When adults without university education search the Internet for health information: The roles of Internet-specific epistemic beliefs and a source evaluation intervention

Yvonne Kammerer *, Dorena G. Amann, Peter Gerjets

Knowledge Media Research Center, Schleichstraße 6, 72076 Tübingen, Germany

A R T I C L E   I N F O

A B S T R A C T

In the present research, $N = 48$ adults without university education were tasked to conduct two web searches on unfamiliar health-related issues. Three research objectives were examined: the predictive value of individuals' Internet-specific epistemic beliefs for their navigation behavior and post-search decisions in Web Search Task 1; the effects of a short source evaluation intervention on individuals' navigation behavior and post-search decisions in Web Search Task 2; and the effects of the source evaluation intervention on individuals' Internet-specific epistemic beliefs. Results showed that beliefs concerning the justification by multiple sources were positively related to the time spent on reliable objective web pages and to the likelihood to make a post-search decision that was in accordance with the objective pages. Beliefs that the Internet is a reliable knowledge resource were also positively related to the time spent on objective pages as well as to greater certainty in the post-search decision. Second, in Web Search Task 2, the intervention group spent more time on objective web pages, was more likely to make a decision that was in accordance with these pages, and was more certain of their decision than the control group. Third, one week after the intervention, individuals possessed stronger beliefs concerning the justification by multiple sources than before. In conclusion, the present research indicates that both adaptive Internet-specific beliefs and a short source evaluation intervention have positive effects on non-university educated adults' online health information seeking and that their Internet-specific epistemic beliefs can be fostered through such an intervention.

1. Introduction

The Internet has evolved into a major knowledge resource for science-related content, offering easy access to billions of web pages. Particularly in the context of individuals' personal concerns, such as medicine and health care, consulting the Internet increasingly supplements face-to-face interaction with experts (Fox, 2006; Stadtler, Bromme, & Kettler, 2009). According to survey data, more than 70% of Internet users in the United States and Europe look online for health information (Andreassen et al., 2007; Fox & Duggan, 2013), with web searches for a certain medical treatment or certain diets or nutritional supplements being among the most popular topics (Fox, 2006; Vermaas & Wijngaert, 2005). About half of individuals' health web searches are on behalf of someone else's health situation (Fox, 2006; Fox & Duggan, 2013). Online health information seekers typically start their search with a general search engine (e.g., Fox, 2006; Fox & Duggan, 2013). They often focus on the first few search results presented by the search engine (e.g. Eysenbach & Köhler, 2002; Zhang, 2012) and visit between two and five websites during an average search session (Fox, 2006; Huang, Hansen, & Xie, 2012; Vermaas & Wijngaert, 2005; Zhang, Broussard, Ke, & Gong, 2014).

Since anyone can publish virtually any information on the Internet, the purpose and quality of web pages, however, can vary widely. Whereas the primary purpose of *objective* websites (e.g. from official health institutions) is presumably the provision of unbiased information that is based on scientific evidence, *subjective* websites (e.g. online health forums) primarily serve to exchange personal opinions and experiences, and *commercial* websites (e.g. provided by health or pharmaceutical companies or supplements shops) use information to promote or sell products or services (cf. Kammerer & Gerjets, 2012; Tate, 2010). Accordingly, unscientific and (intentionally or unintentionally) misleading health websites are as common as those providing factual, high-quality information (Bates, Romina, Ahmed, & Hopson, 2006). Thus, health

* Corresponding author. Tel.: +49 7071 979 224.
E-mail address: y.kammerer@iwm-kmrc.de (Y. Kammerer).

information seekers themselves are responsible for identifying reliable websites and to distinguishing them from less reliable ones (e.g., Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012). Existing empirical evidence whether they actually engage in such evaluation behaviors, however, is inconsistent. While some studies indicate that health information seekers indeed prefer sites run by reputable organizations and distrust websites that sell products or that are sponsored by pharmaceutical companies (Sillence, Briggs, Harris, & Fishwick, 2007; Zhang, 2012), others report that many individuals fail to distinguish trustworthy from less trustworthy websites during their health web searches (Bates et al., 2006; Eysenbach & Köhler, 2002; Ivanitskaya, O'Boyle, & Casey, 2006).

Previous research provides first indications that sophisticated Internet-specific epistemic beliefs – i.e., individuals' personal beliefs about what knowledge and knowing is like on the Internet – positively predict critical online search and evaluation behaviors (Kammerer, Bråten, Gerjets, & Strømsø, 2013; Kammerer & Gerjets, 2012). Another line of research shows that interventions about how to critically evaluate and use different information sources on the Internet also have the potential to improve Internet users' information-seeking and source-evaluation strategies (e.g., Argelagós & Pifarré, 2012; Braasch, Bråten, Strømsø, Anmarkrud, & Ferguson, 2013; Gerjets & Hellenthal-Schorr, 2008; Mason, Junyent, & Tornatora, 2014; Walraven, Brand-Gruwel, & Boshuizen, 2010; Wiley et al., 2009). Furthermore, such source evaluation (or web search) interventions, in turn, might also have the potential to change individuals' epistemic beliefs, as indicated by a third line of research (Tsai, 2008).

The present paper aims at expanding all three lines of research by examining a target group that has received little attention so far, despite representing a considerable percentage of people who gather health information online (cf. Fox & Duggan, 2013): adults without a university background (hereafter also referred to as *non-university educated adults*). This population was selected since their formal education has probably not provided them with the skills to use the Internet for science-related purposes, and they are likely to experience particular difficulties in gathering scientifically sound health information on the Internet. In Germany, where the present research was conducted, for example, less than 30% of the 25–64 year-olds have attained tertiary education (OECD, 2013). Thus, non-university educated adults can be considered a highly important target group.

1.1. Epistemic beliefs

When using the Internet to seek information about an unfamiliar topic, individuals have to make their own decisions about which information to access, evaluate its veracity, and consider whose authority to accept (Hofer, 2004). Hofer (2004) and Tsai (2004) were among the first to postulate that such evaluation processes are associated with one's epistemic beliefs – in other words, an individual's personal conceptions about the nature of knowledge and knowing (Hofer & Pintrich, 1997). More recently, Bråten, Britt, Strømsø, and Rouet (2011) proposed a model that specifies how and why different epistemic belief dimensions (i.e., justification for knowing, source of knowledge, certainty of knowledge, and simplicity of knowledge, cf. Hofer & Pintrich, 1997) might facilitate or impair the processing and evaluation of multiple texts (e.g. multiple websites). For instance, the model postulates that individuals who believe knowledge claims must be justified through reason, rules of inquiry, and the evaluation and integration of multiple sources increasingly try to evaluate the documents' sources and to corroborate information between different sources as compared to individuals who do not feel this need. The model also postulates that individuals who believe that knowledge is transmitted by experts rather than constructed by the self when

learning about rather unfamiliar topics increasingly distinguish more and less trustworthy sources and give prominence to trustworthy information in their overall representation of the issue (Bråten et al., 2011).

1.1.1. The role of Internet-specific epistemic beliefs during web search

When investigating the role of epistemic beliefs during web search, Bråten, Strømsø, and Samuelstuen (2005) suggested focusing specifically on epistemic beliefs related to the Internet as a particular type of knowledge resource due to its specific characteristics, such as the absence of editorial gatekeeping and the great heterogeneity of information sources. To measure Internet-specific epistemic beliefs, they developed the *Internet-Specific Epistemological Questionnaire (ISEQ)* that was designed to assess two dimensions concerning what knowledge on the Internet is like (i.e., certainty of knowledge and simplicity of knowledge) and two dimensions concerning how one comes to know something by using the Internet as a knowledge resource (i.e., source of knowledge and justification for knowing). However, Bråten et al. (2005) empirically found only two dimensions. The first dimension (labeled *general Internet epistemology*) addressed the degree to which students' believed that the Internet is a reliable knowledge resource that contains correct and detailed expert information about what they are studying. The second dimension (labeled *justification for knowing*) addressed students' beliefs concerning the need for critical evaluation of study-related knowledge claims encountered on the Internet through the use of multiple information sources, reasoning, and prior knowledge activation.

Bråten et al. (2005) correlated university students' Internet-specific epistemic beliefs with self-reports on their search and evaluation behavior when searching for study-related issues. Results indicated that students with strong beliefs that the Internet is a reliable knowledge resource that contains correct and detailed information were reportedly more competent and experienced less problems when conducting web searches, evaluating information sources, and using the retrieved information in their course-work than were students who had doubts about this issue. In a similar study, Strømsø and Bråten (2010) found a positive relationship between beliefs that knowledge claims encountered on the Internet need to be checked against other information sources, reason, and prior knowledge on the one hand, and the reported use of self-regulatory strategies (such as planning, monitoring, and regulating cognition and performance) during web search on the other. Furthermore, Lee, Chiu, Liang, and Tsai (2014) showed that such beliefs were positively related to high-school students' reported use of search engines and expert websites to solve academic problems. Beliefs that the Internet provides a wealth of detailed information were also positively related to such reported web search strategies (Lee et al., 2014).

Whereas the research outlined above correlated Internet-specific epistemic beliefs with self-report data, Kammerer and Gerjets (2012) and Kammerer et al. (2013) examined the relationship between Internet-specific epistemic beliefs and more direct measures of search and evaluation processes (i.e., by means of eye-tracking data, log files, and verbal protocols) while using a search engine to learn about a conflicting medical topic. Kammerer and Gerjets (2012) found that the stronger university freshmen's epistemic beliefs that the Internet is a reliable knowledge resource, the more objective (i.e., scholarly, factual) websites they accessed during their web search. Kammerer et al. (2013) found that university students with stronger epistemic beliefs that the Internet is a reliable knowledge resource were more certain about their post-search decisions, that is, about which of two therapies to recommend to a fictitious friend. However, the results also indicated that students with such beliefs verbally reflected less on the nature or credibility of different kinds of information sources (e.g., forum