Psychological barriers to Internet usage among older adults in the UK. *Medical Informatics and the Internet in Medicine*, *30*, 3–17.

Afifi, W. A. & Weiner, J. L. (2004). Toward a theory of motivated information management. *Communication Theory*, *14*, 167–190.

Afifi, W. A. & Weiner, J. L. (2006). Seeking information about sexual health: Applying the theory of motivated information management. *Human Communication Research*, *32*, 35–57.

Anderson, J. G. (2004). Consumers of e-health: Patterns of use and barriers. *Social Science Computer Review*, *22*(2), 242–248.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.

Bennett, N. L., Casebeer, L. L., Kristofco, R. E., & Strasser, S. M. (2004). Physicians' information-seeking behaviors. *Journal of Continuing Education in the Health Professions*, *24*, 31–38.

Berland, G. K., Elliott, M. N., Morales, L. S., Algazy, J. I., Kravitz, R. L., Broder, M. S., Kanouse, D. E., Munoz, J. A., Puyol, J. A., Lara, M., Watkins, K. E., Yang, H., & McGlynn, E. A. (2001). Health information on the Internet. Accessibility, quality, and readability in English and Spanish. *Journal of the American Medical Association*, *285*, 2612–2621.

Brashers, D. E. (2001). Communication and uncertainty management. *Journal of Communication*, *51*, 477–497.

Brashers, D. E., Goldsmith, D. J., & Hsieh, E. (2002). Information seeking and avoiding in health contexts. *Human Communication Research*, *28*, 258–271.

Broom, A. (2005). Virtually healthy: The impact of Internet use on disease experience and the doctor-patient relationship. *Qualitative Health Research*, *15*, 325–345.

Busch, T. (1995). Gender difference in self-efficacy and attitude toward computers. *Journal of Educational Computing Research*, *1*(1), 37–54.

Campbell, R. J. & Nolfi, D. A. (2005). Teaching elderly adults to use the Internet to access health care information: Before-after study. *Journal of Medical Internet Research*, *7*(2). Retrieved December 12, 2005, from http://www.jmir.org/2005/2/e19/

Cline, R. J. & Haynes, K. M. (2001). Consumer health information seeking on the Internet: The state of the art. *Health Education Research*, *16*, 671–692.

Compeau, D. R. & Higgins, C. A. (1995). Application of social cognitive theory to training for computer skills. *Information Systems Research*, *6*, 118–143.

Diaz, J. A., Griffith, R. A., Ng, J. J., Reinert, S. E., Friedmann, P. D., & Moulton, A. W. (2002). Patients' use of the internet for medical information. *Journal of General Internal Medicine*, *17*(3), 180–185.

Dutta-Bergman, M. (2003). Health communication on the Web: The roles of web use motivation and information completeness. *Communication Monographs*, *70*, 264–274.

Dutta-Bergman, M. J. (2004). Primary sources of health information: Comparisons in the domain of health attitudes, health cognitions, and health behaviors. *Health Communication*, *16*(3), 273–288.

Eastin, M. A. & LaRose, R. L. (2000). Internet self-efficacy and the psychology of the digital divide. *Journal of Computer Mediated Communication*, *6*(1). Retrieved July 15, 2004, from http://www.ascusc.org/jcmc/vol6/issue1/eastin.html

Eysenbach, G. (2003). The impact of the Internet on cancer outcomes. *CA: A Cancer Journal for Clinicians*, *53*(6), 356–371.

Eysenbach, G., Powell, J., Kuss., O., & Sa, E. R. (2002). Empirical studies assessing the quality of health information for consumers of the World Wide Web. *Journal of the American Medical Association*, *287*, 2691–2702.

Eysenbach, G., Sa, E. R., & Diepgen, T. L. (1999). Shopping around the Internet today and tomorrow: Towards the millennium of cybermedicine. *British Medical Journal*, *319*, 1294.

Flanagin, A. J. & Metzger, M. J. (2000). Perceptions of Internet information credibility. *Journalism and Mass Communication Quarterly*, *77*, 515–540.

Fox, S. (2006). Online health search 2006. *Pew Internet & American Life Project*. Retrieved December 1, 2006, from http://www.pewinternet.org/PPF/r/190/report_display.asp

Fox, S. & Rainie, L. (2002). Vital decisions: How Internet users decide what information to trust when they or their loved ones are sick. *Pew Internet & American Life Project*. Retrieved June 15, 2004, from http://www.pewinternet.org/PPF/r/59/report_display.asp

Goldsmith, D. J. (2001). A normative approach to the study of uncertainty and communication. *Journal of Communication*, *51*, 514–533.

Health Insight. (1999). *A consumer's guide to taking charge of health information*. Retrieved June 16, 2004, from http://www.health-insight.harvard.edu/

Health on the Net Foundation. (2004). *HON code of conduct (HONcode) for medical and health websites*. Retrieved June 16, 2004, from http://www.hon.ch/HONcode

Hong, T. (2006). The Internet and tobacco cessation: The roles of Internet self-efficacy and search task on the information-seeking process. *Journal of Computer-Mediated Communication*, *11*(2). Retrieved March 15, 2006, from http://jcmc.indiana.edu/vol11/issue2/hong.html

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*, 1–55.

Igbaria, M. & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Omega*, *23*, 587–605.

Johnson, J. D. & Meischke, H. (1993). A comprehensive model of cancer-related information seeking applied to magazines. *Human Communication Research*, *19*, 343–367.

Johnson, T. J. & Kaye, B. K. (2002). Webelievability: A path model examining how convenience and reliance on the Web predict online credibility. *Journalism and Mass Communication Quarterly*, *79*, 619–642.

Kivits, J. (2004). Researching the informed patient. *Information, Communication & Society*, *7*(4), 510–530.

Kline, R. B. (1998). *Principles and practice of structural equation modeling*. New York: Guilford Press.

Krantz, D. S., Baum, A., & Wideman, V. M. (1980). Assessment of preferences for self-treatment and information in health care. *Journal of Personality and Social Psychology*, *39*, 977–990.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test the significance of the mediated effect. *Psychological Methods*, *7*(1), 83–104.

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*, *39*(1), 99–128.

Marakas, G., Yi, M., & Johnson, R. (1998). The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research. *Information Systems Research*, *9*(2), 126–163.

MedlinePlus. (2004). *MedlinePlus guide to healthy web surfing*. Retrieved June 16, 2004, from http://www.nlm.nih.gov/medlineplus/healthywebsurfing.html

Meeker, W. Q., Cornwell, L. W., & Aroian, L. A. (1981). *Selected tables in mathematical statistics, Vol. VII: The product of two normally distributed random variables*. Providence, RI: American Mathematical Society.

Morahan-Martin, J. M. (2004). How Internet users find, evaluate, and use online health information: A cross-cultural review. *CyberPsychology & Behavior*, *7*, 497–510.

Nettleton, S., Burrows, R., & O'Malley, L. (2005). The mundane realities of the everyday lay use of the Internet for health, and their consequences for media convergence. *Sociology of Health & Illness*, *27*, 972–992.

Rice, R. E. (2006). Influences, usage, and outcomes of Internet health information searching: Multivariate results from the Pew surveys. *International Journal of Medical Informatics*, *75*(1), 8–28.

Smith, R. A., Wallston, B. S., Wallston, K. A., Forsberg, P. R., & King, J. E. (1984). Measuring desire for control of health care processes. *Journal of Personality and Social Psychology*, *47*, 415–426.

Stephenson, M. T. & Holbert, R. L. (2003). A Monte Carlo simulation of observable- versus latent-variable structural equation modeling techniques. *Communication Research*, *30*, 332–354.

Tabachnick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). New York: HarperCollins.

Taylor, S. & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*, 144–176.

Wallston, K. A., Stein, M. J., & Smith, C. A. (1994). Form C of the MHLC scales: A condition-specific measure of locus of control. *Journal of Personality Assessment*, *63*, 534–553.

Wallston, K. A., Wallston, B. S. & DeVellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health Education Monographs*, *6*, 160–170.

Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *Journal of Applied Psychology*, *82*(2), 247–252.

Williams, P., Nicholas, D., & Huntington, P. (2003). Health information on the Internet: A qualitative study of NHS Direct Online users. *Aslib Proceedings*, *55*(5/6), 304–312.

Wolfe, R. M. & Sharp, L. K. (2005). Vaccination or immunization? The impact of search terms on the Internet. *Journal of Health Communication*, *10*, 537–551.

Zeng, Q., Kogan, S., Ash, N., Greenes, R. A., & Boxwala, A. A. (2002). Characteristics of consumer terminology for health information retrieval. *Methods Information Medicine*, *41*(4), 289–298.