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OLDER ADULTS' ONLINE HEALTH INFORMATION-SEEKING AND DIAGNOSTIC REASONING: A MIXED METHODS INVESTIGATION

by

Tana Marie Luger

An Abstract

Of a thesis submitted in partial fulfillment
of the requirements for the Doctor of
Philosophy degree in Psychology
in the Graduate College of
The University of Iowa

July 2012

Thesis Supervisor: Professor Jerry M. Suls

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ABSTRACT

Prior research has indicated that laypeople construct mental representations of physical symptoms in order to attempt to understand illness (e.g., Leventhal, Safer, Panagis, 1983; Leventhal & Contrada, 1987; Lau, Bernard, & Hartman, 1989). These "illness representations" are influenced by prior experience with and prior knowledge about illness as well as efforts to seek additional information through social channels or media. More and more, the internet is a prominent source of health information, especially for older adults (aged 50 year and up). Yet, few studies have systematically examined how older adults search for health information online. Similarly, recent trends in healthcare such as health consumerism assume that patients will be more empowered if they have access to more information. However, little has been done to investigate whether patients, in fact, feel more empowered after acquiring online health information.

The current study examined the online health information seeking of older adults (N = 79) in order to determine the cognitive and diagnostic processes that older adults use to acquire information. Older adults read a vignette which depicted one of two common illnesses and then were asked to "think-aloud" while they attempted to diagnose the illness. Older adults then diagnosed the illness using either a traditional search engine (Google) or popular self-diagnosis tool (WebMD Symptom Checker), and answered questions about illness representations, cognitive effort, web interactivity, and feelings of empowerment after the search.

Quantitative results showed inconsistent change in illness representations. Plausible reasons for a lack of findings are discussed. Participants who used WebMD perceived greater cognitive effort while using the computer program than those who used Google, and participants who were inaccurate in their diagnosis perceived greater cognitive effort of diagnosing than those who were accurate. Accuracy was unrelated to perceived interactivity, age, or search method. Participants 50-64 years old found a new

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version of WebMD to be less interactive than Google. In contrast, participants 65 years or older perceived no difference in interactivity depending upon search method. In terms of empowerment, participants who used Google perceived greater choice than WebMD. There were no differences in feelings of competence depending upon search method.

Qualitative results showed that participants spent the majority of time navigating the computer and processing health information. Most participants diagnosed the illness by eliminating diseases whose symptoms did not match the symptoms of the illness vignette. Participants tended to visit commercial health websites such as Everyday Health and begin their information search by typing a vignette symptom into the search bar. Participants who were 65 years or older were less confident about their diagnosis than 50-64 year old participants. Finally, participants who used Google to diagnose were more likely to comment about the credibility of the information found when compared to those who used WebMD.

The current study found no change in illness representations after an online information search. However, this produces questions as to the amount of time in which the layperson constructs his/her illness representation. In addition, few differences in interactivity, accuracy, or empowerment were found between an online health information search conducted with a search engine as compared to a self-diagnosis tool. However, individual differences suggest that different age cohorts may prefer information to be presented in different ways which could influence web design. Further studies in human-computer interaction and health cognition may be able to answer the questions that arose.

Abstract Approved: ______________________________
Thesis Supervisor

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CERTIFICATE OF APPROVAL

PH.D. THESIS

This is to certify that the Ph.D. thesis of

Tana Marie Luger

has been approved by the Examining Committee
for the thesis requirement for the Doctor of Philosophy
degree in Psychology at the July 2012 graduation.

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It has often been said that the Internet is starting to provide the largest library humankind has ever had. As true as this may be, the Internet is also the messiest library that ever has existed.

—Gary Marchionini and Hermann Mauer
The Roles of Digital Libraries in Teaching and Learning

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CHAPTER 1: INTRODUCTION

Primary Goals

Since its dissemination to the general public in the mid-1990's, the internet has changed the way that people communicate and access information (Norman, 2008) by increasing the speed and convenience of information exchange (McMullan, 2006). In particular, myriad websites and e-tools have been developed to provide people with health information, and many researchers have conducted descriptive studies of online health information-seeking behavior (e.g., Eysenbach & Diepgen, 1999; Cline, 2001; Cotton & Gupta, 2004; Hilt & Lipschultz, 2004; McMillan, Avery, & Macias, 2008). Yet, little is known about how the increased health information available affects the layperson's thoughts and behaviors toward his/her health.

In the current paper, we will examine online health information-seeking behavior from a variety of lenses. First, we will establish the primary framework that guides our inquiry: self-regulation theory and the common-sense model of illness. Then, we will apply theories and methodologies from the field of human-computer interaction to the health domain, defining different methods of online search and how we hypothesize these search methods might affect health cognitions. Next, we will place online health information-seeking within the context of a current trend in health care: consumer empowerment. Finally, we will discuss results of a mixed methods (both quantitative and qualitative) study designed to investigate these topics. In particular, the study focuses on a population little studied in the domain of online health information-seeking: older adults.

Self-Regulation and the Common-Sense Model

Self-regulation has been studied in various fields including social cognitive psychology, education, and cybernetics. In all fields, "self-regulation" refers to the ability to set goals, select behavior to attempt to achieve those goals, and self-monitor to

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determine whether the goals are successful. In order to elucidate behavioral self-regulation, Carver and Scheier (2000) liken personal behavior to the Test-Operate-Test-Exit or TOTE model of cybernetics. In this model, a system *tests* its current state against a normative value (or baseline), *operates* to move its state closer to the reference value, *tests* the current state again, and continues the process until the current state is deemed significantly close to the normative value so the process can be stopped (*exit*). Similarly, when a person recognizes a physical symptom (*tests*), s/he must decide what behaviors to undertake (*operates*) with the goal of returning to a baseline state (*exit*). This process of regulation in the context of illness has been dubbed the common-sense model of illness (Leventhal, Brisette, & Leventhal, 2003).

The common sense model is based on the premise that the person is an "active problem solver" (Leventhal, Meyer, & Nerenz, 1980; Leventhal & Cameron, 1987; Bishop, 1991; Suls, Martin, & Leventhal, 1997; Leventhal, Leventhal, & Contrada, 1998). First, the layperson constructs a representation or knowledge and belief schema about the health threat. This representation then influences the particular coping or action plan that the person selects to deal with the health threat. Finally, the person appraises whether the coping plan was successful in reducing the threat. In the following pages, each stage will be discussed in more detail.

Representation

When constructing a mental representation, the layperson first begins by identifying a health threat (Leventhal, Safer, Panagis, 1983). This threat can be internal, such as the identification of physical symptoms, or external such as information about a local outbreak of illness. The perception of a health threat can also be generated by a person's self-concept (Leventhal et al., 1998). For example, a person may perceive themselves as vulnerable to an illness because of their age or family medical history. This can then stimulate sense-making of the threat.

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In general, the health threat is processed in two different ways: an *objective-cognitive* process as well as a *subjective-emotional* process which combine to form the overall representation. These methods have been deemed the "Dual-Process or Parallel-Response Model" and are theorized to function independently (i.e., a health threat can produce an objective response or a subjective response) as well as interact (i.e. a subjective response can influence an objective response and vice versa). In the *subjective-emotional* process, emotional reactions such as fear or depression are generated in response to the threat. These emotions stimulate certain coping plans to manage the emotions produced.

The *objective-cognitive* process combines both episodic memory and semantic memory in constructing the representation (Leventhal et al., 1983; Leventhal & Cameron, 1987). Episodic memory refers to past experiences with the health threat. For example, this can refer to individual experiences with the physical symptoms of the illness or memories about friends and family members' experiences. In contrast, semantic memory relates to general knowledge about an illness concept. For example, a person may know from past conversations with his/her physician that a poor diet can influence cardiac disease. In sum, the layperson combines episodic memories of experiences of a health threat and semantic memories of conceptual knowledge in order to construct a complex representation of the threat. As previously stated, this representation is then used to direct a coping plan to deal with the health problem.

Once constructed, the content of a person's representation can be measured. Both qualitative unstructured interviews and quantitative factor analysis have shown that representations fall into five main domains (Leventhal et al., 2003). First, *identity* refers to the symptoms and names that a person assigns to an illness or health threat. For example, a person may associate chest pain and shortness of breath with a heart attack while another may relate arm pain to the identity of his/her heart attack. Second, *timeline* relates to the duration of the illness. For example, a person might see an illness as an

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acute event that will pass in a short period of time or, conversely, as a chronic condition which will have to be consistently managed. Third, the *cause* of the particular disease is considered. As an example, does the person believe that a heart attack is caused by stress and poor diet or by physical overexertion? Fourth, the person perceives various *consequences* as a result of the illness. After a heart attack, one person may focus on the numerous medications that s/he now has to take while another may see having to change his/her diet as a consequence. Finally, there is a representation of the *control* over the disease or how well the disease can be treated. For example, is the person confident that by taking his/her medication s/he can avoid another heart attack? Researchers have examined the illness representations of a variety of conditions (such as cancer, diabetes, chronic fatigue syndrome, and arthritis) in order to better understand how the layperson approaches the condition (Petrie & Weinman, 1997; Cameron & Leventhal, 2003).

Related to the *identity* of an illness, researchers have found evidence of a *symmetry rule* of illness representation (Lau, Bernard, & Hartman, 1989; Leventhal & Diefenbach, 1991). When a person perceives physical symptoms, s/he automatically attempts to label the symptoms. Leventhal and Diefenbach (1991) state that linking symptoms to labels is an automatic process in which the person refers to previously constructed schema of illness. These schemas are theorized to be based partially upon prototypical or idealized representations of illness (Bishop & Converse, 1986; Bishop, 1991) as well as past experiences with illness as previously discussed.

Another element of the *symmetry rule* is that when provided with labels, people will search for physical symptoms that match. For example, Baumann and colleagues (1989) discovered that when provided false-feedback of elevated blood pressure (a label of hypertension), participants reported more perceived symptoms of hypertension (like dizziness or increased heart rate). Similarly, Meyer, Leventhal, and Gutmann (1985) found that although patients had been told by their physicians that there are no definitive symptoms of hypertension, they still attributed certain symptoms (like headache or

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flushed cheeks) to their blood pressure when they were told their blood pressure was raised. The *symmetry rule* is consistent with a main tenet of the common-sense model that people are motivated to actively interpret illness information. This is seen even in the absence of objective information (such as a lack of hypertension symptoms) and conclusions can be distorted by this drive to seek and interpret illness information.

In sum, the layperson actively constructs a cognitive representation of an illness in order to determine appropriate action. The representation is influenced by emotional reactions, past experiences with illness, and general knowledge of illness. Physical symptoms are compared to a previously constructed illness representation in order to interpret physical illness, but the representation that the layperson holds can similarly encourage symptom-seeking even in the absence of objective symptoms.

Coping and Action

According to Leventhal and colleagues, coping procedures are thoughts and behaviors used by the layman to promote health, prevent illness, and treat disease (Leventhal et al., 1998). The particular actions or coping strategies selected to deal with a health threat are influenced by a person's particular representation (Leventhal & Cameron, 1987; Leventhal et al., 1998). This has been likened to an "if-then" rule in which the coping strategy selected ("then") is derived conditionally from the content of the illness representation ("if"). As a result, two people with the same symptoms may select different methods of coping due to differences in their representations.

As a framework, illness representations have been used to explain differences in lay illness behavior. For example, Cameron, Leventhal, and Leventhal (1993) found that people seeking medical care were more likely to have developed a specific label for their symptoms, believed their symptoms to be more serious, and perceived a greater increase in severity of symptoms than did matched-controls. Similarly, Mora and colleagues (2002) found that symptoms perceived to be more severe and lasting for a longer duration

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were more likely to be associated with care-seeking. Results of both studies suggest that the content of the care-seekers' representations led to a coping strategy selection of "seek medical care."

More evidence for the link between illness representations and coping procedures has been seen in the care for specific health conditions. For example, Horne and colleagues (2000) found that patients who did not experience symptoms "typical" of a heart attack (such as chest pain) were more likely to delay seeking care. In addition, if patients did not experience the symptoms that they expected to accompany a heart attack, they showed longer delays before seeking care. In this case, the coping strategy selected was "to wait and see" because the symptoms presenting did not match with the patient's representation of a heart attack. In some cases, a person's illness representation can even impact the care prescribed by a physician. Macfarlane et al. (1997) found that patients who believed that their respiratory illness was caused by infection were more likely to request antibiotics from their physician. Thus, patients based their idea of an appropriate treatment on their representation of the cause of their illness and communicated such to their physicians. Most surprising, Macfarlane found that physicians were more likely to prescribe antibiotics to patients who asked for them even if the physician did not believe that antibiotics were warranted. Therefore, the pressure that patients put on their physician, stemming from their illness representation, resulted in a treatment that may not have been necessary.

Specifically, knowing a person's illness representation for a particular condition can help to predict the person's subsequent behavioral intentions regarding the condition, and thus, his/her health behaviors (Leventhal et al., 2003; Myers, 2003; Martin, Rothrock, Leventhal, & Leventhal, 2003). For example, Mancuso et al. (2001) found that patients who believed that their asthma could be cured were more likely to use urgent care (such as being hospitalized or visiting the emergency department) than those who did not have this expectation. This could indicate that patients who believe in a cure for asthma do not

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treat it as a chronic condition. Thus, these patients may not see a need to engage in appropriate preventive behaviors (like adhering to a medication regimen), resulting in increased urgent care use.

Evidence shows that people utilize various decision rules when determining what coping strategy is appropriate for the symptoms in question (Leventhal & Diefenbach, 1991; Diefenbach & Leventhal, 1996). These decision rules can affect the construction of the illness representation as well as the coping strategy selected. For example, the *stress-illness rule* dictates that if ambiguous symptoms appear simultaneously with stressful life events, people are likely to interpret the symptoms as stress-related rather than to illness (Bishop, 1991; Cameron et al., 1993; Leventhal & Crouch, 1997; Leventhal et al., 2003). As evidence for this, Baumann and colleagues (1989) asked undergraduates to rate whether a physical symptom was due to stress or illness. Students who rated symptoms on the day before a psychology midterm (an environmental stressor) were more likely to attribute the symptoms to stress when compared to students who rated earlier in the semester. This suggests that the context in which a person is making sense of illness can affect his/her interpretation (Baumann et al., 1989). In addition, people may be more likely to discount symptoms of illness if they are experiencing stressors at the same time.

There are certain decision rules that are likely to influence the representations and coping strategies of older adults. For example, Prohaska and colleagues (1985) discovered that older adults were less likely than young or middle-aged adults to attribute weakness or aches to illness. Further investigation showed that older adults were more likely to associate symptoms with aging rather than illness when compared to young and middle-aged adults (Prohaska et al., 1987). In addition, all age groups were more likely to attribute mild symptoms to aging rather than illness as compared to severe symptoms. These findings provided the basis for the *age-illness rule* or that people are more likely to explain mild symptoms as a consequence of normal aging rather than illness (Leventhal

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& Crouch, 1997). Again, the personal context of symptom presentation appears to influence the construction of representations and coping process. Older adults, who may experience aches and other mild symptoms on a daily basis, would be less quick to consider such symptoms as indicating illness and requiring action. In addition, older adults have more experience with illness and illness information due to the simple fact that they have lived longer (Leventhal & Crouch, 1997). Therefore, their illness representations are constructed differently than those of younger adults. Furthermore, E. Leventhal and colleagues (1993) found that older adults delayed less time before deciding that they were ill and seeking medical care than other age groups. Leventhal et al. explained this difference as a *conservation rule*: older adults would prefer to conserve their cognitive resources and leave the diagnostics to providers. Thus, older adults may want to avoid interpreting ambiguous symptoms entirely and simply consult with a physician. It is evident that age is a factor that influences the interpretation of symptoms and selection of coping strategies. Thus, further investigation of the illness representations of older adults as a unique group seems warranted.

In summary, people are influenced by their illness representations when selecting an action or coping strategy to deal with illness. The content of a person's illness representation can be predictive of their behavioral intentions, making representations useful to study when attempting to predict or influence health behavior. Finally, various decision rules may aid in the construction of illness representations and influence the particular illness coping behavior chosen which also can help predict health behavior.

Appraisal

Once a person has selected and implemented the particular coping strategy derived from their illness representation, they appraise the selected strategy or determine whether it has been successful (Leventhal & Cameron, 1987). People appraise coping strategies by comparing the actual outcome of the coping strategy to their expectations of

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what should occur. For example, people have expectations about the amount of time that a strategy should take to work (Leventhal et al., 1998). They expect that certain strategies, such as taking a lozenge for a cough, should produce results in a short amount of time while other strategies, like chemotherapy for cancer, may take longer to be effective. Thus, a person will wait the expected amount of time before deciding whether the strategy is a success or whether another strategy should be implemented.

Similarly, people also hold expectations about the dose-response of a strategy or the amount needed to produce an effect (Leventhal et al., 1998). For example, a person may think that an antibiotic has effectively treated a disease when his/her symptoms are no longer present. However, a dose of antibiotics must be taken longer than symptoms are present to ensure that the infection does not return. If a person relies on his/her expectation of the dose required to treat the disease, s/he may be prone to recurring infection.

An appraisal can guide the common-sense process in two ways. If the person determines the strategy to be unsuccessful, then another coping strategy can be selected to ameliorate the illness (Leventhal et al., 1998). On the other hand, the person may determine that the representation of the health threat was flawed. S/he can then attempt to reconstruct the illness representation in order to better capture the symptoms and experience with the coping strategy. In short, the final step of the common-sense model is to appraise the success of the previous representation and coping strategy. This appraisal will then guide further representation and action until the person is satisfied with the outcome.

Individual Differences

As previously discussed, personal experiences with and general knowledge of illness can influence representation and selection of coping strategy. There is evidence that personality and affective factors can also influence illness self-regulation. For

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example, research has shown that people who measure high in neuroticism tend to report more health complaints (increased number of symptoms and intensity of symptom experience) than people who measure lower in this trait (Watson & Pennebaker, 1989, 1991; Davidson & Pennebaker, 1996; Contrada & Coups, 2003). Trait neuroticism is associated with increased levels of distress and dissatisfaction in various situations (Watson & Clark, 1984; Costa & McCrae, 1987; Watson & Pennebaker, 1991) and at first, the hypothesis was that these patterns of functioning associated with neuroticism were producing the increased symptoms seen. However, further, more convincing work by Watson and Pennebaker (1989) gave rise to the *symptom perception hypothesis*, which suggests that personality traits can affect how a person attends to and interprets physical symptoms. Thus, people high in neuroticism are more likely to be attentive to their bodily sensations and therefore, more likely to report symptoms. In addition, because neuroticism is associated with increased distress, people high in neuroticism are more likely to interpret minor symptoms as being serious (Watson & Pennebaker, 1989; Howren & Suls, 2011).

Another theory suggests that because people high in neuroticism are more self-focused, they may be more accurate in interpreting bodily sensations (Cameron, Leventhal, & Love, 1998). Therefore, people high in neuroticism are capturing serious symptoms earlier than people who are lower in the trait. This is in contrast to the thought that they are simply misinterpreting non-serious symptoms. In fact, Cameron and colleagues (1998) found that trait anxiety (which is correlated with neuroticism) was associated with increased symptom reporting by breast cancer patients taking tamoxifen but not among patients taking a placebo. This suggests that trait anxiety was facilitating accurate symptom perception among the women, rather than simply increasing symptom reporting in general. Whatever the case, it is well established that people high in neuroticism view symptoms differently than those lower in the trait and this likely affects the construction of their illness representations.

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Another individual difference that may affect representation is depression. Aneshensel, Frerichs, and Huba (1984) found a longitudinal, reciprocal relationship between illness and depression such that illness predicted a concurrent increase in depression while depression predicted a future increase in illness over a period of four months. This is consistent with Leventhal and Diefenbach's (1992) contention that emotional states may affect the initiation and progress of existing disease. Another explanation is that there are differences in how the depressed interpret symptoms, similar to people high in neuroticism. For example, depressed persons have been found to interpret the symptoms of physical illness as less controllable and with more serious consequences than the non-depressed (Murphy, Dickens, Creed, & Bernstein, 1999; Paschalides, Wearden, Dunkerly, Bundy, Davies & Dickens, 2004). Thus, there appear to be differences in how the depressed approach somatic symptoms. Finally, when interpreting physical illness, a person experiencing an emotional state (like depression) may add emotional symptoms to their illness representation, which may not be typical of a physical diagnosis (Leventhal & Diefenbach, 1992). This makes it more difficult to self-diagnose the physical illness as it is complicated by emotional symptoms.

The Social Influence

In addition to individual differences, social factors can influence the interpretation of illness. For example, people tend to consult with family or friends in order to appraise symptoms (Pennebaker, 1982; Suls, Martin, & Leventhal, 1997). In fact, family, friends, and other social contacts are considered the person's “lay referral network” and are an important source of illness information (Suls et al., 1997). In particular, social contacts like friends and family help the ill person interpret the *identity* or label of symptoms, reveal the cause of the illness, or determine an appropriate treatment (Leventhal, Hudson, & Robitaille, 1997; Suls et al., 1997). The lay referral network may offer direct advice or serve as an indirect comparison for interpreting one's own symptoms.

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Social comparison allows a person to evaluate his/her own symptoms by comparing them to another person's symptoms. For example, a person who is experiencing a sore throat and congestion may recall that his/her spouse had similar symptoms last week and was diagnosed with a sinus infection. Thus, s/he may interpret his/her symptoms as caused by a sinus infection as well because the symptoms are comparable to those that the spouse previously had. In sum, the purpose of social comparison can be for self-evaluation of salient symptoms (Leventhal et al., 1997; Suls et al., 1997).

On the other hand, noticing that other people are displaying symptoms can initiate social comparison (Suls et al., 1997). For example, if a person's co-worker has developed a rash, the person may check him/herself for a similar rash. Thus, symptoms in others can stimulate "self-monitoring" of symptoms. In some cases, reports of ambiguous symptoms in others can induce similar reports in others. For example, in the case of mass psychogenic illness, symptoms of stress, such as increased heart rate or sweating, can be interpreted as the symptoms of a mysterious illness if others in contact with the person are also experiencing the same symptoms (Kerckhoff & Back, 1968).

While social comparison can provide information that can be used to interpret symptoms, evidence is mixed as to whether the lay referral network encourages or discourages care-seeking. Berkanovic, Telesky, and Reeder (1981) found that people who reported more contact with their social network, as well as those with larger social networks, were more likely to visit a physician for symptoms of illness than people with less social contact or smaller social networks. Cameron and colleagues (1993) also found that people who discussed their symptoms with others were more likely to seek care than those who did not discuss their symptoms. Furthermore, people who sought care were more likely to be encouraged to do so by the others that they consulted than the people who didn't seek care.

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In contrast, McKinlay (1973) found that women who utilized health care were more likely to live further from their family members and visit with family less frequently (having less social contact with family) than women who did not access health care. This may suggest that family members are considered a reliable source of health information and if one does not have access to family, they seek information from a physician for health concerns. Nevertheless, the women who utilized health care were more likely to have frequent social contact with friends and consult with friends for health advice than women who didn't use care. Thus, the particular social contact consulted may influence care-seeking in different ways. Alonzo (1986) similarly found that people having a cardiac event were more likely to delay care when they consulted with a spouse or family member rather than a friend or neighbor. Further investigation showed that delay depended on the type of advice that the family member gave; people were less likely to delay if their family member encouraged seeking medical care. This suggests that family members can sometimes hinder medical care by providing erroneous advice.

In short, social comparison is utilized by the layperson to identify a health threat, gather information that contributes to the illness representation, and determine appropriate action to cope with the threat. The social influence can be beneficial in encouraging care when needed. Nevertheless, sometimes social contacts can influence patients negatively by promoting a delay in care-seeking.

Health Information Search

We have previously discussed one theory about how laypeople make sense of physical symptoms and health conditions. Connected to this concept is the layperson's search for information in order to construct the representation or select a coping strategy. The information-search process has been studied extensively in the field of informatics, education, and health communication and will be reviewed in the following pages.

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Motivations for Search

People are motivated to search for information for a variety of reasons (Rouse & Rouse, 1984; Freimuth, Stein, & Kean, 1989; Wilson, 1997; Wilson, 1999). One may be to reduce uncertainty that the seeker feels in a domain that is relevant to him/her (Rouse & Rouse, 1984; Freimuth et al., 1989). A search for information can provide material to use in decision-making or problem-solving processes, which can make the seeker more certain about a course of action. Information search does not necessarily dictate the need for action, however. Dervin (1976) suggests that a major purpose for information-seeking is to make sense of the world. The seeker does this by combining "objective" information from the external world with already collected "internal" information to construct a relative reality. Thus, information can reduce uncertainty by providing the seeker with a greater understanding of his/her world.

Another position relates information-seeking to the psychological theories of stress and coping (Wilson, 1997; Wilson, 1999). In this context, stress can be seen as a threat that exceeds the person's resources while coping is the attempt to reduce the effects of the threat (Wilson, 1997). Previously held information can affect the amount of stress perceived. If the person has sufficient information about the event, then stress effects may be less than if the person perceives a lack of adequate information. In addition, information-seeking is highly compatible with "problem-focused coping" in which the person tries to actively manage the stress-causing problem in order to reduce distress (van Zuuren & Wolfs, 1991; Wilson, 1997). If the stressful event or threat is an illness, it follows that information-seeking could be employed to provide a path of action or health behavior or a better understanding of the illness which could aid in coping efforts.

Specific to health, Lambert and Loiselle (2007) have suggested three main motivations for health information seeking. First, similar to stress and coping theories, adults seek health information when they are facing a health-threat such as new symptoms or a new diagnosis (Lambert & Loiselle, 2007). Thus, health information

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seeking is again a form of problem-focused coping to actively deal with the health threat. Second, adults seek health information in order to be more involved in personal medical decisions. They may search for information so that they can better understand their providers' recommendations or even take a more active role in making the ultimate decision. Finally, health information search and knowledge acquisition may be one of the first steps in promoting health behavior change as the person gains requisite knowledge about the health behavior.

Information and Behavior

While people may be spurred for various reasons to search for health information, it is also important to know how information affects behavior, in order to determine the impact of an information search. For example, particularly in the field of public health, many media campaigns or direct interventions designed for health promotion contain an information/education component (Berry, 2006). A main assumption behind the provision of health information is that providing people with factual health information will affect their health-related attitudes and as a result, change their health behaviors (Bettinghaus, 1986).

In one approach, an attempt is made to increase positive attitudes toward a protective health behavior or increase negative attitudes toward a risky behavior (Bettinghaus, 1986). While this proposition may seem straight-forward, research has shown that appeals to health attitudes are not sufficient to change behavior except when the specificity of the attitude matches the specificity of the target (Ajzen & Fishbein, 1977; Davidson & Jaccard, 1979). In other words, a specific attitude (e.g., smoking is bad because it will cause lung cancer) may best predict a specific behavior (e.g., I won't smoke cigarettes), and a general attitude (e.g., drugs are bad) may best predict a pattern of behaviors (e.g., I don't smoke, drink, or take illegal drugs). However, a general attitude is unlikely to predict a specific behavior consistently. Nevertheless, those who

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design health communication campaigns assert that although some attitude-behavior correlations may be weak, even weak effects can influence large segments of the population when information is provided through a mass media source (Bettinghaus, 1986).

Another approach to health promotion involves changing health behavior by appealing to the health cognitions of the public (Berry, 2006). Thus, health information is provided in order to change people's current thoughts or beliefs about a health topic in order to influence their behavior. For example, the Health Belief Model asserts that a person's health behavior can be predicted based on his/her *perceived susceptibility* or risk for a condition, the *perceived seriousness* of the condition, and both the *perceived benefits* and *perceived barriers* of performing the behavior (Rosenstock, 1966). Thus, a health promotion campaign should target these beliefs in order to influence health behavior. However, similar to attitude change, only modest effects have been found in the Health Belief Model's ability to predict behavior change, and focusing on individual health cognition tends to ignore socio-economic determinants of health (Berry, 2006). It is likely that a campaign that utilizes health information will want to incorporate information that targets both attitudes and cognition simultaneously to boost the effect on behavior.

In spite of the potentially limited ability of health information to change health behavior, research has shown a variety of improved health outcomes associated with the provision of health information (Greenfield, Kaplan, & Ware, 1985; Fallowfield, Hall, Maguire, & Baum,1990; Burton, Waddell, Tillotson & Summerton, 1999). Fallowfield et al. (1990) found that women with breast cancer who were provided information by their surgeons about treatment options and were also included in the treatment decision-making process showed less anxiety and depression two weeks, three months, and 12 months post-surgery than those women whose surgeon favored a specific treatment option. Greenfield et al. (1985) found that an intervention designed to encourage patients

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to become more involved in the doctor-patient relationship, including improving information-seeking skills, resulted in decreased reported physical limitations after the intervention. Finally, Burton et al. (1999) found that participants who received a booklet targeting fear-avoidance beliefs regarding physical activity and low back pain showed a reduction in disability at three months post-intervention. Although the above studies were all designed based upon different theories by which information might affect behavior (i.e., avoidance beliefs, patient-provider relationship; shared-decision making), it does point to the benefits that health information can afford to various health outcomes. Similarly, the variety of mechanisms proposed, also suggests a need for further study of the impact of health information.

Online Health Information Seeking

According to economic theory, the doctor-patient relationship presents a unique challenge in that the patient suffers from an information asymmetry (Mooney & Ryan, 1993; Ryan, 1994; Vick & Scott, 1998). The patient, who does not have the extensive medical training of the physician, brings to the relationship less information and knowledge than the physician. As a result, the patient is forced to rely on the physician to be his/her agent and act in his/her own interests. This type of paternalism has traditionally been characteristic of the doctor-patient relationship (Frankel, 2001). However, the internet and recent health care trends have challenged the reliance on this type of relationship. In the following pages, we will discuss how the internet and a focus on consumer health have influenced health information.

Access

Searching for health information online is a popular activity for adults of all ages (Dutta-Bergman, 2004; Fallows, 2005; Fox, 2011). For example, the Pew Internet and American Life Project has shown that looking for health information is the third most popular online activity of adults, after E-mail and search engine use (Fox, 2011). Online

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health information seekers tend to be young, Caucasian, college-educated, and of higher income levels; these groups also tend to have greater access to the internet in general. Along gender lines, women are more likely than men to search for health information, although this switches when people reach older adulthood (Fallows, 2005). Caregivers search often for health information about their loved ones, and people with chronic diseases also access health information about their particular disease (Fox, 2011). In general, those who are health conscious or concerned about health topics tend to search for health information online (Dutta-Bergman, 2004). The above descriptive findings show that health information is of particular relevance for adults and online information is a timely topic.

The advent of the internet has allowed people to search for health information with much more ease than was available in the past (Murray et al., 2003; McMullan, 2006). People can hunt for information on websites sponsored by the government, hosted by medical and public libraries, sites with commercial interests, and those designed for specific diseases and patient populations (Cullen, 2006). In addition, the internet provides the platform for person-to-person health communication such as the ability to E-mail a health professional or to chat with another patient in an online support group (Cullen, 2006). With 66% of Americans having broadband internet access at home (Smith, 2010), an ever growing majority have fast, reliable access to health information.

The proliferation of health information available to patients has been controversial. Searching for information on the internet has been described as "drinking from a fire hose" (McLellan, 1998) with the worry that patients will be overloaded by the sheer amount of health information available on the net. Patients have admitted to becoming overwhelmed while searching for health information (Sommerhalder, Abraham, Zufferey, Barth, & Abel, 2009). Similarly, physicians have asserted that they see more patients with increased health distress due, in part, to their attempts to weed through large amounts of information (Hart, Henwood, & Wyatt, 2004; Ahmad, Hudak,

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Bercovitz, Hollenberg, & Levinson, 2006). In fact, the term "cyberchondriac" has been coined to refer to a person who fears having a serious disease or misinterprets bodily symptoms while looking at health information online (Ryan & Wilson, 2008; Smith, Fox, Davies, & Hamidi-Manesh, 2006). It is unclear whether patients have the critical skills necessary to discern between differing treatments, health outcomes, and recommendations published on the web (Breckons, Jones, Morris, & Richardson, 2008; Iverson, Howard, & Penney, 2008).

Literacy

Health literacy has been defined as "the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Ratzen & Parker, 2000). According to the U.S. Department of Education (Kutner, Greenberg, Jin, & Paulsen, 2006), 53% of adults in the U.S. have "intermediate" health literacy abilities (scoring between the 45th and 62nd percentile on the National Assessment of Adult Literacy scale) with 12% showing "proficient" levels (scoring above the 62nd percentile), 22% showing "basic" levels (scoring between the 37th and 45th percentiles), and 14% having "below basic" health literacy (scoring below the 37th percentile). The levels are measured by the ability to use and understand health related texts about the treatment of specific diseases, prevention such as screenings and warning labels, and navigation of the health care system. Health literacy is highly related to reading ability (general literacy), and people with more education tend to show higher health literacy levels (Kutner et al., 2006; Cutilli, 2009). In addition, health literacy has been associated with health behaviors; White, Chen, and Atchison (2008) found that people with higher levels of health literacy were more likely to take preventative health actions such as dental checkups and osteoporosis screenings. Similarly, Berkman et al. (2011) showed in a systematic review that people with low health literacy were more likely to be hospitalized, more likely to use the ER for care, and less likely to take

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medications appropriately. Finally, health literacy also affects information-seeking behavior. Those with low health literacy are less likely to use the internet to search for health information for themselves or others (Cashen, Dykes, & Gerber, 2004; von Wagner, Semmler, Good, & Wardle, 2009). Nevertheless, participation in health education activities such as "mini-medical school" have been shown to effectively improve health literacy (van Moorsel, 2001), suggesting that people with low educational attainment and/or health literacy can achieve higher health literacy with practice.

Researchers have begun to examine health literacy within the context of internet health information (Ivanitskaya, O'Boyle, & Casey, 2006; Norman & Skinner, 2006; Bodie & Dutta, 2008). Health information literacy includes skills in assessing the quality of health information and the credibility of health information sources, being able to effectively retrieve documents about topics of interest, and understanding the advantages and disadvantages of different media formats (Ivanitskaya et al., 2006). In short, health information literacy can be conceptualized as the person's ability to interact with the internet in order to access appropriate information, as well as basic health literacy skills. Norman & Skinner (2006) also assert that eHealth literacy, defined as "the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem," reflects the combination of a number of types of literacy. They conceived a model of eHealth literacy consisting of traditional literacy (reading and comprehension ability), information literacy (how to effectively access information), media literacy (the ability to critically think about media content), health literacy, computer literacy (the ability to use the computer to solve problems) and scientific literacy (understanding how science is done). Thus, effectively engaging with health information on the internet seems to require a number of different skills.

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Quality

Apart from the skills required to effectively access health information on the internet, the information that can be found on the web also varies in terms of quality and credibility. Eysenbach and colleagues (2002) conducted a systematic review of 79 empirical studies (in English or German) that examined the quality of health websites. Eysenbach concluded that health information on the internet varies greatly in terms of comprehensiveness (i.e., how completely the website discusses the topic) and accuracy. As a result, physicians report in focus groups worries that inaccurate or false information is being disseminated among patients who search online for health information (Potts & Wyatt, 2002; Hart et al., 2004; Ahmad et al., 2006; Ryan & Wilson, 2008; Sommerhalder et al., 2009). Eysenbach et al. (2002) also found that health websites show varying readability (i.e., the complexity of the information presented). Consequently, patients may not be able to navigate complex, medical information (Ahmad et al., 2006; Iverson, Howard, & Penney, 2008), especially if they have low health literacy.

In order to aid people in assessing the quality of information, web developers and health organizations have created tools for consumers (Wilson, 2002). For example, groups may develop a "code of conduct" or quality guidelines that web designers are encouraged to follow (Wilson, 2002; Breckons et al., 2008). Silberg, Lundberg, and Musacchio (1997) suggest that websites report, at the minimum, the authorship of the information (including author's credentials), references and sources for the information, disclosure of any financial interests in the site, and dates that the content was uploaded and updated. With such guides, patients can judge the quality of websites by comparing the features of the site to the quality guidelines. Unfortunately, these guidelines may be developed with no specific plan to ensure dissemination, resulting in the inability of websites to consider them during construction. As another example, web designers may place a "quality label" or logo on their site after a formal application process with the logo developers (e.g., Health on the Net Foundation) (Gagliardi & Jadad, 2002; Wilson,

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2002). The label demonstrates a commitment to quality that consumers can use when deciding which websites to select. Nevertheless, some quality labels are not regulated by a specific foundation and instead can be purchased (Gagliardi & Jadad, 2002; Wilson, 2002). In these cases, the logo may not be a valid indicator of quality. Finally, researchers have developed tools that consumers can use themselves to judge quality (Wilson, 2002; Breckons et al., 2008). For example, DISCERN is a brief questionnaire that people can complete about the websites that they have visited (Charnock, Shepperd, Needham & Gann, 1999). It is a tool that aids consumers to think critically about health information on the internet. Regardless of the particular quality tool used, it is unknown how well lay people attend to information related to quality. While some researchers have found that people ignore or do not assess the quality of a website (Eysenbach & Köhler, 2002; Bates, Romina, Ahmed, & Hopson, 2006), others have shown that people do take the source of a site into consideration and assess its credibility when searching (Eastin, 2001; Adams, de Bont, & Berg, 2006). Still, few people seem to rely on the quality tools described above (Eysenbach & Köhler, 2002; Adams et al., 2006). As previous findings have been mixed, more investigation into lay people's practices assessing health information quality seems warranted.

Applications to Health Care

In focus groups and qualitative inquiries, physicians consistently discuss the healthcare burden created by easily available health information online (Potts & Wyatt, 2002; Hart et al., 2004; Ahmad et al., 2006; Wald, Dube, & Anthony, 2007; Iverson et al., 2008; Sommerhalder et al., 2009). For example, physicians must spend more time with patients explaining or critiquing the information discovered (Potts & Wyatt, 2002; Iverson et al., 2008). Additionally, patients may request certain procedures or prescriptions found online that the physician is unwilling to provide. Physicians may find that they must spend time alleviating the distress of patients who have latched onto

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erroneous or drastic information regarding their condition or diagnosis (Hart et al., 2004; Ahmad et al., 2006). Finally, some physicians may resent the challenge to their professional authority that online health information represents (Hart et al., 2004; Wald et al., 2007).

Despite the concerns of physicians about online health information, there may be benefits connected to the recent, increased availability of health information. For example, of U.S. adults surveyed by the Pew Internet & American Life Project in 2010, 59% of the adults searching for online health information were chronic disease patients who searched to gain a better understanding of diseases with which they are already diagnosed (Fox, 2011). In focus groups, patients claim that they feel more confident in their interactions with their physicians because they feel better prepared to discuss certain topics with more information access (Ahmad et al., 2006; Donnelly, Shaw, & van den Akker, 2008; Sommerhalder et al., 2009). In addition, patients may decide that their illness can be managed with self-care, which could reduce the time-burden on physicians (McMullen, 2006; Ryan & Wilson, 2008).

Online Information-Seeking of Older Adults

Some researchers have pronounced a "digital divide," indicating that some demographic groups, including older adults, do not have access to the internet in as great numbers as other groups (Loges & Jung, 2001; Cullen, 2006; Pew Internet & American Life Project, 2010). Over time, researchers have determined that this "divide" seems to be related to income-level, with only 50% of those earning less than $30,000 annually having internet access at home, compared to 95% of those earning $75,000 or more annually (Jansen, 2010). However, the demographics of internet users do support the "divide" concept. For example, 95% of young adults (aged 18-29 years) currently utilize the internet as compared to 42% of older adults (aged 65 and older) (Pew Internet & American Life Project, 2010). Nevertheless, the percentage of older adults utilizing the

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internet has increased in the past decade. Only 15% of older adults had internet access in 2000 as compared to almost half in 2010 (Fox, 2004; Pew Internet & American Life Project, 2010). Older adults have also asserted that the internet plays as large of a role in their lives as in younger adults' (Loges & Jung, 2001). Thus, while older adults continue to adopt online technology at lower rates than younger adults, they cannot be discounted as "non-users."

As with other age groups, older adult use of the internet is dependent on various demographic factors. Older internet users tend to be of higher socio-economic status, higher education levels, and be young-old (e.g., 65-70 years) rather than old-old (85+ years) (Campbell, 2009; Macias & McMillan, 2008). Nevertheless, training programs have been successful in encouraging older adults, who may have been apprehensive in the past, to utilize computers and the internet for health information (Campbell, 2009). Recent data suggest that baby boomers have gained computer skills in their occupations and will continue to adapt to computer and online technologies as they age (Wagner, Hassanein, & Head, 2010; McMillan, Avery, & Macias, 2008; Loges & Jung, 2001).

When examining the online behaviors of older adults, older adults first use the internet to send E-mail to friends and family. In addition to socializing, older adults also view the internet as an "invaluable resource" of information that can replace the library (McMillan et al., 2008; Hilt & Lipschultz, 2004). However, older adults do recognize that the internet may contain erroneous information and worry about the quality of online information found (McMillan et al., 2008).

In spite of worries about the accuracy of information, older adults comprise the first-ranked demographic group searching for health information online, and many older adults claim to use the internet to prepare for physician's visits or "fill in the gaps" left by health providers (McMillan et al., 2008). A qualitative study of older adult internet use found that older adults tend to use search engines like Google and Yahoo to obtain health information as opposed to having a particular website in mind (e.g., Mayo Clinic site)

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(Hilt & Lipschultz, 2004). Additionally, observational research found that older adults tend to select the first website which appears in the search results, and then refine their search after viewing this site (Eysenbach & Köhler, 2002). In terms of health literacy, research has found that adults over the age of 65 years are more likely to have lower health literacy than other age groups (Kutner et al., 2006; Rudd, 2007). As health literacy requires working memory and verbal fluency abilities, one reason for this age difference may be cognitive decline that naturally occurs with older age (Federman, Sano, Wolf, Siu, & Halm, 2009). Nevertheless, samples of participants in gerontological research tend to be highly educated (as those with more education are more likely to volunteer to participate; Schaie & Willis, 2002) which may buffer cognitive decline's effects on health literacy, at least in study populations.

Sixty-six percent of older adults who have internet access utilize the internet for health information, in spite of their generally lower rate of computer use (Fox, 2004). As previously reviewed, some studies have examined older adults' use of the internet in order to describe common behaviors and characteristics of users. Nevertheless, few studies have systematically examined the processes underlying older adult health information search. To fill this gap in knowledge, my study focuses on the online health information-seeking behaviors of older adults. Age, education, and income will also be assessed because of their relationship to health literacy and the digital divide.

Illness Representations and Information-Seeking

As previously mentioned, the common-sense model is an active process in which the layperson attempts to make sense of health threats. The person builds and relies on cognitive representations in order to determine an appropriate course of action regarding physical illness. This can be compared to previously discussed reasons for information-seeking. People are motivated to search for information in order to make sense of an event or, similarly, establish a course of action. In short, both the common-sense model

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and information-seeking are problem-solving processes which allow a person to choose a behavioral plan.

Furthermore, information-seeking is an integral part of the common-sense process. Internal and external information are used to identify a health threat. Past experiences can be compared with current symptoms to inform representations and action. Additionally, social information can help to determine the threat as well as appropriate action. Thus, the layperson seeks and relies on multiple sources of information when making sense of an illness episode.

The internet is a unique source of health information. As previously discussed, the internet encompasses a variety of information resources such as government, commercial, and consumer-driven sites (Cullen, 2006). In addition, this extensive body of information can be accessed with ease and speed (McMullan, 2006). These factors raise a question about how using the internet as a source of health information affects illness representations. Of particular interest is to investigate this question by studying older adults because they frequently use the internet as a health information source but have seldom been studied empirically in regards to the internet. Thus, an exploratory question of my study is:

> **Exploratory Question 1.** Do older adults' illness representations change after searching for online health information?

Expert Diagnostic Reasoning

We have previously discussed how a layperson makes sense of illness through the framework of the common-sense model and through access to health information, particularly via the internet. However, physicians, with their extensive training in medical information and diagnostics, must also make sense of the physical symptoms with which their patients present. Thus, other research has concentrated on the processes that physicians use to diagnose illness.

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Foundational Work in Diagnostic Reasoning

Elstein and colleagues (1978) conducted a series of studies on diagnostic reasoning. These ranged in methodology from presenting the physicians with note cards containing physical data (such as blood pressure readings) to a more realistic scenario in which actors played patients whom the physician could interview and obtain more information via a bank of physical data. Overwhelmingly, Elstein found that physicians used hypothetico-deductive strategies to develop a diagnosis. First, physicians produce an initial hypothesis by examining the apparent symptoms (Elstein, Shulman, & Sprafka, 1978; Elstein & Schwarz, 2002). Elstein (1978) suggested that this hypothesis is generated through associative retrieval in which the presentation of the patient recalls another case with which the physician has had experience or stimulates knowledge of the incidence of certain diseases for the patient's demographic group. This is similar to the common-sense model which suggests that people's representations are influenced by previous experience with and general knowledge of illness. For physicians, the illness experience and knowledge is much more developed than for the layman.

After the hypothesis is generated, the physician then gathers data (such as clinical tests) to test his/her hypothesis. The data collected can be used to evaluate the initial hypothesis or serve to generate new, alternative hypotheses (Elstein et al., 1978). Elstein found that physicians used the data to make final diagnostic decisions (when considering between alternative hypotheses) in three ways. First, the physician could choose the hypothesis supported by the most confirmatory data. In other words, the majority of the data collected positively supported the hypothesis. Second, the physician could reject the hypothesis which showed the most dis-confirming data. Thus, the hypothesis with the most evidence against it would be rejected, leaving the alternative hypothesis as the most likely candidate. Finally, the physician could weigh the confirming and dis-confirming evidence for each hypothesis and select the alternative in which the confirmatory data outweighed the dis-confirming. Physicians who concentrated on rejecting a hypothesis

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with dis-confirming data seemed to be the least accurate. However, the accuracy of the three decision models hinged upon the fact that the physician generated the correct hypothesis to begin with.

Criticisms of Elstein's Findings

Further research has questioned the validity of Elstein's findings for a number of reasons (Patel & Groen, 1986; Elstein, 1994; Schmidt, Norman, & Boshuizen, 1990). First, Elstein studied both expert physicians and novice medical students and found that both utilized the hypothetico-deductive method. This led other researchers to question the finding's utility if expert diagnostic reasoning couldn't be distinguished by studying hypothetico-deductive strategies. In addition, Elstein could not distinguish between successful and non-successful diagnostic reasoning as there was considerable variability in the accuracy of the physicians' diagnoses across different cases. Most errors in diagnosis seemed to occur when the physician misinterpreted the physical data, resulting in an error in evaluating a hypothesis (Elstein et al., 1978). However, physicians engaged in a variety of errors with no clear, emerging pattern or predictive ability.

Patel and colleagues (1986) suggest that because of the accuracy and speed of expert diagnostic reasoning observed, expert physicians likely use automatic processes to diagnose illness which have been termed *pattern-recognition* (Patel & Groen, 1986; Johnson et al., 1991; Coderre, Mandin, Harasym & Fick, 2003). Patel (1986) had cardiovascular specialists read the description of a case of acute bacterial endocarditis. The case description was then removed, and the specialists diagnosed the case by writing down what they recalled about the case and what underlying pathophysiological processes might be at play. By analyzing the writing of the specialists, Patel found that the physicians who came upon an accurate diagnosis used only *forward reasoning*. *Forward reasoning* is based upon causal networks or "if-then" rules (Patel & Groen, 1986). Physicians develop "if-then" rules with increasing clinical experiences and

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medical study (Patel & Groen, 1986; Coderre et al., 2003) which can be used to make inferences about a case. In addition, Schmidt, Norman, and Boshuizen (1990) argue that further patient contact has the effect of organizing knowledge according to *illness scripts* or "simplified mental models that sufficiently explain the phenomena observed." This results in a quicker, more automatic diagnosis which may be more accurate. *Forward reasoning* and *illness scripts* are in contrast to *backwards reasoning*, another term for hypothetico-deductive reasoning, which begins with a hypothesis. Novice medical students, who do not have the clinical experience of expert physicians, likely rely on hypothesis-testing and an analytical approach until they create more definite causal networks or illness scripts (Schmidt et al., 1990; Coderre et al., 2003).

Turning Toward Novice Diagnostic Reasoning

The layman is a novice when it comes to medical diagnostics. As a result, it is possible that laypeople rely on a hypothetico-deductive approach when engaging in self-diagnosis. On the other hand, there is evidence that people are motivated to reduce their cognitive effort (i.e., Marchionini, 1992; Todd & Benbasat, 1992; Fiske & Russell, 2010). Thus, laypeople may utilize their personal "illness scripts" or illness representations for self-diagnosis, mimicking a *pattern-recognition* approach, rather than an explicit hypothetico-deductive strategy. Illness representations provide the layman with an organized framework for identifying their symptoms, help to determine the symptoms' severity, and aid decisions about what behaviors should be undertaken (Leventhal et al., 2003). Although illness representations do not incorporate clinical experience, these schemas still provide the lay person with important information and heuristic rules (see previous section on illness representations) that can guide self-diagnosis. In sum, I propose that lay people utilize their illness representations to guide self-diagnosis. However, the hypotheses and data collection strategies of participants

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will also be examined to determine whether lay people do engage in hypothetico-deductive strategies while involved in self-diagnosis.

> **Exploratory Question 2.** What are the processes that older adults use to diagnose a set of physical symptoms online?

> **Exploratory Question 3.** Do older adults' illness representations change as a function of whether they change their diagnosis after accessing more information?

Human Computer Interaction

Human computer interaction (HCI) studies peoples' own cognitive processes as well as the processes and design features of computers, and then examines how these relate and influence each other (Card, Moran, & Newell, 1983; Olson & Olson, 2003; Norman, 2008). Much of the work in this area has concentrated on how to best design computer systems so that they will either be "user-friendly" (easy for the lay person to use) or better accomplish tasks (Carroll, 1997; Byrne, 2003; Norman, 2008). However, simultaneously, investigators have been interested in how the user thinks about a computer system and what goals the user has for its use. This type of "user-centered" design has drawn much from cognitive psychological theory and investigation (Byrne, 2008; Norman, 2008; Olson & Olson, 2003).

Card, Moran, and Newell define the human-computer interface as "a communicative dialogue [between the user and computer] whose purpose is the accomplishment of some task" (1983, p. 4). The user simultaneously cognitively processes his/her goal (e.g., problem solving, memory, and perceptual processes) (Card et al., 1983) as well as interprets how to accomplish the goal via the computer system. It is thought that a "gulf of execution" occurs when a person has a task-related psychological goal but doesn't know how to accomplish that goal within the physical boundaries of the system (Norman, 1986). The gulf can be remedied by modifying the design factors of the system to better match the user's goals or, conversely, by encouraging the person to align his/her goals and plans of action to better match the system (Norman, 1986).

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Mental Models

The question arises: how does a person conceptualize the system in order to modify his/her goals? One theory in HCI is that s/he creates a mental model. The mental model suggests that while a person interacts with a computer, s/he creates a mental representation, or model, of how the computer is operating for a particular task (Proctor & Vu, 2007). The mental model consists of the person's task-oriented goals, the actions required to accomplish the goal, and expectations about how the computer system will behave when actions are initiated. In particular, knowledge of discrepancies between a person's mental model and the actual design of the system can help programmers to modify systems in order to account for human errors in interaction (Zhang, 2008). Mental models may be drawn analogously; for example, a person may take what s/he knows about a typewriter and apply it to a computer in order to complete a task (Carroll & Thomas, 1982). A person may also rely on his/her experiences with similar systems (e.g., older operating system versions) to problem-solve in the current computer system (Jonassen & Cho, 2008).

Because mental models are developed through interaction with the computer system, it follows that people with less computer experience have poorer mental models (Van der Veer & Melguizo, 2002 [in Jacko, 2004]). This then affects computer performance; having better mental models of the computer system has been shown to allow a person to perform tasks more quickly and more accurately (Carroll & Thomas, 1982; Kieras & Bovair, 1984; Sharit, Hernandez, Czaja, & Pirolli, 2008; Zhang, 2008). For example, Lehner and colleagues (1987) had college-aged participants solve a number of problems related to a simulated stock market with the help of a computer expert system; the system provided suggestions as to the most likely answer to the problem when the participants provided the system with data. Lehner found that participants who were given a detailed description of how the expert system problem-solved, and therefore had a clearer mental model of the system, answered more of the problems correctly than

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participants who were not provided a model of the system. Thus, a better mental model was associated with better problem-solving performance. However, mental models are not simply a function of computer experience. Research has shown that older adults have different mental models of technology systems than other age groups. For example, Ziefle and Bay (2004) compared the mental models of both younger and older adult novice users testing a cell phone. They found that although few of the participants in either age group owned a cell phone, older adults were less likely to create accurate, hierarchical mental models of the cell phone's different menus than younger adults. This further suggests that older adults take different procedural and cognitive approaches to technology and investigating older adults' online health information seeking, and mental models of such, is warranted.

Further Design Factors

Apart from the compatibility of a person's mental model and the system, other computer design factors can influence human-computer interaction. For example, designers are particularly concerned with the usability of a system (Olson & Olson, 2003; Teo, Oh, Liu & Wei, 2003; Wang & Senecal, 2007; Cyr, Head, & Ivanov, 2009). Usability can be defined as how easily a novice user, or one that has no formal training, can interact with a computer system (Benbunan-Eich, 2001). Usability concerns whether the user, no matter what their background or computer skill level, can utilize the system effectively (Benbunan-Eich, 2001). Usability has further been related to a number of user attitudes and behaviors. For example, Gefen, Karahanna, and Straub (2003) found that the perceived usability of an e-vendor's (online business) website was associated with the user's trust in the e-vendor and intention to use the e-vendor's services (i.e. input credit card information to receive product). Thus, simply being able to navigate the company's website affected the user's perceptions of the company and whether they chose to engage in business with the company. In terms of health information, a website

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with greater usability may be perceived as having more trustworthy and credible information than a website with less usability. This may affect confidence in the information found and ultimately, the decisions made based on the health information.

Although usability is an important design factor, it has been studied in a limited fashion in older adults. In particular, designers have begun to use what is known about the cognitive and perceptual age-related changes that older adults experience in order to create usable designs for seniors (Becker, 2004; Morrell, 2005). For example, the National Institute on Aging, National Library of Medicine, and National Institute of Health (2001) suggest that websites or computer programs present information by breaking documents into smaller sections in order to compensate for declines in working memory that older adults experience. Smaller sections allow older adults to more easily process and comprehend what has been expounded (Becker, 2004). As another example, Morrell (2005) suggests that a 12-14 point sans serif font be used to improve the readability of text in a website or computer program to contend with older age vision declines. Because little usability testing has been conducted specifically with older adults during the design process (Nahm, Preece, Resnik, & Mills, 2004), some websites or computer applications may be more senior-friendly than others. The current study will examine differences in the usability of two different online computer applications to see if usability affects seniors' personal understanding of illness.

Another factor that is studied extensively is interactivity. Interactivity has been defined in various ways depending upon the specific interest of the researcher, but McMillan and Hwang (2002) suggest that *direction of communication*, *user control*, and *time* are critical components of interactivity. First, *direction of communication* typically refers to the creation of "two-way communication" in a human-computer relationship. In other words, both the computer system and the user engage in mutual action so that a "reciprocal" relationship is established (Johnson, Brunen, & Kumar, 2006). More specific examples would include the computer's ability to provide the user

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with feedback during a task or the ability of two (or more) people to communicate via a computer tool like a chat room or discussion board (McMillan & Hwang, 2002). Second, *user control* involves the features of computer programs and applications which allow a person to complete desired tasks or access desired information. Another way of discussing user control is how "responsive" the system is to the user's goals or whether the system can provide "appropriate and relevant" communication (Johnson et al., 2006). Finally, *time* is concerned with the speed at which computers can access desired information or enable users to achieve their computing goals (McMillan & Hwang, 2002). Users associate a shorter delay in response with higher interactivity, likely because the interaction with the computer system is then perceived as more similar to human interaction (Johnson et al., 2006).

Perceived interactivity has been shown to influence various perceptions of web applications including usability (Wang & Senecal, 2007), usefulness (or whether the user's goals can be accomplished with the particular system or application; Olson & Olson, 2003; Teo et al., 2003), trust, and enjoyment (Cyer et al., 2009). Therefore, knowledge about the user perceived interactivity of a website or web application can provide additional information about the user's orientation toward the site and how the user might be utilizing it.

Interactivity has been studied in the context of health communication with much anticipation (Robinson, Patrick, Eng, & Gustafson, 1998, Fotheringham, 2002). Interactivity is thought to improve health communication by allowing the information provided to be tailored to the particular user. For example, by answering a few questions posed by the computer system, the user can get access to the information that is most relevant to his/her health situation. Being directed to the most appropriate information may reduce the information overload that many experience online (Sommerhalder et al., 2009). In addition, tailored health information is theorized to be more effective at encouraging health behavior change than generalized health information as interactive

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information is perceived as more credible (Fotheringham, 2002). Additionally, interactivity has been found to increase the likelihood that information is read and retained (Fotheringham, 2002). For example, Lustria (2007) found that people viewing an interactive health website showed greater comprehension of the health content than people viewing a less interactive website. Thus, interactivity can affect what a person remembers or gleans from a site which can indirectly affect health behavior. Furthermore, more interactive methods of communication have extended intervention effects for longer than print-media (Fotheringham, 2002). Thus, the potential for longer lasting behavior change accompanies interactive media. Finally, if users can find tailored answers to their health questions online, it provides support for self-care which may reduce burden on the healthcare system (Robinson et al., 1998). In short, interactive health communication has the potential to have myriad effects on health behavior.

Decision Support Systems

One application that can be used for interactive health communication is a decision support system (DSS). DSS or decision aids are interactive computer tools that have been used in a variety of contexts including aeronautics (Smith, McCoy, & Layton, 1997), engineering (Wiegmann, 2002), and health diagnostics (Sainfort, Jacko, Edwards, & Booske, 2008). DSS are designed to support consumer decision-making, and in some cases, automatize behavior (Smith, Geddes, & Beatty, 2008). Although DSS can reflect different designs, most health DSS use an algorithm to make inferences based upon information that the clinician or patient provides (Smith et al., 2008).

Research has identified two factors which seem to largely influence the decision-making process: cognitive effort and decision quality (Payne, 1982; Todd & Benbasat, 1992). Payne (1982) suggested that decision-makers face a “cost-benefit trade-off” in which they must decide whether to augment accuracy or decision quality or, conversely, reduce cognitive effort. In most circumstances, researchers have found that people prefer

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to reduce effort when faced with a decision or problem in order to conserve cognitive resources (Marchionini, 1992; Todd & Benbasat, 1992; Fiske & Russell, 2010). Thus, a DSS that can reduce the cognitive burden of a decision-maker would likely appeal to the user. It is suggested that DSS reduce cognitive effort by automatizing problem-solving or information processing, decreasing the need for effortful cognition (Smith et al., 2008). For example, Todd and Benbasat (1992) found that people using a DSS engaged in less information-processing, instead relying on the DSS to assimilate information. In addition, Lim, Benbasat, and Todd (1996) found that a computer interface which promoted automation allowed participants to spend less time planning what they were going to do and more time implementing an action plan. In short, participants spent less time processing the problem and more time interacting with the computer system. Furthermore, Smith, McCoy, and Layton (1997) found that users of a decision aid for flight planning felt less disorientation with the computer system as well as less uncertainty toward their chosen flight plan. DSS appear to save people's cognitive resources; however, a caveat must be noted. Only a well-designed, DSS that is high in usability is likely to reduce cognitive effort. As Todd and Benbasat (1992) suggest, a DSS is only of value if "the effort required to interact with it is less than the effort reduction in problem-solving it provides" (p.380). For people with less computer experience, such as older adults, interaction with a decision aid may require additional cognitive effort. Therefore, the effort expelled by using a decision aid would be an important avenue of inquiry.

In spite of the "cost-benefit trade-off" (Payne, 1982), can a well-designed DSS simultaneously reduce cognitive effort while improving the accuracy of decisions? DSS are theorized to produce more accurate decisions because of their ability to reduce the effects of human cognitive biases and errors (Smith et al., 2008). Furthermore, DSS are thought to be able to compensate for limitations in human memory, perception, and information-processing (Smith et al., 2008). For example, allowing a DSS to consolidate

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the information needed to find a solution to a problem can reduce cognitive overload that people may experience while problem-solving or conducting an online search (Smith et al., 2008). Thus, people may be able to make more accurate, complex decisions with the aid of DSS. Empirical studies have found that DSS improved the accuracy and quality of decisions in budget allocation (McIntyre, 1982), online shopping (Häubl & Trifts, 2000), and clinicians' diagnostic reasoning (Garg et al., 2005; Kawamoto, Houlihan, Balas, & Lobach, 2005). However, Arnold and colleagues found that novices (people with little previous experience in the field) made poorer decisions when considering the solvency of a business even when using a decision aid (Arnold, Collier, Leech, & Sutton, 2004). As the layman is a novice when it comes to medical decisions, it is important to investigate whether a particular consumer health decision aid can truly improve the accuracy of health decisions and under what conditions.

WebMD Symptom Checker

WebMD is a popular consumer health website. According to Alexa.com (which measures web traffic analytics for websites), WebMD has a ranking of 166 in the United States. This ranking is based upon the average daily visitors to WebMD's page as well as the number of page views over the past three months (Alexa, 2011). For comparison, Google is ranked #1 while websites can be ranked all the way to #2,000,000. Alexa estimates that older adults are over-represented at WebMD.com compared to the general internet population. In other words, older adults prefer to visit WebMD compared to other health websites. In addition, Whites and African-Americans, those who have attended some college or have completed a college degree, and females are overrepresented at WebMD.com compared to the general internet population.

WebMD's Symptom Checker is one example of a consumer decision aid for the purpose of self-diagnosis (see Appendix E: Figure 1). The application features an avatar (or pictorial representation) of the human body. A person clicks on the area of the body

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where the symptoms are located. S/He next inputs descriptors of the symptoms such as “pain,” “tenderness,” or “warm to touch.” The application then asks tailored questions based on the location of symptoms, the descriptors, and the person’s response to each previous question. After gleaning enough information, the application will present a list of potential diagnoses. The person can click on a diagnosis to get more information about its symptoms and severity as well as recommendations for care. Alexa (2011) estimates that almost half of visitors to WebMD.com (45%) are searching for the Symptom Checker.

As previously mentioned, a decision aid is different from a traditional search for information on a search engine (e.g., Google) because a) it is more interactive, b) it may reduce the cognitive effort that the seeker must expel, and c) it may produce more accurate search results. In addition, a decision aid may have greater usability, which could give people more confidence in the information produced (or the content of their illness representations). Therefore, my study is interested in investigating any differences in these factors between older adults who diagnose the symptoms of an illness using WebMD’s Symptom Checker and those who use a Google search. Based on the literature reviewed above, I hypothesize that:

> **Hypothesis 1.** Older adults who use WebMD to acquire health information will rate the search as more interactive than those who use Google.
>
> **Hypothesis 2.** Older adults who use WebMD to acquire health information will report less perceived cognitive effort used during the task than those who use Google.
>
> **Hypothesis 3.** Older adults who use WebMD to acquire health information will make more accurate diagnoses of physical symptoms than those who use Google.
>
> **Hypothesis 4.** Older adults who use WebMD to acquire health information will be more confident in their illness representations than those who use Google.

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Consumer Health and Empowerment

The next section will attempt to place the previously discussed online health information-seeking behavior within the context of a larger, healthcare trend. For example, in the past two decades, there has been an effort to give patients more choice and control over their health care in a variety of arenas (e.g., Robinson & Ginsburg, 2009). This movement has emerged primarily because patients were unhappy with managed care's "gatekeeper" approach in which providers and insurance companies had the ultimate say over the patient's access to care.

Healthcare Consumerism

The consumerism movement has appeared in a variety of health contexts. For example, direct-to-consumer advertising (DTCA) of pharmaceuticals has encouraged patients to "ask their doctor" about a variety of conditions and accompanying medications (Hollon, 2005). Studies have shown that DTCA has increased patient requests for particular medications as well as increased physician prescribing of said drugs. Physicians have not been convinced that the requested drug was the only or best treatment option and don't believe that DTCA improves patient health (Mintzes et al., 2002; Hollon, 2005). Nevertheless, DTCA has encouraged patients to discuss treatment options their physician. As another example, high deductible health insurance plans have been tested to allow patients more control over their individual health care spending (Robinson & Ginsburg, 2009). While high-cost unanticipated care is still covered by the insurance plan, patients are responsible for routine, low cost care. Patients bank money in a "health savings account" and decide on which care they want to spend their funds. Patients are expected to make informed decisions about the price and performance of the care they receive by seeking advice from physicians or information from sources such as health advisors or the internet (Robinson & Ginsburg, 2009). As a final example of health consumerism, patient-centered primary care seeks to create partnerships between

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the provider and patient so that the patient's preferences are respected (Institute of Medicine, 2001 cited in Commonwealth Fund, 2007). In theory, the patient would have more direct access to his/her provider so that s/he can remain informed about his condition. Patient-centered primary care also includes a model of "shared-decision making" in which the provider and patient come to a mutually satisfactory treatment plan for the patient's conditions (Joosten, DeFuentes-Merillas, de Weert, Sensky, van der Staak, & de Jong, 2008; Legare, Ratte, Gravel & Graham, 2008; Brock, 2009).

Empowerment

Consumerism is assumed to improve patient satisfaction with health care as a result of patient empowerment (Longo, 2005; Louise, 2008). While empowerment has been defined in various ways, the "transfer of power from one group to another" has been emphasized (Rodwell, 1996; Hagquist & Starrin, 1997). Thus, while the physician has traditionally held the most power in the patient-provider relationship (Frankel, 2001), patient empowerment encourages a shift of power in the direction of the patient. This is not to say that the relationship is entirely flipped (with the patient having *all* of the power); in fact, many patients still desire to rely on their physician for health information and health decisions (Henwood, Wyatt, Hart, & Smith, 2003; Lemire, Sicotte, & Paré, 2008). However, patients are encouraged to take a more active role in their health care by being more involved in healthcare decisions (Rodwell, 1996; Eysenbach & Diepgen, 2001; Henwood et al., 2003; Newman & Vidler, 2006).

Also associated with patient empowerment and a key element in the goal of shared decision-making is the concept of "informed choice" (Eysenbach & Diepgen, 2001; Henwood et al., 2003). Informed choice occurs when patients are given "access to information about the advantages and disadvantages of all possible courses of action…" (Eysenbach & Diepgen, 2001, p. 11). Thus, information plays an important role in informed choice and patient empowerment. For example, Spreitzer (1996) found that

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employee perceptions of access to information were positively associated with perceived empowerment in the workplace. Newman and Vidler (2006) suggest that consumerism has the ability to lessen the information asymmetry, where the patient has access to less information than the physician, which typically characterizes the patient-provider relationship. This change in the relationship then shifts more of the power toward the patient, resulting in empowerment. Nevertheless, researchers assert that simply providing the patient with more information is not sufficient for fostering empowerment (Eysenbach & Diepgen, 2001; Henwood et al., 2003). For example, there has been criticism that patients may not have the skills to obtain and interpret the information necessary to make personal health decisions (Eysenbach & Diepgen, 2001; Henwood et al., 2003). Henwood and colleagues (2003) found that, in a sample of middle-aged women considering hormone-replacement therapy, women with lower information literacy seemed less inclined to make health decisions and preferred, instead, to rely on their physician for health answers. Thus, some patients may not perceive empowerment with a greater access to information as they have difficulty wading through the information. Other researchers have suggested that it is important to tailor information to the particular skills and interests of the patient in order to reduce patient burden that may occur with information-processing (Hibbard, Slovic, & Jewett, 1997; Eysenbach & Diepgen, 2001; Newman & Vidler, 2006).

As previously discussed, the internet has appeared as a massive, public source of information. If access to information is associated with feelings of empowerment in some populations, it follows that use of the internet may also be associated with empowerment. Eysenbach and Diepgen (2001) argue that the internet can nurture more equal partnerships between patients and physicians by providing patients with more information, with the caveat being the challenges mentioned above. Furthermore, Lemire and colleagues (2008) found that internet use was positively associated with personal empowerment. As Lemire (2008) suggests, the internet and other "new media" have led

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to changes in the "process of diffusion and appropriation of health knowledge…a better understanding of its [the Internet's] many opportunities for personal empowerment provides useful insight into the stakes involved" (p. 136). Thus, the Internet may be an important tool in supporting patient empowerment and more research in this area is warranted.

Along with shared power and choice, a final theme of empowerment is to promote feelings of autonomy (Rodwell, 1996). For example, Rodwell (1996) suggests that the field of health promotion views empowerment as "enabling and supporting people to set their own health agendas and to take control of their health status…" (p. 308). In order to take control, people must be able to act without significant constraints. These factors have been studied extensively by social psychologists Deci and Ryan, and have been further related to health and health behavior.

Self-Determination Theory

Self-determination theory seeks to explain human motivation as a striving of the self to master its internal environment (Sheldon, Williams, & Joiner, 2003) or achieve *competence*. This behavior occurs within the context of the external world and the person must "interface" with the external environment in order to achieve mastery. However, a key goal for the person is to be able to function in spite of external forces that would seek to manipulate him/her. Thus, the person seeks to achieve *autonomy* in the external world. Finally, people are also motivated to connect with others or achieve *relatedness*. Therefore, according to the self-determination theory, human behavior is guided by the three goals of *competence, autonomy,* and *relatedness*.

Self-determination theory has been studied in the context of health as a person's work to feel more "self-ownership" of behavior (Sheldon et al., 2003). Self-determination principles have been shown to motivate improved health behaviors. For example, Williams et al., (1996) investigated obese patients attending a low-calorie

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weight-loss program. Patients who were identified as participating for autonomous reasons were more likely to attend meetings of the weight-loss program and have a lower BMI both at the close of the program and at the 20 month follow-up point. Thus, there may be benefit of the current trend to encourage choice and autonomy in health care.

Another key aspect of the self-determination theory is the need to provide an opportunity for people to act autonomously and achieve competence; this is described as *autonomy support* (Sheldon et al., 2003; Williams, McGregor, King, Nelson & Glasgow, 2005). In health care, the physician's ability to provide autonomy support for the patient has been studied. Essentially, the physician provides the patient with information so that the patient can make an informed choice about treatment or health goals, which results in the feeling of autonomy, which, in turn, could then lead to behavior change (Moller, Ryan & Deci, 2006; Williams et al., 2005). Williams et al. (2005) found that physician-provided autonomy support for a group of patients with type 2 diabetes was related to greater perceived competence which then related to improved glycemic control, decreased depressive symptoms, and increased patient satisfaction. Thus, it was shown that autonomy support can indirectly influence physical and mental health outcomes.

In the context of health information, the internet may be seen as an autonomy supportive environment as it provides the patient with increased information and increased opportunities for choice. In particular, a search for health information (with a search engine) may allow the patient to feel increased competence and autonomy as s/he must choose between different websites and personally amass the relevant information himself. Self-diagnosis applications also provide the patient with increased information; however, the application provides recommendations to the patient in a more authoritative manner with less patient activity. Thus, one goal of my proposal is to investigate which type of method facilitates more autonomy and competence during health information search. I hypothesize that:

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Hypothesis 5. Older adults who use WebMD to acquire health information will report less perceived choice and less feelings of competence than those who use Google.

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CHAPTER 2: METHODS

Participants

A convenience sample of 79 older adults was recruited from the counties surrounding the University of Iowa (predominantly Johnson County). Participants were included in the study if they were a) at least 50 years or older, b) a community resident (i.e., not living in a nursing home), c) able to travel to the research laboratory for in-person data collection, d) owned a computer at home, e) did not have a previous diagnosis of dementia or cognitive impairment, and f) did not show cognitive impairment or confusion on the Short Portable Mental Status Questionnaire (SPMSQ) (i.e., score $\leq$ 7; Pfeiffer, 1975).

Participants were recruited in several ways. First, the "Seniors Together in Aging Research" (STAR) Registry through the University of Iowa Center on Aging was utilized. The STAR Registry consists of older adults over the age of 50 who live within a two-hour driving distance of the University of Iowa. Older adults who are interested in volunteering for research fill out a STAR registration form consisting of information such as demographics and medical history. Once registered, STAR members can be sent information about the studies for which they qualify. For the current study, the STAR Registry sent three batches of 150 recruitment mailers (total = 450) to seniors in Johnson County, Iowa who fulfilled the inclusion criteria above (community resident, owning a home computer, no previous diagnosis of dementia or cognitive impairment). Second, an ad was placed in the University of Iowa Hospitals and Clinics "Noon News," a daily flyer produced for hospital patients and staff that contains advertisements for research participation. Third, an information table was assembled at the Iowa City Senior Center in order to generate interest. Finally, recruitment flyers were posted in community locations such as public libraries, local diners, local churches, grocery stores, and exercise classes. Interested seniors who noticed the study either in the recruitment

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mailer, Noon News ad, Senior Center information table, or recruitment flyer could call a phone number to express interest in participating. The senior was then screened over the phone for cognitive impairment with the SPMSQ, and if negative, then an in-person appointment was scheduled. Seniors who participated received a $10 community gift card in appreciation and parking vouchers for their time in the study.

Care was taken to recruit participants from two age strata: 50-64 years (*N* = 38) or 65 years and older (*N* = 41). These strata were selected because of their similarity to societal distinctions in aging (e.g., an older adult qualifies for Medicare at age 65), and the fact that other epidemiological investigations also have categorized seniors in this way (e.g., Fox, 2004).

Participants were predominantly Caucasian (97.5%) with a mean age of 63.97 years (*SD* = 7.68), and 60.8% (*N* = 48) of participants were female. Participants were highly educated with all having achieved some college while 52.6% (*N* = 41) had earned a post-graduate degree. In addition, most participants earned between $50,000 and $75,000 per year. Participants were healthy, experiencing a mean of 3.11 (*SD* = .55) physical symptoms in the past three weeks (out of 14 total symptoms) and a mean of 2.58 (*SD* = 1.59) health conditions in their lifetime (out of 17 total conditions). In addition, most participants showed minimal depression (a score below 13) on the BDI-II (89.9%, *N* = 71).

Apparatus

Data mainly was collected on a Dell (TX) Vostro 3750 laptop computer. Participants completed the electronic diagnostic task (described in the Procedures section) on the laptop. Web screen actions such as the websites visited and the search terms utilized by participants were recorded with Camtasia Studio 7 (Techsmith, MI). Quantitative questionnaires were formatted with Qualtrics, Inc. (UT) Survey Software so that they could be presented to participants via the laptop computer. Qualitative "think-

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alouds" were recorded with an Olympus VN-8100PC Digital Voice Recorder and an Olympus ME-15 Microphone (Olympus America, PA) and transcribed using Express Scribe Version 5.32 (NCH Software, Canberra, ACT, Australia).

Design

The current study utilized a mixed methods design that included qualitative think-alouds as well as quantitative Likert-type questionnaires. Think-alouds (Ericsson & Simon, 1983) are the verbalizations of a participant regarding his/her thoughts and actions about a task. The verbalizations are recorded and transcribed in order to be qualitatively coded and analyzed. Verbalization can occur concurrently during the task or retrospectively after the task is finished. While previously researchers have worried about the validity of concurrent think-alouds, a meta-analysis by Fox, Ericsson, and Best (2011) found that concurrent think-alouds do not disrupt the cognitive processes of participants and so accurately reflect perceived cognitive processes. Thus, concurrent think-alouds were used in the current study to collect data about the cognitive strategies used by participants while conducting an online health information search. In addition, web screen shots were captured with Camtasia Studio 7 to create an ecological record of the actions that the participant completed on the internet that could also be qualitatively coded. Illness representations were measured as a within-subjects factor with the quantitative Illness Representation Questionnaire-Revised (see Measures). Representations were measured both before and after the online health information search was conducted to determine if any change occurred in the participants' illness representations as a result of the online search.

Participants were randomly assigned to conditions. Participants received one of two vignettes to diagnose; the vignette either depicted the symptoms of mononucleosis or scarlet fever (for more information, see Measures). Participants were also assigned to diagnose the symptoms online using either a Google search or WebMD's Symptom

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Checker (see Measures). The role of age was assessed as a subject variable; as previously discussed, older adults were recruited along two age strata (50-64 years or 65 years and older) in order to be able to examine the contribution of age to the effects. Thus, a 2 (illness vignette) x 2 (Google/WebMD) x 2 (age) between-subjects factorial design was employed. Participants were randomized based on age strata. Each participant had a 1:4 chance of being assigned to each condition (Google search with mononucleosis story, Google search with scarlet fever story, WebMD with mononucleosis story, or WebMD with scarlet fever story).

During the period of data collection, designers at WebMD, L.L.C developed and made live an updated version of their Symptom Checker. Thus, some participants diagnosed the vignettes using the previous version of the Symptom Checker while others had diagnosed using the newest version. At face value, there appears to be little substantive change in the old and new versions of the Symptom Checker. However, the different versions utilize slightly different graphics, and the new version has included a small visual analogue scale next to each possible condition that seems to depict the likelihood of the particular condition being a diagnosis for the inputted symptoms. To account for the difference in Symptom Checker versions, all quantitative analyses were conducted with the WebMD groups separated into “old” and “new” versions.

Perceived competence and choice during the online search were measured to determine whether the use of one search method resulted in more feelings of competence or choice. Finally, a variety of covariates, such as website interactivity, cognitive effort, health history, computer experience, depression, neuroticism, preferred role in medical encounters, income, education, and gender were collected because they could potentially affect online information search or illness representations. All covariates were measured with quantitative Likert-type questionnaires administered on the computer.

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Procedure

A flowchart of study procedures can be found in Appendix E (Figure E1). Participants were given an informed consent sheet that outlined the study procedures. The think-aloud procedure was then described, and the experimenter demonstrated a think-aloud while opening an internet browser window on the Dell laptop computer (see Appendix D for think-aloud instructions). The participant was then given the opportunity to practice thinking out loud while navigating to the University of Iowa's website and finding the name of the University President. When the participant felt comfortable with the procedure, s/he was given either the mononucleosis or scarlet fever vignette to read. Participants provided their best estimate of a diagnosis for the illness by thinking aloud about the different symptoms and which specific illness seemed most applicable. Participants were instructed to "talk continuously while diagnosing the symptoms" and to "say whatever comes to mind" while completing the task. If the participant remained silent for five seconds, s/he was reminded to "please keep talking." It was requested that participants choose one specific diagnosis (i.e., a specific illness or condition) in order to complete the task. No other prompting or questioning came from the researcher regarding the diagnosis. The participant was audio-recorded during the think-aloud to allow for later analysis. After diagnosing, the participants then completed the Illness Perception Questionnaire-Revised on the Dell laptop (see Measures). Participants were instructed to "answer questions based upon the diagnosis that you previously found."

For the second diagnosis task, participants were randomly assigned to diagnose the vignette with Google or WebMD Symptom Checker. Those assigned to the Google group were instructed to use any of the features of Google that they wished and to select from any of the Google provided websites in order to acquire information to diagnose the vignette. Those assigned to the WebMD Symptom Checker group were instructed to read the directions provided by the WebMD application and to input their own age and gender when requested by the application. The computer program Camtasia Studio

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(Techsmith, MI) recorded participants' diagnostic search, capturing the websites visited and mouse movements. During the search, the participant engaged in another think-aloud that was audio recorded. If the participant appeared confused or frustrated with the computer application (either Google or WebMD) for more than five seconds, the researcher provided computer support in the form of describing the interface in more detail or describing what web actions were available to the participant. The researcher did not suggest what the participant should input into the system or which condition the participant should select. After diagnosing, the participants again completed the Illness Perception Questionnaire-Revised on the Dell laptop (see Measures) and were instructed to "answer questions based upon the most recent diagnosis that you found."

Finally, participants completed quantitative measures of web interactivity, cognitive effort, perceived competence and choice, computer experience, Big Five personality factors, depression, demographics, recent health history, lifetime health history, and preferred role in medical encounters (see Measures). Then, the participants were debriefed as to the purpose of the study and given a $10 community gift card in appreciation as well as a parking voucher for time spent in the study.

Measures

Short Portable Mental Status Questionnaire (SPMSQ)

Cognitive impairment was measured with the 10-item SPMSQ. It has good internal consistency ($\alpha = .83$, mean inter-item correlation=.33), as well as high sensitivity in inpatient samples (86%) (Pfeiffer, 1975). A score of 7 or less on the SPMSQ indicates abnormal mental functioning. Participants scoring ≤ 7 were excluded from the current study.

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Vignettes

Two vignettes were developed for the current study (see Appendix C for formatted vignettes). The acute conditions of mononucleosis and scarlet fever were selected as they are rare in older adults, but still relatively common in the general population. This was to ensure that few participants would have recent experiences with the illness that could influence their diagnostic process. Vignettes were drafted from symptom information found at Mayo Clinic's website (www.mayoclinic.com) as well as the National Institute of Allergy and Infectious Diseases website (www.niaid.nih.gov). Information was combined from multiple sites so that a Google search would not point directly to the site from which the information was drawn. Ten graduate students piloted both vignettes using both Google and WebMD's Symptom Checker. Seven out of the ten students obtained the correct diagnosis for both vignettes. The mononucleosis vignette text is as follows: "I've been feeling sick for almost a week. I feel exhausted, and I have a mild fever. My throat is really sore. In the past few days, the lymph nodes in my armpits and neck have swollen. My left side, right below my ribs, is a little sore too. I wish I would feel better soon." The scarlet fever vignette text is as follows: "I've been feeling sick for almost a week. I have a high fever and the lymph nodes in my neck are swollen. I also have this weird, red rash on my neck and arms. My tongue has red bumps on it too. I wish I would feel better soon."

Illness Perception Questionnaire-Revised (IPQ-R)

The IPQ-R is a 71-item questionnaire designed by Moss-Morris, Weinman, Petrie, Horne, Cameron, and Buick (2002) that adapted the original IPQ (Weinman, Petrie, Moss-Morris, and Horne, 1996). The purpose of the IPQ was to measure the five domains of cognitive illness representations: identity, cause, timeline, consequences, and cure-control. Based upon evidence from principal components factor analysis, the IPQ-R amends these subscales by separating the cure-control subscale into personal control (i.e.,

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self-efficacy) and treatment control (i.e., treatment outcome expectancies). The IPQ-R also divides the timeline subscale into acute/chronic and cyclical. Finally, scales that measure emotional representations of illness (e.g., "My illness makes me feel afraid") and illness coherence (e.g., "My illness is a mystery to me") are included. The IPQ-R has been tested with eight different patient groups (asthma, diabetes, rheumatoid arthritis, chronic pain, acute pain, myocardial infarction, multiple sclerosis, and HIV). Overall, the subscales showed good internal consistency (α = .67-.89), 3-month test-retest reliability (r = .46-.88), and 6-month test-retest reliability (r = .50-.82, excluding the timeline-cyclical subscale with r = .35).

For the current study, the IPQ-R was adapted so that participants were instructed to rate their opinions about the illness in the vignette rather than their own illness. Questions were modified for clarity (e.g., "My illness is unpredictable" was changed to "The illness is unpredictable."). In addition, the item "How confident are you regarding your response to the statement above?" was inserted between each item of the IPQ-R. Items about confidence were rated on a 5 point Likert-type scale with 1 indicating "Not at all confident" and 5 indicating "Very confident." Participants completed the IPQ-R after diagnosing the vignette on their own and also after diagnosing with Google or WebMD in order to measure their illness representations about their diagnosis.

Concurrent Think-Aloud

Participants were given explicit instructions about the think-aloud before beginning the task. These instructions were adapted from Ericsson and Simon's protocols (Ericsson & Simon, 1983), as well as instructions posted by Rader (2008; http://bierdoctor.com/2008/05/15/think-aloud-instructions/) (see Appendix D for adapted instructions). Participants were told to approach the think-aloud "basically like you're talking to yourself, but loud enough for other people to hear." Participants were instructed to tell the researcher "everything that you are thinking from the time you begin

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the exercise until you finish it" and that the goal was to "think-aloud as continuously as possible." Participants were also told that the exercise would end when "you've come upon a diagnosis that you are satisfied with."

First, the researcher demonstrated a think-aloud while opening an internet browser window. Participants then had the opportunity to ask questions. Second, the participant was asked to think-aloud while navigating to the University of Iowa webpage and locating a page with the University President's name on it (Sally Mason). Participants again had the opportunity to ask questions. If the participant felt comfortable, the diagnostic task then began. If a 5 second period of time lapsed in which the participant did not iterate any thoughts, the researcher reminded them to "please keep talking." Thoughts were audio recorded for the purpose of transcription and qualitative analysis.

Interactivity

Six items adapted from Cyr, Head, and Ivanov (2009) were used to measure perceived website interactivity. Items were rated on a 7-point Likert-type scale (1 = strongly agree, 7 = strongly disagree). Sample items included a) "I was in control over the content of this website that I wanted to see" and b) "The information shown when I interacted with the site met my expectations." Cyr et al. used confirmatory factor analysis to ensure acceptable construct validity. In addition, Cyr et al., found internal consistency to be good (Cronbach's α = .81-.96) for their sample.

Perceived Cognitive Effort

Perceived cognitive effort was measured with two self-report items adapted from Brunken, Plass, and Leutner (2003). The items were designed to measure subjectively perceived cognitive load or effort as reflected by the difficulty of the materials used. Thus, the items assessed the subjective difficulty of the diagnostic task (i.e., "How difficult was it to diagnose the symptoms in the story") and the difficulty of using the

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computer interface (i.e., "How difficult was it to use the computer program"). Whereas objective measures, such as timed performance measures or neuroimaging, are preferable to subjective self-report measures (Brunken et al., 2003), such measures were not feasible for the current study. In addition, subjective measures have been shown to assess perceived cognitive effort reliably (Paas, Tuovinen, Tabbers, &Van Gerven, 2003).

Perceived Competence and Choice

Perceived competence and choice related to the diagnostic task were measured with an adapted version of the Intrinsic Motivation Inventory (IMI) (Ryan, 1982). The inventory contains subscales that measure: a) task-specific perceived competence or how well the person believes s/he performed during the task and b) perceived choice or whether the person believes that s/he was autonomous during the task. Deci and Ryan assert that the sub-scales of the IMI were meant to be used independently, depending on the particular interest of the researcher ("Intrinsic Motivation Inventory," n.d.) http://selfdeterminationtheory.org/questionnaires/10-questionnaires/50. They also maintain that the subscale items can be adapted to the specific task utilized in the study. Thus, items were adapted to reflect the diagnosis task of the current study. Sample perceived competence items include: "I think I am pretty good at finding a diagnosis" and "After working at finding a diagnosis for a while, I felt pretty competent." Sample perceived choice items include: "I believe I had some choice about how to find a diagnosis" and "I didn't really have a choice about how to find a diagnosis." The perceived competence subscale of the IMI has demonstrated good internal consistency in other studies (α=.80-.83) (McAuley, Duncan, & Tammen, 1989; Goudas & Biddle, 1994) while the perceived choice subscale has shown acceptable reliability (α>.64) (Goudas & Biddle, 1994).

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Screen Shots

The computer program Camtasia captured the web sites that participants visited, the mouse clicks that they made, and the amount of time that the participant spent diagnosing the symptom vignette (for example screen shots see Appendix E: Figures E2-4). In order to analyze this data, measures used by Zhang (2004) were adapted. For the Google condition, the number of websites and types of websites visited, the number of "backtracks" (i.e., clicking 'Back' and returning to a web site already visited), and the number of terms and types of terms inputted in the search engine were tabulated. For the WebMD condition, the area of the avatar's body selected, the answers to the application's tailored questions, the specific symptoms selected, and the chosen diagnosis were recorded.

Computer Experience

Participants completed a free-response self-report questionnaire about their computer use/experience. The questionnaire was adapted from a study in which older adults utilize computerized cognitive training programs. Sample items included a) About how many hours per week do you use your home computer? b) Do you use your computer for word processing? c) Do you use your computer for socializing, and d) How many years have you had access to a computer in your home?

Demographics

Age, gender, ethnicity, education, and income were collected via a self-report survey in order to be included as covariates in analysis.

Recent Health History

Physical symptom experience was measured using a retrospective symptom checklist (Larsen, 1992). Participants indicated the frequency (0 = not at all; 6 = extremely much) that they had experienced each of 15 symptoms (e.g., headache,

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dizziness) in the past 21 days. Factor analysis demonstrated that the symptoms fell along four dimensions that represent depression (e.g., loss of interest, urge to cry), ache (e.g., backache, muscle soreness), gastrointestinal (e.g., poor appetite, nausea/upset stomach), and upper respiratory (e.g., sore throat, congestion). Larsen found that all symptoms showed factor loadings of .40 or greater.

Lifetime Health History

Chronic health history was measured with a checklist of common chronic conditions (e.g., diabetes, pneumonia) (Pecoraro, 1979). Participants indicated whether or not they had ever experienced each condition. The self-report health history has shown good agreement with a verbal history taken by a physician (K=.79), and acceptable test-retest agreement (K=.61).

Beck Depression Inventory

Depressive symptoms were assessed with the Beck Depression Inventory-II (BDI-II). The BDI-II consists of 21 items representing common symptoms of depression. Each item's response format consists of four graded statements among which the participant chooses to best represent his current feeling or thought. Numerical values of zero, one, two, or three are assigned each statement to indicate degree of severity. The BDI-II has shown high internal consistency (mean Cronbach's α= .91) (Dozois & Covin, 2004) and a test-retest reliability of .93 (Beck et al., 1996).

Big Five Inventory

Neuroticism was measured with the Big Five Inventory (BFI). The BFI (John, Donahue, & Kentle, 1991) is a measure designed to capture the prototypical facets of the Big Five personality factors: Extraversion, Neuroticism, Agreeableness, Openness, and Conscientiousness (Srivastava, 1995). The 44-item measure consists of short phrases that exemplify each of the five personality factors. The participant then indicates degree of

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self-endorsement with each phrase on a five-point scale (1 = "disagree strongly, 5 = "strongly agree"). The personality factor subscales have good internal consistency (average α=.80) and the BFI shows convergent and divergent validity with other Big Five personality measures (Srivastava, 1995).

Preferred Role in Medical Encounters

The role that patients prefer to have in medical encounters was measured with five Likert-type items (Trachtenberg, Dugan, & Hall, 2005). These items were compiled from work by Krantz, Baum, and Wideman (1980), Brody and colleagues (Brody, Miller, Lerman, Smith & Caputo, 1989) and Davis, Hoffman, and Hsu (1999). Four items are designed to assess how active or passive of a role the participant prefers to play in the patient-provider relationship (e.g., "It is always better to seek professional help than to try to treat yourself"). Trachtenberg (2005) additionally includes an item about treatment adherence (i.e., "You always follow physicians' recommendations about treatment") in order to further measure attitudes toward medical care.

Analysis Plan

Pilot Study

In order to assess the design and feasibility of the current study, pilot data were collected. Participants were 18 years or older and recruited via a Noon News advertisement. Participants engaged in a think-aloud while diagnosing either the mononucleosis or scarlet fever vignette on their own and then using Google or WebMD. During the pilot, participants did not answer the additional quantitative questions (e.g., IPQ-R).

The audio recordings of pilot participant think-alouds were transcribed using Express Scribe (NCH Software, Canberra, ACT, Australia). Transcripts were further

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segmented by the experimenter. Each independent clause was off-set on its own line for ease of coding.

Qualitative analysis was implemented to explore the processes that older adult's use to diagnose physical symptoms online. The analysis was based on the Q-sort method (McKeown & Thomas, 1998). The experimenter and a group of research assistants (N = 9) read segmented transcripts from the think-alouds of pilot study participants. Research assistants were divided into teams so that each team consisted of three assistants reading the same five participants' think-alouds (for a total of 15 different participants' transcripts). Each assistant was asked to independently select bundles of content/meaning from the transcripts, form categories of content based on patterns in the content bundles, and label the categories. After coding for content, the team met to discuss the content categories to formulate a final coding scheme. This coding scheme was compiled into a "coding dictionary."

Two additional research assistants, who had previously not participated in creating the coding dictionary, were tasked with validating the dictionary. These research assistants coded five randomly selected segmented pilot transcripts in order to assess inter-rater reliability. The experimenter served as the arbitrator in the coding process. In other words, if the two research assistants disagreed about coding a segment, the experimenter's response was the deciding factor. Inter-rater reliability was calculated (Cohen's κ) to determine whether the content had been reliably captured by the content categories (Marques & McCall, 2005). An acceptable Cohen's κ is .70 or above (Landis & Koch, 1977). The experimenter noted whether each research assistant had assigned a particular code for each transcript (presence) or whether the research assistant had believed the code not to apply to the particular transcript (absence). The number of presences and absences that each research assistant assigned was tabulated, and then the number of presence agreements, absence agreements, and disagreements were used to calculate Cohen's κ. The Cohen's κ for the pilot transcripts was .62. The two research

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assistants and the experimenter then met to discuss how to refine the coding dictionary in order to improve inter-rater reliability. This final version of the dictionary was used to analyze transcripts for the current study (see Appendix B: Think-Aloud Coding Dictionary).

Current Study: Qualitative

Think-Alouds

As previously mentioned, the audio recordings of participant think-alouds were transcribed using Express Scribe (NCH Software, Canberra, ACT, Australia). Transcripts were then segmented by two research assistants. Each independent clause was off-set on its own line for ease of coding.

A team of 13 research assistants coded the segmented transcripts using the previously compiled coding dictionary. The team was instructed to label the segmented lines of the transcript with the codes that they believed were depicted. The team was advised that not every line needed to be coded and that some lines may depict more than one code. Each segmented transcript was coded by two research assistants independently in order to assess inter-rater reliability.

Two research assistants were randomly selected to serve as validators. One-fifth (N = 16) of the transcripts that these research assistants coded were randomly selected to calculate Cohen's κ. The experimenter noted whether each research assistant had assigned a particular code for each transcript (presence) or whether the research assistant had believed the code not to apply to the particular transcript (absence). The number of presences and absences that each research assistant assigned was tabulated, and then the number of presence agreements, absence agreements, and disagreements were used to calculate Cohen's κ (κ = .53). Finally, the coded transcripts were then examined to note the themes that had emerged.

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Screen Shots

During the computer search, the participants' web actions were recorded with Camtasia Studio (Techsmith, MI). The experimenter then designed a coding scheme based upon Zhang's (2008) inquiry of mental models. In order to validate the coding scheme, research assistants ($N = 9$) were instructed to view the screen shots and code for specific information (see Appendix B: Screen Shots Coding Dictionary) about the Google search or the use of WebMD. This included information about the websites visited, the terms inputted in the Google search bar, and the answers to tailored questions that WebMD posed to the participant.

Current Study: Quantitative

Illness Representations

IPQ-R scores obtained both before and after the participant utilized the computer to search for a diagnosis were compared. With the inclusion of the covariates of computer experience, health history, depression, and neuroticism, the score for the subscales (timeline, consequences, personal control, treatment control, illness coherence, cyclical timeline, emotional representations, confidence, cause) was compared across a) Google, WebMD old version, and WebMD new version b) age (the two age strata as well as continuous age) c) gender, and d) whether the participant changed his/her diagnosis of the symptoms between the first think-aloud and the second (categorized by reading the think-aloud transcripts). Repeated measures Analysis of Covariance (ANCOVA) was used to analyze each outcome variable.

Cognitive Effort

The mean ratings for the cognitive effort questions were analyzed. With the inclusion of the covariates of computer experience and education, these scores were compared across a) search method and b) age using factorial ANCOVA.

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Interactivity

The mean ratings for perceived interactivity (Cyr, Head, & Ivanov, 2009) were compared. With the inclusion of the covariate of computer experience, these scores were compared across a) search method and b) age using a factorial ANCOVA.

Empowerment

The mean ratings for the subscales of the IMI (perceived competence and perceived control) were compared. With the inclusion of the covariates of computer experience, gender, and health status, these scores were compared across a) search method and b) age using factorial ANCOVA.

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CHAPTER 3: QUANTITATIVE RESULTS

Missing Values and Multiple Imputation

Upon initial examination, 96% of participants had at least one missing response in the quantitative measurements. The decision was made to use maximum likelihood (ML) methodology for multiple imputation of data as it is preferred to more traditional methods such as case deletion or mean-value imputation (e.g., Schafer & Graham, 2002). Multiple imputation was undertaken for groups of variables which had similar content (i.e., measure subscales). The Expectation/Maximization (EM) algorithm subcommand in the SPSS statistical program was used to calculate the expected values based upon the observed data and the maximum likelihood estimates of parameters based upon the expected values. All analyses were then performed on the imputed data set.

Descriptive Information

Participants demonstrated a wide range of computer experience; when computer use in hours per week was measured, participants demonstrated use between 1 and 85 hours with a mean of 18.77 hours per week (SD = 13.33). In addition, participants claimed home computer ownership for 1 to 35 years with a mean of 18.17 years (SD = 8.14). The main activities that participants completed on the computer were checking E-mail (96.2%, N = 76) and gathering information (91.1%, N = 72). Interestingly, there was no significant difference in computer hours per week between participants aged 50-64 years or 65 years and older ($t(77) = .30, p \leq .76$). Similarly, no significant age difference was found for years of computer ownership ($t(77) = -1.18, p \leq .24$).

Participants were randomly assigned to use a particular computer program to search for information online. 41 participants (51.9%) were assigned to use Google, and 38 (48.1%) were assigned to use WebMD. However, as previously mentioned, the WebMD interface was changed during data collection. As a result, 26 participants (32.9%) used the old version of WebMD while 12 participants (15.2%) used the new

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version. In addition, participants were randomly assigned to diagnose the symptoms of either mononucleosis or scarlet fever. 37 participants (46.8%) were given the mononucleosis vignette while 42 participants (53.2%) diagnosed the scarlet fever vignette. We also examined whether the participant changed their diagnosis after using the computer program to find more information; 50 participants (63.3%) did change their diagnosis after using the computer while 29 (36.7%) maintained their original diagnosis. Finally, we examined whether the participant had accurately diagnosed the vignette illness. 32 participants (40.5%) accurately diagnosed the illness that they had been assigned while 47 (59.5%) were not accurate in their diagnosis.

Participants were asked to answer questions about their preferred role in medical care (Trachtenberg, 2005). The majority of participants (79.7%, $N = 63$) believed that patients and physicians should collaborate when coming to medical decisions and control of the medical care should be shared equally (72.2%, $N = 57$). However, most participants simultaneously agreed that it was better to seek medical help when ill than treat oneself (75.9%, $N = 60$).

Illness Representations

Factorial ANCOVA was used to examine whether there was a change in the illness representation domains of participants (*timeline, consequences, personal control, treatment control, cyclical illness, illness coherence, and emotional representation*) after using the computer to search for health information on the internet. A general linear model was constructed containing a) the illness representation domain of interest, b) the between-subject factors of age (50-64 years or 65 years or older), search method (Google, WebMD's old version, or WebMD's new version), and illness vignette (mononucleosis or scarlet fever), and c) covariates of computer experience, depression, and neuroticism. Models that included age as a continuous variable were also tested. A summary table can be found at the end of the written results starting on page 71 (see Table 1).

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Timeline Representations

The timeline subscale examines beliefs about the duration or chronicity of illness. When dichotomous age was examined (50-64 years or 65 years or older), no significant main effects or interactions were found for *timeline* illness representations (see Appendix A: Table A1). However, when age was examined as continuous, a significant *timeline* by age by illness interaction ($F(12) = 2.85$, $p \leq 0.03$) and a *timeline* by search method by illness interaction were found ($F(1) = 6.11$, $p \leq 0.03$) (see Appendix A: Table A2). Upon further examination, Sidak-adjusted pairwise comparisons showed no significant change in *timeline* illness representations when comparing dichotomous age for either mononucleosis or scarlet fever symptoms, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A3 and A4). In addition, pairwise comparisons showed no significant change in *timeline* illness representations between participants who used Google, the old version of WebMD, or the new version of WebMD for either mononucleosis or scarlet fever symptoms, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A5 and A6).

Change in the confidence that participants had about their *timeline* illness representations after using the computer was also examined. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A7) or when age was treated as continuous (see Appendix A: Table A8).

Consequence Representations

The *consequence* subscale assessed how strongly the participant believed that negative consequences would result from the illness. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A9) or when age was continuous (see Appendix A: Table A10).

Change in the confidence that participants had about their *consequence* illness representations after using the computer was also examined. While no significant main

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effects or interactions were found when age was dichotomized (see Appendix A: Table A11), a marginally significant *consequence confidence* by illness interaction was found when age was treated as a continuous variable ($F(1) = 3.59$, $p \leq 0.08$) (see Appendix A: Table A12). Participants who diagnosed the symptoms of mononucleosis showed a tendency to be less confident in their beliefs about the negative consequences of the illness after using the computer but more confident in general about their *consequence* beliefs than those who diagnosed the symptoms of scarlet fever. In addition, participants who diagnosed the symptoms of scarlet fever showed a tendency to be more confident in their beliefs about the negative consequences of the illness after using the computer.

Personal Control Representations

The *personal control* subscale assessed how well the participant believed that the illness could be controlled by one's own actions. When age was dichotomized, no significant main effects or interactions were found (see Appendix A: Table A13). However, when age was treated as a continuous variable, a significant *personal control* by search method interaction was found ($F(2) = 5.98$, $p \leq 0.01$) (see Appendix A: Table A14). Upon further examination, Sidak-adjusted pairwise comparisons showed no significant change in *personal control* illness representations between participants who used Google, the old version of WebMD, or the new version of WebMD, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A15). In addition, a significant *personal control* by age by illness interaction was found ($F(12) = 2.84$, $p \leq 0.03$). However, pairwise comparisons showed no significant change in *personal control* illness representations among younger (one *SD* below the mean; approximately aged 51 to 57 years), mean-aged (approximately age 57 to 64 years), and older (one *SD* above the mean; approximately aged 64 to 84 years) participants for either mononucleosis or scarlet fever symptoms, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A16 and A17). Finally, there was a

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marginally significant *personal control* by age by search method interaction ($F(8) = 2.38$, $p \leq 0.07$). For those participants who used Google to diagnose, there was a tendency for mean-aged participants to be more likely to believe that the illness could be controlled by one's own actions when compared to younger and older participants. In addition, mean-aged participants who used Google believed more strongly that the illness could be controlled by personal actions after using the computer. In contrast, older participants who used Google believed less strongly that the illness could be controlled by oneself after using the computer. For those participants who used the old version of WebMD to diagnose, younger participants tended to be most likely to believe that the illness could be controlled. In addition, all participants, regardless of age, who used the old version of WebMD believed less strongly that the illness could be controlled by personal actions after using the computer. Finally, for those participants who used the new version of WebMD to diagnose, older participants were most likely to believe that the illness could be controlled by oneself. In addition, mean-aged participants who used the new version of WebMD believed less strongly that the illness could be controlled by personal actions after using the computer, while older participants who used the new version of WebMD believed more strongly that the illness could be controlled by oneself after using the computer.

Change in the confidence that participants had about their *personal control* illness representations after using the computer was also examined. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A18) or when age was treated as a continuous variable (see Appendix A: Table A19).

Treatment Control Representations

The *treatment control* subscale assessed how well the participant believed that the illness could be controlled by medical treatment. When age was dichotomized, there was a marginally significant *treatment control* by illness interaction ($F(1) = 3.00$, $p \leq 0.09$)

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(see Appendix A: Table A20). There was a tendency for participants who diagnosed the symptoms of mononucleosis to believe less strongly that the illness could be controlled by medical treatment after using the computer. In contrast, participants who diagnosed the symptoms of scarlet fever believed more strongly that the illness could be controlled by medical treatment after using the computer. However, no significant main effects or interactions were found when age was treated as a continuous variable (see Appendix A: Table A21).

Change in the confidence that participants had about their *treatment control* illness representations after using the computer was also examined. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A22). However, there was a marginally significant *treatment control confidence* by illness interaction ($F(1) = 3.35$, $p \leq 0.09$) when age was treated as a continuous variable (see Appendix A: Table A23). Participants who diagnosed the symptoms of scarlet fever tended to be more likely to be confident about their *treatment control* beliefs when compared to participants who diagnosed the symptoms of mononucleosis. However, those who diagnosed the symptoms of scarlet fever showed no change in confidence after using the computer. In comparison, there was a tendency for participants who diagnosed the symptoms of mononucleosis to be less confident in their beliefs that the illness could be controlled by medical treatment after using the computer.

Coherence Representations

The *coherence* subscale assessed the participant's personal understanding of the illness. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A24) or when age was treated as a continuous variable (see Appendix A: Table A25).

Change in the confidence that participants had about their *coherence* illness representations after using the computer was also examined. Again, no significant main

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effects or interactions were found when age was dichotomized (see Appendix A: Table A26) or when age was treated as a continuous variable (see Appendix A: Table A27).

Cyclical Representations

The *cyclical* subscale assessed how strongly the participant believed that the illness had a cyclical nature (i.e., would worsen and then improve over time). When age was dichotomized, there was a significant *cyclical* by illness interaction ($F(1) = 4.05$, $p \leq 0.05$) as well as a significant *cyclical* by search method by illness interaction ($F(1) = 3.84$, $p \leq 0.03$) (see Appendix A: Table A28). Upon further examination, Sidak-adjusted pairwise comparisons showed no significant change in *cyclical* illness representations for either mononucleosis or scarlet fever symptoms, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A29). In addition, pairwise comparisons showed no significant change in *cyclical* illness representations between participants who used Google, the old version of WebMD, or the new version of WebMD for either mononucleosis or scarlet fever symptoms, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A30 and A31). Finally, no significant main effects of interactions were found when age was treated as a continuous variable (see Appendix A: Table A32).

Change in the confidence that participants had about their *cyclical* illness representations after using the computer was also examined. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A33) or when age was treated as a continuous variable (see Appendix A: Table A34).

Emotional Representations

The *emotional representations* subscale assessed how strongly the participant felt negative emotions about the illness. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A35) or when age was treated as a continuous variable (see Appendix A: Table A36).

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Change in the confidence that participants had about their *cyclical* illness representations after using the computer was also examined. Again, no significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A37) or when age was treated as a continuous variable (see Appendix A: Table A38).

Change in Diagnosis

Change in participants' illness representation domains was explored depending upon whether the participant changed their illness diagnosis after using the computer. A general linear model was constructed containing a) the illness representation domain of interest, b) whether the participant changed their diagnosis or not, and c) covariates of computer experience, depression, and neuroticism.

No significant main effects or interactions were found for any of the illness representation domains (see Appendix A: Tables A39, A41, A43, A45, A47, A50, and A53). When a change in confidence about the illness representation after using the computer was examined, a marginally significant *timeline confidence* by diagnosis change interaction was found ($F(1) = 43.80$, $p \leq 0.06$) (see Appendix A: Table A40). There was a tendency for participants who did not change their diagnosis to be more confident in their beliefs about the duration of the illness after using the computer, while participants who did change their diagnosis showed a slight decrease in their confidence after using the computer. In addition, a marginally significant *personal control confidence* by diagnosis change interaction ($F(1) = 3.06$, $p \leq 0.09$) was found (see Appendix A: Table A44). There was a tendency for participants who did not change their diagnosis to be more confident in their beliefs that the illness could be controlled by personal actions after using the computer, while participants who did change their diagnosis showed a decrease in their confidence after using the computer. In addition, there was a significant *coherence confidence* by diagnosis change interaction ($F(1) = 7.58$, $p \leq 0.01$) (see Appendix A: Table A48) as well as a significant *cyclical confidence*

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by diagnosis change interaction (see Appendix A: Table A51). Upon further examination, Sidak-adjusted pairwise comparisons showed no significant change in *coherence confidence* between those participants who changed their diagnosis (vs. those who did not change) after using the computer, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A49). In addition, pairwise comparisons showed no significant change in *cyclical confidence* between those participants who changed their diagnosis (vs. those who did not change) after using the computer, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A52).

Gender

Changes in participants' illness representation domains were explored depending upon the gender of the participant. A general linear model was constructed containing a) the illness representation domain of interest, b) the gender of the participant, and c) covariates of computer experience, depression, and neuroticism. No significant main effects or interactions were found for any of the illness domains (see Appendix A: Tables A55, A57, A59, A61, A63, A65, and A67) However, there was a marginally significant *cyclical* by gender interaction ($F(1) = 3.11$, $p \leq 0.08$) (see Appendix A: Table A65). There was a tendency for women to believe less strongly that the illness had a cyclical nature after using the computer, while men believed more strongly that the illness had a cyclical nature after using the computer. There were also no significant main effects or interactions found for any of the illness representation confidence domains (see Appendix A: Tables A56, A58, A60, A62, A64, A66, and A68).

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Table 1. Summary Table of Illness Representation and Confidence Effects

Model Type	Illness Representation	Significant Effect?
Age Dichotomized	Timeline	N
	Confidence About Timeline	N
	Consequence	N
	Confidence About Consequence	Marginal Effect for Illness
	Personal Control	N
	Confidence About Personal Control	N
	Treatment Control	Marginal Effect for Illness
	Confidence About Treatment Control	Marginal Effect for Illness
	Coherence	N
	Confidence About Coherence	N
	Cyclical	Effect for Illness; Search Method x Illness Interaction
	Confidence About Cyclical	N
	Emotional	N
	Confidence About Emotional	N
Age Continuous	Timeline	Age x Illness Interaction; Search Method x Illness Interaction
	Confidence About Timeline	N
	Consequence	N
	Confidence About Consequence	Marginal Effect for Illness
	Personal Control	Effect for Search Method; Age x Illness Interaction; Marginal Age x Search Method Interaction
	Confidence in Personal Control	N
	Treatment Control	N
	Confidence in Treatment Control	Marginal Effect for Illness
	Coherence	N
	Confidence in Coherence	N
	Cyclical	N
	Confidence in Cyclical	N
	Emotional	N
	Confidence in Emotional	N
Change in Diagnosis	Timeline	N
	Confidence in Timeline	Marginal Effect for Change in Diagnosis
	Consequence	N
	Confidence in Consequence	N
	Personal Control	N
	Confidence in Personal Control	Marginal Effect for Change in Diagnosis
	Treatment Control	N
	Confidence in Treatment Control	N
	Coherence	N
	Confidence in Coherence	Effect for Change in Diagnosis
	Cyclical	N
	Confidence in Cyclical	Effect for Change in Diagnosis
	Emotional	N
	Confidence in Emotional	N
Gender	Timeline	N

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Table 1 (continued).

Model Type	Illness Representation	Significant Effect?
Gender	Confidence in Timeline	N
	Consequence	N
	Confidence in Consequence	N
	Personal Control	N
	Confidence in Personal Control	N
	Treatment Control	N
	Confidence in Treatment Control	N
	Coherence	N
	Confidence in Coherence	N
	Cyclical	N
	Confidence in Cyclical	Marginal Effect for Gender
	Emotional	N
	Confidence in Emotional	N

Cause of the Illness

Participants indicated how strongly they believed that a particular factor caused the illness. Thus, any change in the strength of participants' beliefs about a potential causing factor after using the computer was examined. A general linear model was constructed containing a) the potential causing factor, b) the between-subject factors of age (50-64 years or 65 years or older), search method (Google, WebMD's old version, or WebMD's new version), and illness vignette (mononucleosis or scarlet fever), and c) covariates of computer experience, depression, and neuroticism. Models that included age as a continuous variable were also examined.

For ease of interpretation, the 18 potential causes of illness are discussed according to four factors delineated by Moss-Morris and colleagues (2002): risk factors (i.e., heredity, diet, poor medical care, behavior, aging, smoking, and alcohol), psychological factors (i.e., stress, mental attitude, family, overwork, emotional state, and personality), immunity factors (i.e., germ or virus, pollution, and immunity), and accident or chance (i.e., accident and chance). A summary table can be found at the end of the written results starting on page 85.

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Risk Factors

Heredity

Participants answered whether they believed that the cause of the illness was hereditary or likely to run in the family. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A75) or when age was treated as a continuous variable (see Appendix A: Table A76).

Diet

Participants answered whether they believed that diet or eating habits could have caused the illness. When age was dichotomized, there was a marginally significant *diet* by age interaction ($F(1) = 3.45$, $p \leq 0.07$) (see Appendix A: Table A79). There was a tendency for participants aged 60-64 years to believe more strongly that diet could have caused the illness after using the computer, while participants aged 65 years or older tended to believe less strongly in diet as a cause after using the computer. When age was treated as a continuous variable, no significant main effects or interactions were found (see Appendix A: Table A80).

Poor Medical Care

Participants answered whether they believed that poor medical care in the past could have caused the illness. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A83). However, there was a significant *poor medical care* by search method interaction ($F(2) = 4.08$, $p \leq 0.04$) and *poor medical care* by illness interaction ($F(1) = 3.52$, $p \leq 0.05$) when age was treated as a continuous variable (see Appendix A: Table A84). Upon further examination, Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *poor medical care* between participants who used Google, the old version of WebMD, and the new version of WebMD, after adjusting for computer experience, depression, and

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neuroticism (see Appendix A: Table A85). In addition, pairwise comparisons showed no significant change in beliefs about *poor medical care* between diagnosing mononucleosis symptoms or scarlet fever symptoms, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A86).

Behavior

Participants answered whether they believed that one's own behavior could have caused the illness. When age was dichotomized, a significant *behavior* by age interaction was found ($F(1) = 5.95$, $p \leq 0.02$) (see Appendix A: Table A91). However, Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *behavior* between participants aged 50-64 years or aged 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A92). When age was treated as a continuous variable, there was a significant *behavior* by age interaction ($F(28) = 2.92$, $p \leq 0.01$) (see Appendix A: Table A93). Pairwise comparisons showed no significant change in beliefs about *behavior* between younger, mean-aged, or older participants, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A94). In addition, a significant *behavior* by search method interaction was found ($F(2) = 6.05$, $p \leq 0.01$). Yet, pairwise comparisons showed no significant change in beliefs about *behavior* between those who used Google, the old version of WebMD, or the new version, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A95). Additionally, there was a significant *behavior* by illness interaction ($F(1) = 5.51$, $p \leq 0.03$). Again, pairwise comparisons showed no significant change in beliefs about *behavior* between participants who diagnosed the symptoms of mononucleosis and those who diagnosed the symptoms of scarlet fever, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A96). Finally, there was a marginally significant *behavior* by age by illness interaction ($F(12) = 2.11$, $p \leq 0.08$). For those who diagnosed the symptoms of

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mononucleosis, there was a tendency for younger and mean-aged participants to believe less strongly that behavior caused the illness after using the computer. In contrast, there was a tendency for older participants to believe more strongly that behavior caused the illness after using the computer. For those who diagnosed the symptoms of scarlet fever, older participants were most likely to believe that behavior caused the illness when compared to younger and mean-aged participants. In addition, there was a tendency for mean-aged and older participants to believe less strongly that behavior caused the illness after using the computer. In comparison, there was a tendency for younger participants to believe more strongly that behavior caused the illness after using the computer.

Aging

Participants answered whether they believed that aging could have caused the illness. When age was dichotomized, a marginally significant *aging* by illness interaction was found ($F(1) = 3.13$, $p \leq 0.08$) (see Appendix A: Table A116). There was a tendency for participants who diagnosed the symptoms of mononucleosis to believe more strongly that aging could have caused the illness after using the computer. In contrast, participants who diagnosed the symptoms of scarlet fever believed less strongly that aging could have caused the illness after using the computer. In addition, there was a significant *aging* by age by search method interaction ($F(2) = 5.37$, $p \leq 0.01$). Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *aging* between participants using Google, the old version of WebMD, or the new version of WebMD for participants aged 50-64 years or 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A117 and A118). When age was treated as a continuous variable, no significant main effects or interactions were found see Appendix A: Table A119).

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Smoking

Participants answered whether they believed that smoking could have caused the illness. When age was dichotomized, there was a significant *smoking* by age by illness interaction ($F(1) = 5.01$, $p \leq 0.03$) (see Appendix A: Table A126). Sidak-adjusted pairwise comparisons showed no significant change in *smoking* beliefs between participants aged 50-64 years or aged 65 years or older for those participants who diagnosed the symptoms of mononucleosis, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A127 and A128). However, there was a tendency for participants aged 50-64 years to believe more strongly that smoking caused the illness when compared to participants aged 65 years or older for those participants who diagnosed the symptoms of scarlet fever ($MD = 0.36$, $SE = 0.21$, $p \leq 0.09$). In addition, a significant *smoking* by age by search method by illness interaction was found ($F(2) = 5.48$, $p \leq 0.01$). Yet, pairwise comparisons showed no significant change in *smoking* beliefs between participants aged 50-64 years or aged 65 years or older for those participants who diagnosed the symptoms of mononucleosis or the symptoms of scarlet fever, regardless of search method, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A129-132). When age was treated as a continuous variable, there were no significant main effects or interactions found (see Appendix A: Table A133).

Alcohol

Participants answered whether they believed that alcohol could have caused the illness. When age was dichotomized, a significant *alcohol* by age by search method by illness interaction was found ($F(2) = 4.37$, $p \leq 0.02$) (see Appendix A: Table A120). Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *alcohol* between participants aged 50-64 years who diagnosed the symptoms of mononucleosis and used Google, the old version of WebMD or the new version of

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WebMD (see Appendix A: Table A121). However, for participants aged 50-64 years who diagnosed the symptoms of scarlet fever, those who used Google were less likely to believe that alcohol caused the illness when compared to those who used the new version of WebMD (*MD* = -1.10, *SE* = 0.30, $p \leq 0.01$) (see Appendix A: Table A122). In addition, for participants aged 50-64 years who diagnosed the symptoms of scarlet fever, those who used the old version of WebMD were less likely to believe that alcohol caused the illness when compared to those who used the new version of WebMD (*MD* = -1.21, *SE* = 0.37, $p \leq 0.02$). For participants aged 65 years or older, no significant change in beliefs about *alcohol* were found for those who diagnosed the symptoms of mononucleosis or those who diagnosed the symptoms of scarlet fever, regardless of search method (see Appendix A: Tables A123 and A124). When age was treated as a continuous variable, no significant main effects or interactions were found (see Appendix A: Table A125).

Psychological Factors

Stress

Participants answered whether they believed that stress or worry could have caused the illness. When age was dichotomized, significant *stress* by age ($F(1) = 8.12$, $p \leq 0.001$), *stress* by search method ($F(2) = 4.67$, $p \leq 0.01$), and *stress* by age by search method interactions ($F(2) = 3.77$, $p \leq 0.03$) were found (see Appendix A: Table A74). Upon further examination, Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *stress* between participants aged 50-64 years and 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A70). In addition, pairwise comparisons showed no significant change in beliefs about *stress* between those participants who used Google, the old version of WebMD and the new version of WebMD, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A71). Finally, pairwise

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comparisons showed no significant change in beliefs about *stress* between those participants aged 50-64 years old and those 65 years or older among those who used Google, the old version of WebMD and the new version of WebMD, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A72 and 73).

When age was treated as a continuous variable, no significant main effects or interactions were found (see Appendix A: Table A74).

Mental Attitude

Participants answered whether they believed that one's mental attitude (e.g., thinking about life negatively) could have caused the illness. When age was dichotomized, there was a significant *mental attitude* by age interaction ($F(1) = 7.24$, $p \leq 0.01$) (see Appendix A: Table A97). Pairwise comparisons showed no significant change in beliefs about *mental attitude* between participants aged 50-64 years and 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A98). In addition, a marginally significant *mental attitude* by age by search method interaction was found ($F(2) = 2.60$, $p \leq 0.08$). There was a tendency for participants aged 50-64 years to believe less strongly that mental attitude could have caused the illness after using the computer if they used Google or the old version of WebMD to diagnose. In contrast, participants aged 50-64 years believed more strongly that mental attitude caused the illness after using the computer if they used the new version of WebMD to diagnose. In comparison, there was a tendency for all participants aged 65 years or older to believe less strongly that mental attitude caused the illness after using the computer, regardless of the search method used. When age was treated as a continuous variable, no significant main effects or interactions were found (see Appendix A: Table A99).

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<u>Family</u>

Participants answered whether they believed that family problems or worries could have caused the illness. When age was dichotomized, a significant *family* by age interaction ($F(1) = 6.29$, $p \leq 0.02$) was found (see Appendix A: Table A100). Pairwise comparisons showed a marginally significant change in beliefs about *family* when 50-64 year old participants were compared to 65 years or older year old participants (MD = 0.28, SE =0.15, $p \leq 0.07$), after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A101). There was a tendency for 50-64 year old participants to believe more strongly that family problems or worries could have caused the illness after using the computer, when compared to 65 years or older old participants. In addition, there was a marginally significant *family* by age by search method interaction ($F(2) = 2.56$, $p \leq 0.09$). There was a tendency for participants aged 50-64 years who used the new version of WebMD to more strongly believe that family problems or worries caused the illness after using the computer. In contrast, participants aged 65 years or older who used the new version of WebMD less strongly believed that family problems or worries caused the illness after using the computer. Participants who used the old version of WebMD less strongly believed that family problems or worries caused the illness after using the computer, regardless of age. Finally, participants aged 65 years or older who used Google less strongly believed that family problems or worries caused the illness after using the computer while participants aged 50-64 years slightly more strongly believed that family problems or worries caused the illness after using the computer. When age was treated as a continuous variable, no significant main effects or interactions were found (see Appendix A: Table A104).

<u>Overwork</u>

Participants answered whether they believed that overwork could have caused the illness. When age was dichotomized, a significant *overwork* by age interaction was

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found ($F(1) = 6.29$, $p \leq 0.02$) (see Appendix A: Table A105). Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *overwork* between participants aged 50-64 years and 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A106). When age was treated as a continuous variable, a significant *overwork* by illness interaction was found ($F(1) = 8.62$, $p \leq 0.01$) (see Appendix A: Table A107). Pairwise comparisons showed that participants who diagnosed the symptoms of mononucleosis were more likely to believe that overwork caused the illness after using the computer than participants who diagnosed the symptoms of scarlet fever, after adjusting for computer experience, depression, and neuroticism ($MD = 0.64$, $SE = 0.09$, $p \leq 0.001$) (see Appendix A: Table A108).

Emotional State

Participants answered whether they believed that one's emotional state could have caused the illness. When age was dichotomized, a significant *emotional state* by age interaction was found ($F(1) = 12.35$, $p \leq 0.001$) (see Appendix A: Table A109). Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *emotional state* between participants aged 50-64 years and 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A110). In addition, a significant *emotional state* by age by search method interaction was found ($F(2) = 3.35$, $p \leq 0.04$). Pairwise comparisons showed no significant change in beliefs about *emotional state* between participants aged 50-64 years and 65 years or older for those who used Google, the old version of WebMD, or the new version of WebMD, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A111 and A112). When age was treated as a continuous variable, there was a significant *emotional state* by age by search method interaction ($F(8) = 2.77$, $p \leq 0.04$) (see Appendix A: Table A113). Pairwise comparisons showed no significant change in

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beliefs about *emotional state* between younger, mean-aged or older participants for those who used Google, the old version of WebMD, or the new version of WebMD, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A114 and A115). In addition, a marginally significant *emotional state* by illness interaction was found ($F(1) = 3.53$, $p \leq 0.08$). There was a tendency for participants who diagnosed the symptoms of mononucleosis to believe more strongly that emotional state could have caused the illness after using the computer when compared to participants who diagnosed the symptoms of scarlet fever, after adjusting for computer experience, depression, and neuroticism.

Personality

Participants answered whether they believed that personality could have caused the illness. When age was dichotomized, there was a significant *personality* by age interaction ($F(1) = 5.89$, $p \leq 0.02$) (see Appendix A: Table A140). Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *personality* between participants aged 50-64 years and 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A141). In addition, a significant *personality* by age by search method by illness interaction was found ($F(2) = 4.47$, $p \leq 0.02$). However, pairwise comparisons showed no significant change in beliefs about *personality* between participants aged 50-64 years and 65 years or older for participants who diagnosed the symptoms of mononucleosis or those who diagnosed the symptoms of scarlet fever, regardless of search method, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A137 and A138). Finally, there was a marginally significant *personality* by age by search method interaction. There was the tendency for participants who used Google, regardless of age, to believe more strongly that personality could have caused the illness after using the computer. In addition, participants who used the old version of WebMD, regardless of

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age, showed a tendency to believe less strongly that personality caused the illness after using the computer. In contrast, participants aged 50-64 years who used the new version of WebMD showed a tendency to believe more strongly that personality caused the illness after using the computer, while participants aged 65 years or older who used the new version of WebMD tended to believe less strongly in personality as a cause. When age was treated as a continuous variable, no significant main effects or interactions were found (see Appendix A: Table A146).

Immunity Factors

Germ or Virus

Participants answered whether they believed that the cause of the illness was a germ or virus. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A77) or when age was treated as a continuous variable (see Appendix A: Table A78).

Pollution

Participants answered whether they believed that environmental pollution could have caused the illness. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A88). However, when age was treated as a continuous variable, a significant *pollution* by age by illness interaction was found ($F(12) = 2.40$, $p \leq 0.05$) (see Appendix A: Table A88). Pairwise comparisons showed no significant change in beliefs about *pollution* for younger, mean-aged, or older participants among those who diagnosed either mononucleosis symptoms or scarlet fever symptoms, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Tables A89 and A90).

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Immunity

Participants answered whether they believed that altered immunity could have caused the illness. When age was dichotomized, a significant *immunity* by age interaction was found ($F(1) = 4.17$, $p \leq 0.05$) (see Appendix A: Table A147). Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *immunity* between participants aged 50-64 years or 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A148). When age was treated as a continuous variable, there was a marginally significant *immunity* by age by illness interaction ($F(12) = 2.31$, $p \leq 0.06$) (see Appendix A: Table A149). For participants who diagnosed the symptoms of mononucleosis, older participants were most likely to believe that altered immunity caused the illness. In addition, there was a tendency for younger participants to show no change in beliefs about *immunity* after using the computer. However, mean-aged participants believed less strongly that altered immunity caused the illness after using the computer while older participants believed more strongly that altered immunity caused the illness after using the computer. For participants who diagnosed the symptoms of scarlet fever, older participants again were most likely to believe that altered immunity caused the illness when compared to younger and mean-aged participants. In addition, all age groups who diagnosed scarlet fever showed a tendency to believe less strongly that altered immunity caused the illness after using the computer, although mean-aged participants showed the greatest decrease compared to the other two age groups.

Accident or Chance Factors

Accident

Participants answered whether they believed that an accident or injury could have caused the illness. When age was dichotomized, significant *accident* by age ($F(1) = 7.65$, $p \leq 0.01$), *accident* by illness ($F(1) = 4.84$, $p \leq 0.03$), and *accident* by age by search

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method ($F(2) = 6.68$, $p \leq 0.001$) interactions were found (see Appendix A: Table A134). Upon further examination, Sidak-adjusted pairwise comparisons showed no significant change in beliefs about *accident* between participants aged 50-64 years or 65 years or older, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A135). In addition, pairwise comparisons showed no significant change in *accident* beliefs between participants who diagnosed the symptoms of mononucleosis and those who diagnosed the symptoms of scarlet fever, after adjusting for computer experience, depression, and neuroticism (see Appendix A: Table A136). Finally, pairwise comparisons showed no significant change in *accident* beliefs between 50-64 year old participants who used Google, the old version of WebMD, or the new version (see Appendix A: Table A137). Nevertheless, participants aged 65 years or older who used Google believed more strongly that an accident or injury could have caused the illness than those who used the old version of WebMD ($MD = 0.46$, $SE = 0.16$, $p \leq 0.03$) see Appendix A: Table A138). In addition, participants aged 65 years or older who used the old version of WebMD showed a tendency to believe less strongly that an accident or injury could have caused the illness than those who used the new version of WebMD ($MD = -0.68$, $SE = 0.28$, $p \leq 0.06$).

Chance

Participants answered whether they believed that chance or bad luck caused the illness. No significant main effects or interactions were found when age was dichotomized (see Appendix A: Table A81) or when age was treated as a continuous variable (see Appendix A: Table A82).

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Table 2. Summary Table of Effects for Illness Cause

Model Type	Illness Cause	Significant Effect?
Age Dichotomized	Heredity	N
	Diet	Marginal Effect for Illness
	Poor Medical Care	N
	Personal Behavior	Effect for Age
	Aging	Marginal Effect for Illness; Age x Search Method Interaction
	Smoking	Age x Illness Interaction; Age x Search Method Interaction
	Alcohol	Age x Search Method Interaction
	Stress	Effect for Age; Effect for Search Method; Age x Search Method Interaction
	Mental Attitude	Effect for Age; Marginal Age x Search Method Interaction
	Family	Effect for Age; Marginal Age x Search Method Interaction
	Overwork	Effect for Age
	Emotional State	Effect for Age; Age x Search Method Interaction
	Personality	Effect for Age; Age x Search Method Interaction; Marginal Age x Search Method Interaction; Age x Search Method x Illness Interaction
	Germ or Virus	N
	Pollution	N
	Immunity	Effect for Age
	Accident	Effect for Age; Effect for Illness; Age x Search Method Interaction
	Chance	N
Age Continuous	Heredity	N
	Diet	N
	Poor Medical Care	Effect for Search Method; Effect for Illness
	Personal Behavior	Effect for Age; Effect for Search Method; Effect for Illness; Marginal Age x Illness Interaction
	Aging	N
	Smoking	N
	Alcohol	N
	Stress	N
	Mental Attitude	N
	Family	N

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Table 2 (continued).

Model Type	Illness Cause	Significant Effect?
	Overwork	Effect for Illness
	Emotional State	Marginal Effect for Illness; Age x Search Method Interaction
	Personality	N
	Germ or Virus	N
	Pollution	Age x Illness Interaction
	Immunity	Age x Illness Interaction
	Accident	N
	Chance	N

Cognitive Effort

Cognitive Effort of Diagnosis

Participants responded to Likert-type questions about how much cognitive effort they perceived while diagnosing the symptoms of the vignette as well as using the computer program to diagnose. When age was dichotomized, there were no significant differences between groups for the cognitive effort of diagnosing the symptoms ($F(8) = 1.08, p \leq 0.39$), controlling for computer experience and education level (see Appendix A: Table A154). In other words, participants perceived an equal amount of cognitive effort while diagnosing the symptoms, regardless of age or search method, after controlling for computer experience and education level. Similarly, when age was treated as a continuous variable, there were no significant differences between groups ($F(54) = 0.88, p \leq 0.67$) (see Appendix A: Table A155).

Cognitive effort, controlling for computer experience and education level, was also examined depending upon whether the participant was accurate in their final diagnosis. For the cognitive effort of diagnosing the symptoms, a significant main effect was found ($F(1) = 11.46, p \leq 0.001$) (see Appendix A: Table A156). Participants who were not accurate in their diagnosis perceived greater cognitive effort diagnosing the

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symptoms than those who were accurate ($M_{notaccurate(adj)}$ = 5.22, SE = 0.22; $M_{accurate(adj)}$ = 4.02, SE = 0.27).

Cognitive Effort of Computer Program

When the cognitive effort of using the computer program was examined, a main effect for search method was found when age was dichotomized, controlling for computer experience and education level ($F(2) = 4.25$, $p \leq 0.02$) (see Appendix A: Table A150). Sidak-adjusted pairwise comparisons found that participants who used the new version of WebMD to diagnose symptoms perceived greater cognitive effort than those who used Google (MD = 1.37, SE = 0.47, $p \leq 0.02$) (see Appendix A: Table A151). In addition, participants who used the new version of WebMD to perceive marginally greater cognitive effort (MD = 1.18, SE = 0.50, $p \leq 0.06$) than those who used the old version. Yet, there was no significant difference between those who used the old version of WebMD and those used Google (MD = 0.20, SE = 0.35, $p \leq 0.92$). When age was treated as a continuous variable, a main effect of search method was found ($F(2) = 3.48$, $p \leq 0.05$) (see Appendix A: Table A152). However, pairwise comparisons did not detect any significant differences between search methods (see Appendix A: Table A153).

Cognitive effort, controlling for computer experience and education level, was also examined depending upon whether the participant was accurate in their final diagnosis. There was no significant main effect found for the cognitive effort of using the computer ($F(4) = 2.40$, $p \leq 0.06$), depending upon the accuracy of the diagnosis.

Interactivity

Participants answered Likert-type questions about the interactivity of the computer program that they used to diagnose (adapted from Cyr, Head, & Ivanov, 2009). When age was dichotomized, there was a marginal effect for age ($F(1) = 2.89$, $p \leq 0.09$) (see Appendix A: Table A158). There was a tendency for participants aged 65 years or older to perceive the computer program as more interactive when compared to

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participants aged 50-64 years. In addition, an age by search method interaction was found ($F(2) = 6.01$, $p \leq 0.004$). Participants aged 50-64 years who used the new version of WebMD to diagnose perceived the computer program as significantly less interactive than those who used the old version of WebMD ($MD = -12.39$, $SE = 4.34$, $p \leq 0.02$) and marginally less interactive than those who used Google ($MD = -9.09$, $SE = 4.09$, $p \leq 0.10$) (see Appendix A: Table A159). In contrast, pairwise comparisons for participants aged 65 years and older showed no significant differences between search methods for interactivity (see Appendix A: Table A160). When age was treated as a continuous variable, there was no main effect found for age ($F(28) = 1.07$, $p \leq 0.44$) (see Appendix A: Table A161). However, there was marginally significant main effect for search method ($F(2) = 3.01$, $p \leq 0.07$). There was a tendency for participants who used the old version of WebMD to perceive the computer program as more interactive when compared to participants who used Google or the new version of WebMD. Also, participants who used Google tended to perceive the computer program as more interactive when compared to participants who used the new version of WebMD. In addition, an age by search method interaction was found ($F(21) = 2.62$, $p \leq 0.01$). Sidak-adjusted pairwise comparisons showed that there were no significant differences between search methods for both younger (one *SD* below the mean; approximately aged 51 to 57 years) and older (one *SD* above the mean; approximately aged 64 to 84 years) participants (see Appendix A: Tables A162-164). However, for mean aged participants (approximately age 57 to 64 years), those who used the new version of WebMD perceived the compute program as less interactive than those who used the old version of WebMD ($MD = -15.33$, $SE = 4.01$, $p \leq 0.002$) or Google ($MD = -15.04$, $SE = 3.95$, $p \leq 0.003$).

We also examined whether interactivity could predict the accuracy of the participant's diagnosis. Binary logistic regression was utilized, including the covariates

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of "hours of computer use per week" and "years of owning a computer" (see Appendix A: Tables A165 and 166). "Hours of computer use per week" significantly predicted accuracy of diagnosis ($\beta = 0.05$, $p \leq 0.03$). Specifically, with increasing hours of computer use per week, the odds of an accurate diagnosis increased as well. However, interactivity did not significantly predict accuracy of diagnosis ($\beta = 0.03$, $p \leq 0.31$).

Empowerment

Participants completed an adapted Intrinsic Motivation Inventory (Ryan, 1982) to examine feelings of patient empowerment after diagnosing the symptoms online. Patient empowerment was defined as feelings of choice and competence, while diagnosing online for the current study. Therefore, feelings of choice and competence were examined, adjusting for computer experience, gender, recent health history, and chronic health history.

Choice

For feelings of choice, when age was dichotomized, there was a significant main effect for search method ($F(2) = 13.16$, $p \leq 0.001$) (see Appendix A: Table A167). Sidak-adjusted pairwise comparisons showed that participants who utilized Google to search for a diagnosis felt more choice about how to diagnose online than those who used the old version of WebMD ($MD = 2.00$, $SE = 0.44$, $p \leq 0.001$) or the new version of WebMD ($MD = 2.19$, $SE = 0.59$, $p \leq 0.001$) (see Appendix A: Table A168). No significant difference in choice was found between the old and new versions of WebMD ($MD = 0.19$, $SE = 0.62$, $p \leq 0.99$). Finally, there was no significant interaction between age and search method ($F(2) = 0.95$, $p \leq 0.39$). When age was treated as a continuous variable, a significant main effect for search methods was found ($F(2) = 9.40$, $p \leq 0.001$) (see Appendix A: Table A169). Sidak-adjusted pairwise comparisons showed that participants who utilized Google to search for a diagnosis felt more choice about how to diagnose online than those who used the old version of WebMD ($MD = 1.87$, $SE = 0.42$,

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$p \leq 0.001$) or the new version of WebMD (MD = 1.80, SE = 0.63, $p \leq 0.03$) (see Appendix A: Table A170). Again, no significant difference in choice was found between the old and new versions of WebMD (MD = -0.07, SE = 0.60, $p \leq 1.00$). In addition, a significant age by search method interaction was found ($F(21) = 2.44$, $p \leq 0.02$). Sidak-adjusted pairwise comparisons showed that there were no significant differences between search methods for younger participants (one SD below the mean; approximately aged 51 to 57 years) (see Appendix A: Table A171). However, those mean aged participants (approximately age 57 to 64 years) that used Google felt that they had more choice about how to diagnose online than those who used the old version of WebMD (MD = 2.71, SE = 0.62, $p \leq 0.001$) and those who used the new version (MD = 2.95, SE = 0.85, $p \leq 0.01$) (see Appendix A: Table A172). There was no significant difference in feelings of choice between mean-aged participants who used the old version of WebMD and those who used the new version. Finally, older participants (one SD above the mean; approximately aged 64 to 84 years) that used Google to diagnose felt that they had more choice about how to diagnose online than those who used the old version of WebMD (MD = 2.11, SE = 0.77, $p \leq 0.03$) but showed no significant differences between those who used the new version (MD = 1.32, SE = 1.00, $p \leq 0.49$) (see Appendix A: Table A173). In addition, there were no significant differences in choice about how to diagnose online between those older participants who used the old version of WebMD and those who used the new version (MD = -0.79, SE = 1.07, $p \leq 0.85$). Finally, no significant main effects or interactions were found when the accuracy of the participants' diagnosis was examined ($F(1) = 1.57$, $p \leq 0.21$) (see Appendix A: Table A174).

Competence

For feelings of competence, when age was dichotomized, no significant main effects or interactions were found (see Appendix A: Table A175). However, when age was treated as a continuous variable, there was a significant main effect of age ($F(28)$ =

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2.11, $p \leq 0.04$) (see Appendix A: Table A176). However, Sidak-adjusted pairwise comparisons showed no significant differences in feelings of competence regardless of age, after adjusting for computer experience, gender, recent health history, and chronic health history (see Appendix A: Table A177). In addition, a significant age by search method interaction was found ($F(21) = 2.66$, $p \leq 0.01$). Yet, again, Sidak-adjusted pairwise comparisons showed no significant differences in feelings of competence regardless of age or search method, after adjusting for computer experience, gender, recent health history, and chronic health history (see Appendix A: Tables A178-180). Finally, no significant main effects or interactions were found when the accuracy of the participants' diagnosis was examined ($F(1) = 2.38$, $p \leq 0.13$) (see Appendix A: Table A181).

Supplementary Analyses

Because of the inconsistent pattern of results found when illness representations were examined, we wondered whether differences in the amount of information encountered online could affect illness representation construction. As participants assigned to use WebMD were only subject to information from one website (www.webmd.com)--limiting variability--supplementary analyses were only conducted with those participants who used Google to diagnose. Thus, the number of websites that the participant visited and the number of backtracks (clicking back to a previous webpage) were examined in relation to each illness representation domain and confidence in the domain. Difference scores were calculated for each illness representation domain and confidence in the domain to represent change in representation and confidence after using the computer.

No significant bivariate relationships were found when the number of websites visited was examined in relation to illness representation domains or illness representation confidence. However, change in *timeline* representation (the duration or

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chronicity of the illness) was marginally related to the number of backtracks ($r = .30$, $p \leq 0.06$). There was a tendency, after using the computer, for participants to be more likely to believe that the illness would last a long time as the number of backtracks increased.

Quantitative Summary

Overwhelmingly, no change in illness representation domains after using the computer was found. Although significant interactions were found between study factors (age, illness vignette symptoms, or search method) and cyclical representations when age was dichotomized, Sidak-adjusted comparisons showed no significant changes between groups after covariates were included (computer experience, depression, neuroticism). Similarly, when age was treated as a continuous variable, significant interactions between both timeline representations and personal control representations and study factors were found. Yet, pairwise comparisons showed no significant changes between groups after covariates were included.

In addition, no change in confidence about illness representations after using the computer was found for study factors. Yet, significant interactions were found between both confidence in coherence representations and confidence in cyclical representations and whether the participant changed their diagnosis after using the computer. However, pairwise comparisons again showed no significant change between groups after covariates were included. Finally, no change in illness representation domains or confidence about illness representations was found depending upon participant gender.

When participants were asked about the perceived cause of the illness, findings showed no clear pattern. Significant age differences were found primarily for psychological causes such as stress or mental attitude. However, upon further examination, pairwise comparisons showed no significant differences between groups. Significant differences between search methods were found for the risk factors of poor medical care and personal behavior, and the psychological factor of stress. Again,

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pairwise comparisons showed no significant differences between groups after including covariates. Finally, significant differences between illness vignette symptoms were found for the risk factors of poor medical care and personal behavior, the psychological factor of overwork, and accident. Further examination showed that participants who read the symptoms of mononucleosis (vs. scarlet fever) were more likely to believe that overwork caused the illness.

Three-way interactions (e.g., cause by age by search method) similarly showed no discernible pattern of effects. However, after including covariates in the model, significant group differences emerged for the causes of smoking, alcohol, and accident. Participants aged 50-64 years (vs. 65 years or older) were more likely to believe that smoking caused the illness and that alcohol caused the illness if they had diagnosed the symptoms of scarlet fever (vs. mononucleosis). Participants aged 50-64 years were also more likely to believe that alcohol caused the illness if they had used the new version of WebMD (compared to both the old version of WebMD and Google). Finally, participants aged 65 years or older were more likely to believe that accident caused the illness if they had used the new version of WebMD or Google compared to the old version of WebMD.

Cognitive effort was examined in two ways: the effort of diagnosing the symptoms and the effort of using the computer. When the effort of diagnosis was investigated, no significant differences between study factors (i.e., age, search method, illness vignette symptoms) were found. However, participants who were ultimately inaccurate in their diagnosis perceived greater cognitive effort of diagnosing than those who were accurate. When effort of using the computer was investigated, a significant difference of search method was found. Participants who used the new version of WebMD perceived greater cognitive effort of using the program than those who used Google.

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When interactivity was examined, age differences were discovered. Participants aged 50-64 years were more likely to find the new version of WebMD to be less interactive than participants aged 65 years or older. In addition, interactivity did not predict accuracy of diagnosis as previously predicted.

In terms of empowerment, participants who used Google perceived more choice about how to diagnose than those who used either version of WebMD. Age by search method differences were also found; younger participants showed no significant difference in perceived choice depending upon search method while mean-aged and older participants who used Google perceived greater choice when compared to the old version of WebMD. Mean-aged participants further perceived greater choice with Google than the new version of WebMD while older participants perceived equal choice with Google and with the new version of WebMD. Finally, there were no significant differences across study factors when perceived competence was measured and covariates were included.

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CHAPTER 4: QUALITATIVE RESULTS

General Findings

In order to address our second exploratory question ("What are the processes that older adults use to diagnose a set of physical symptoms online?"), the transcripts of participant think-alouds were coded and patterns assessed. Overwhelmingly, participants seemed to spend much of their cognitive resources navigating the computer programs (98.7% of participants, *N* = 78; e.g., "*Type that in and hit Enter")* and reading (98.7%, *N* = 78) and/or summarizing the information presented (100%, *N* = 79; e.g., "*And it says it usually goes away in a few days*"). The majority of participants planned the steps that they would take to diagnose before implementing those actions (93.7%, *N* = 74; e.g., "*So I guess what I will do is, uh, try to think of something that Google will be interested in trying to answer*"). Participants also tended to select a particular symptom on which to focus during diagnosing (96.2%, *N* = 76; e.g., "*High fever….I'm going to put this in quotes*") before moving onto another symptom. Many participants also made comments about the layout or features of the website that they were visiting (88.6%, *N* = 70; e.g., "*Well, here's a tool from the Mayo Clinic*").

Participants reasoned whether the information presented in the vignette or on the computer screen was useful or relevant to their goal of diagnosing (91.1%, *N* = 72; e.g., "*Well, darn, that's not gonna, that's not gonna help*"). Yet, only a quarter of participants considered the source of the information that they were viewing or factored the credibility of a source when selecting a particular website (27.8%, *N* = 22; e.g., "*And the page I'm looking at, MedicineNet.com, that looks very reliable*"). Many participants commented on the cause of the vignette symptoms (51.9%, *N* = 41; e.g., "*Could be bacterial, could be viral*") when making a diagnosis. Participants tended to discuss the information that they were lacking that they would find beneficial to make a diagnosis (86.1%, *N* = 68; e.g., "*Um, but, um, I, I don't know how old, how old this particular*

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person is"). In addition, half of participants suggested some sort of action that the vignette target should take such as going to the doctor or asking for antibiotics (50.6%, *N* = 40).

About two-thirds of participants seemed to utilize previously held medical knowledge to help to diagnose the symptoms, even while using the computer simultaneously (69.6%, *N* = 55; e.g., "*Um-m-m, colon polyps, that's not symptomatic*"). In addition, a little under half of participants accessed memories of previous experiences with the symptoms and illness to aid in diagnosis (44.3%, *N* = 35; e.g., "*Been there, done that, um, so I had it as a kid*"). Overwhelmingly, participants took the strategy of eliminating potential diagnoses when the illnesses/conditions demonstrated symptoms that did not match with the vignette symptoms (91.1%, *N* = 72; e.g., "*No, this person is not short of breath*"). Participants also tended to try to confirm potential diagnoses by determining whether the illnesses/conditions demonstrated symptoms that, in fact, matched with the vignette symptoms (73.4%, *N* = 58; e.g., "*It fits some of it. High fever and lymph nodes*").

Participants tended to have difficulty with the computer programs, either not knowing how to navigate them or not knowing how to troubleshoot after an error message (81.0%, *N* = 64; e.g., "*Oh, where, where did Question B go? I don't know where Question B is. What happened there? Umm, am I at the top of Question B?*"). About half of participants also demonstrated confusion about how to attempt to diagnose the vignette symptoms (55.7%, *N* = 44; e.g., "*I'm kind of at a loss where to go now*"). Finally, some participants seemed hesitant to make a diagnosis and demonstrated that they were not confident in the diagnosis that they had settled upon (38.0%, *N* = 30; e.g., "*I can't diagnosis this by myself*").

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Findings Based on Age

The think-aloud content of participants aged 50-64 years was compared to those participants aged 65 years or older. Chi squared analyses were examined for all codes. If a code had cells with expected values of less than 5, Fisher's exact test was examined. A significant difference was found when we examined the relevancy or usefulness of information encountered (p = .001, FET). Only 81.6% (N = 31) of participants aged 50-64 years discussed whether information was relevant as compared to all 100% (N = 41) of participants aged 65 years or older. A marginally significant difference was found when we examined the credibility of information ($\chi^2(1) = 2.95, p \leq .09$). Approximately thirty-seven percent (36.8%, N = 14) of participants aged 50-64 years tended to discuss the credibility or source of the information encountered as compared to only twenty percent (19.5%, N = 8) of participants aged 65 years or older. In addition, a marginally significant difference was found when we examined lack of information ($\chi^2(1) = 3.10, p \leq .08$). Approximately seventy-nine percent (78.9%, N = 30) of participants aged 50-64 years commented on a lack of information as compared to ninety-three percent (92.7%, N = 38) of participants aged 65 years or older. Finally, a significant difference was found when we examined confidence in diagnosis ($\chi^2(1) = 11.89, p \leq .001$). Only 18.4% ($N$ = 7) of participants aged 50-64 years mentioned a lack of confidence in their diagnosis as compared to 56.1% (N = 23) of participants aged 65 years or older.

Findings Based on Search Method

The think-aloud content of participants using Google to diagnose was compared to those using the old version of WebMD and those using the new version of WebMD. A significant difference was found when we examined credibility ($p \leq .002$, FET). Approximately forty-four percent (43.9%, N = 18) of participants who used Google discussed the credibility or source of the information as compared to fifteen percent (15.4%, N = 4) of participants who used the old version of WebMD discussed credibility

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and none of the participants who used the new version of WebMD. In addition, a significant difference was found when we examined a lack of information ($p \leq .03$, FET). Seventy-six percent (75.6%, $N = 31$) of participants who used Google mentioned lacking information as compared to ninety-six percent (96.2%, $N = 25$) of participants who used the old version of WebMD and all (100%, $N = 12$) participants who used the new version of WebMD.

Findings Based on Gender

The think-aloud content of female participants was compared to male participants. There was a marginally significant difference when previous experience was examined ($\chi^2(1) = 3.00, p \leq .08$). Fifty-two percent (52.1%, $N = 25$) of women recalled a previous experience with the vignette symptoms as compared to thirty-two percent (32.3%, $N = 10$) of men. No other gender differences were found.

Findings Based on a Change of Diagnosis

The think-aloud content of participants who changed their diagnosis was compared to those who did not. There was a marginally significant difference when relevance of information was examined ($p \leq .09$, FET). Ninety-six percent (96.0%, $N = 48$) of those participants who changed their diagnosis commented on the relevancy or usefulness of the information encountered as compared to eighty-three percent (82.8%, $N = 24$) of those who did not change. A marginally significant difference for discussion of unknown information was also found ($p \leq .09$, FET). Ninety-two percent (92.0%, $N = 46$) of participants who changed their diagnosis mentioned unknown information while diagnosing as compared to seventy-six percent (75.9%, $N = 22$) of participants who did not change. A marginally significant difference was also found for web orientation ($p \leq .07$, FET). Ninety-four percent (94.0%, $N = 47$) of participants who changed their diagnosis commented on the layout or features of the website/s used as compared to seventy-nine percent (79.3%, $N = 23$) of participants who did not change.

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Findings Based Upon Accuracy of Diagnosis

The think-aloud content of participants who accurately diagnosed the illness was compared to those who did not. There was a significant difference for suggested actions ($\chi^2(1) = 3.71, p \leq .05$). Approximately thirty-eight percent (37.5%, $N = 12$) of participants who accurately diagnosed the illness suggested medical action for the vignette target to take as compared to sixty percent (59.6%, $N = 28$) of participants who did not accurately diagnose.

Web Screen Shots

Screen shots were captured for both participants who used Google and those who used both versions of WebMD. For Google, the type of website visited was categorized. The majority of participants (86.7%, $N = 39$) used a commercial health website to diagnose (e.g., MedicineNet, Everyday Health). Almost half of participants (48.9%, $N = 22$) browsed to a government-hosted site (e.g., Medline) or a hospital site (e.g., Mayo Clinic). Finally, a third of participants (33.3%, $N = 15$) viewed user-generated content (e.g., Wikipedia or a discussion board). A few participants also viewed advertisements, foundation websites (e.g. LiveStrong), online dictionaries, university websites, or additional search engines (e.g., Ask.com). Chi squared tests showed that there were no relationships between the type of website used and age or the type of website used and the accuracy of diagnosis.

The phrases that participants typed into the Google search bar were also categorized. Most participants entered a number of symptoms (e.g., fever, sore throat) into the search bar (62.2%, $N = 28$) and then viewed the results to see what types of conditions appeared. In contrast, some participants searched for a specific illness or condition (24.4%, $N = 11$) and then read information in order to seek the symptoms that accompanied the condition. Still others had a specific website in mind that they had used in the past and browsed immediately to that site (20.0%, $N = 9$). A few participants had a

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different strategy, instead searching for the phrase "symptom checker" (*N* = 4) or "diagnosis" (*N* = 4) to see if they could find a tool to help them in their diagnostic goal. Chi squared tests showed that there were no relationships between the search phrase used and age or the search phrase used and the accuracy of diagnosis.

For WebMD, the number of symptoms that the participant inputted into the program was tabulated. The number of symptoms used ranged from 1 to 11 with a mean of 5 (*SD* = 2.31). In addition, the number of possible conditions that the participant viewed (i.e., clicked on the link to get an informational article about the condition) was tabulated. The number of conditions viewed ranged from 1 to 18 with a mean of 6 (*SD* = 5.28). Bivariate correlations showed no relationships between the number of symptoms used, the number of conditions viewed, age, or accuracy of diagnosis.

Qualitative Summary

Participants seemed to spend the majority of their search time navigating the computer program or acquiring information by reading or paraphrasing information on the site. Participants also considered whether the information found was relevant, whether there was information that they lacked to make a diagnosis, and whether they felt confident about their diagnosis. In order to diagnose, most participants used a strategy of comparing the illness vignette symptoms to the symptoms of a possible condition found online, eliminating the condition if the symptoms from both did not match.

A few differences were found when qualitative themes were examined by study factors. Participants aged 65 years or older (vs. participants 50-64 years) were more likely to discuss the relevancy of the information acquired as well as mention a lack of confidence in their diagnosis. In addition, participants who used Google were more likely to comment on the credibility or source of the information acquired (vs. both old and new version of WebMD), while participants who used WebMD were more likely to discuss a lack of information. Finally, participants who accurately diagnosed the illness

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were more likely to suggest medical actions for the vignette target to take than those participants who did not accurately diagnose.

Although web screen shots did not reveal relationships to age or accuracy of diagnosis, some themes emerged. Among those who used Google, participants were most likely to visit a commercial website, followed by a government-hosted site, and then a site with user-generated content. In addition, participants were most likely to type vignette symptoms into the Google search bar, followed by typing in a specific condition, and finally a specific website. Among those who used WebMD, there was much variability in the number of symptoms that participants inputted into the decision aid (ranging from 1-11) as well as variety in the number of conditions that participants considered (ranging from 1-18).

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CHAPTER 5: DISCUSSION

Discussion Plan

In the following pages, results will first be briefly summarized, and then plausible explanations for the findings will be discussed. In addition, recommendations for future studies will be included. Quantitative results will be discussed first in the order that they were reported: illness representation domains and confidence in illness representations, illness causes, cognitive effort, interactivity, and empowerment. Extra space will be taken to discuss a factor of interest which spans all of the above variables, the accuracy of diagnosis. Second, overarching qualitative themes will be discussed and then concluding remarks will appear.

Illness Representations

Quantitative analyses found no consistent patterns of results when examining the illness representation domains or confidence in illness representations of participants. While some domains or confidence in domains showed significant age, search method, illness or change in diagnosis effects, further examination showed no significant differences after adjusting for computer experience, depression, and neuroticism. Thus, the tentative answer to Exploratory Questions 1 (“Do older adults’ illness representations change after searching for online health information?”) and 3 (“Do older adults’ illness representations change as a function of whether they change their diagnosis after accessing more information?”) is “No.” In addition, our hypothesis that participants using WebMD would be more confident in their illness representations was unsupported.

There are a number of possible reasons for these negative findings. First, computer experience, depression, and neuroticism may be more important in the construction of illness representations than age, type of search method, or type of illness. Second, we considered whether the variability in the amount of information encountered by participants during their computer search could influence illness representation

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construction. However, supplementary analyses did not indicate significant relationships between either the number of websites visited or the number of backtracks and change in illness representation domains or confidence. Third, participants completed the second (post-computer use) measurement of the Illness Perception Questionnaire-Revised (IPQ-R) in a relatively short period of time after the baseline measurement (ranging from 5-35 minutes after baseline). Moss-Morris et al. (2002) and colleagues examined the stability of illness representations in a patient sample after a three-week follow-up, a much longer period of time compared to the current study. Therefore, it is possible that measurement occurred after too little time had passed to see changes in participants' illness representations. Finally, participants were asked to rate the illness representations of an unspecified vignette target, in contrast to other studies of illness representations which have had participants rate their own illness (for examples, see: Petrie & Weinman, 1997; Cameron & Leventhal, 2003) or caregivers rate their loved one's illness (Kuipers et al., 2007). Thus, it is possible that participants were not invested in constructing an illness representation for the target or did not have enough background information on which to base their representations. Future studies may want to investigate the diagnosis of illness online after a longer follow-up period. In addition, it may be beneficial to provide participants with more background illness information or have participants obtain information about their own personal illness state in order to determine whether constructing an illness representation of an unknown target is problematic.

Illness Causes

Participants rated a number of factors as to the likelihood that the factor caused the illness. Differences based upon age were found mainly for psychological factors (e.g., stress, mental attitude, family problems, overwork, emotional state, and personality). However, differences based on age, search method, and vignette illness exhibited no discernible pattern across the other factors (risk, immunity, and

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accident/chance). In addition, after computer experience, depression, and neuroticism were entered into the models, there failed to be significant differences between age, search method, or illness for all of the factors except smoking, alcohol, overwork and accident. It may be that computer experience, depression, and neuroticism are more important factors relating to beliefs about the cause of an illness rather than participant age, search method, or particular illness investigated. In addition, as previously mentioned, participants were rating the cause of the illness of an unknown target. Thus, participants may not have been invested in rating or may have had insufficient information on which to base their ratings.

Cognitive Effort and Interactivity

We predicted that participants who used WebMD to diagnose the illness would perceive less cognitive effort. However, this was not found both for the cognitive effort devoted to diagnosing the illness and the cognitive effort of using the computer program. In fact, participants who used the new version of WebMD perceived greater cognitive effort while using the computer program than those who used Google. Anecdotally, the majority of participants had used Google to search for information in the past. In addition, many of the participants aged 50-64 years had additionally used the old version of WebMD. In contrast, few participants aged 65 years or older had experience with WebMD at all, and few participants 50-64 years had used the new version. As a result, those using Google may have sufficient previous experience with the program, reducing cognitive effort. Furthermore, frustration from those aged 50-64 years with the changes to WebMD may explain the increased cognitive effort for those who used the new version.

In addition, findings suggested that participants perceived greater cognitive effort diagnosing the illness if they were not ultimately accurate in their diagnosis. One explanation may be that participants who were inaccurate have less medical knowledge

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and so expended more cognitive resources processing and sorting through medical information. In fact, *post hoc* investigation showed that accuracy of diagnosis was related to number of lifetime conditions that the participant had experienced ($r = .23$, $p \leq .05$). Thus, participants with fewer experiences with illness may have a more difficult time producing a diagnosis, which ultimately affected their accuracy. Further studies may want to qualitatively investigate sources of effort during an online health information search in more detail.

In terms of interactivity, our hypothesis that participants using WebMD would find the program to be more interactive was unsupported. Participants aged 65 years and older showed no differences in interactivity between search methods. Furthermore, participants aged 50-64 years found the new version of WebMD to be less interactive than the old version and marginally less interactive than Google. Again, this may be related to the experience that most of the 50-64 year old participants had had with WebMD in the past. The participants may prefer the old version of WebMD because it is familiar, finding it to be more interactive. A future study that compares familiar layouts of websites with new layouts may yield useful information as to how interactivity manifests.

Accuracy of Diagnosis

Interestingly, accuracy was found to be unrelated to search method or perceived interactivity of the computer program. Thus, the decision aid did not appear to improve the accuracy of diagnosis for participants as we hypothesized. *Post hoc* investigations also showed that accuracy was unrelated to previous experience with mononucleosis or scarlet fever (the vignette illnesses). However, accuracy was related to the number of hours per week that the participant used the computer. This suggests that people who use the computer more frequently have either more experience acquiring appropriate information online, or more experience aggregating the information acquired. Thus, if

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accuracy is required in an information search, it would behoove an older adult with less computer experience to solicit aid from a more experienced family member or a librarian. In addition, as previously mentioned, accuracy was related to the number of lifetime conditions experienced by participants. People with previous illnesses may be more familiar with medical information, which influences their ability to accurately diagnose a set of symptoms. A future investigation may want to examine the relationship between personal illness and application of medical information knowledge.

Empowerment

Overall, participants perceived less choice in how to search online for a diagnosis when they used WebMD than when they used Google, consistent with our hypothesis. When age was investigated, younger participants showed no difference in choice between search methods, while mean aged and older participants perceived less choice with WebMD. It may be that younger participants perceive that they always have much choice in how to search online because they conceive of an online search as entirely user guided. Future research may want to investigate age cohort differences in the mental models of older adults.

No differences in feelings of competence were found across age, search method, or illness. Thus, our hypothesis that those who used WebMD would feel less competent was not supported. In general, participants felt very competent during their search (M = 19.51, SD = 5.10, Possible range = 6-30) so it may be that there was too little variability among participants to see differences. However, it could also be that simply searching for information online does not produce feelings of competence regarding diagnosis. As previously mentioned (see Chapter 4, Descriptive Information), most participants agreed that it is better to seek a physician's help than to treat oneself. Thus, participants may not feel more competent after an online search because they prefer to rely on their physician to make a diagnosis and competently diagnosing symptoms is not a desired skill.

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Qualitative Trends

The Cohen's κ for the qualitative coding scheme was shown to be moderate (κ = .53) as good agreement is deemed to be .70 or higher. However, Cohen's κ tends to be an overly conservative measurement of agreement (Hsu & Field, 2003). Future studies may want to continue to refine the coding scheme and training protocol in order to improve the inter-rater reliability.

An investigation of the processes that older adults used to search for health information showed that most participants elected a strategy of eliminating potential diagnoses when the illness's symptoms did not match with the vignette symptoms. This is similar to Elstein's finding that physicians seek dis-confirming data when attempting a diagnosis. Furthermore, our older adult participants also tended to try to confirm potential diagnoses by determining whether the illness's symptoms matched with the vignette symptoms. Again, this mirrors Elstein's finding that physicians may also seek confirmatory data when assessing a diagnosis.

A few age differences were found during qualitative inquiry. For example, participants aged 65 years or older were more likely to express a lack of confidence in their diagnosis than participants aged 50-64 years. It is possible that the lack of confidence is related, again, to the belief that physicians should be relied on and one should not diagnose oneself. In fact, *post hoc* investigation showed that participants aged 65 years or older were significantly more likely to endorse the belief that one should rely on his/her physician than 50-64 year olds were ($F(1) = 4.71$, $p \leq .03$). Thus, cohort differences between preferred role in medical care may be at play. Participants aged 65 years or older may be less likely to use the computer for self-diagnosis (i.e., to research symptoms) because they believe that they should simply rely on their physician for care. Therefore, these participants may be less confident about their diagnosis because they have less experience self-diagnosing.

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In addition, there were a small number of search method differences that can be explained by the nature of the different search methodology. For example, participants who used Google were more likely to comment on the credibility or source of information than those who used WebMD. This is likely because participants using Google had to choose between more than one website, making the credibility of the site more relevant. In contrast, participants using WebMD started their search on the WebMD Symptom Checker page and were instructed to only use that site. In addition, those who used WebMD were more likely to discuss what information was lacking than those who used Google. This is likely because the WebMD Symptom Checker asked tailored questions to participants about the symptoms that they inputted. Thus, participants' attention was drawn to the information that they did not know because they had difficulty answering the tailored questions.

Application of Findings

One of the goals of our study was to explore the processes that older adults used to search for online health information, specifically information for self-diagnosis. While few of our hypotheses were supported, there are some effects which emerged which could prove useful to those in the business of online health information. For example, our think-alouds showed that participants spent most of their time and effort navigating the website visited or reading/summarizing through the health information presented. Thus, developers may want to design webpages or web tools with clear navigation aids that guide users as to how the page is structured, how the user can backtrack, and how the search bar can best be used. Furthermore, webpages with visual summaries of information such as tables or figures, may help to decrease user effort.

We found no significant difference in computer experience (hours per week and years of computer ownership) depending upon age. This confirms that members of the "Silent Generation" (older than 65 years) cannot be discounted as non-users. However,

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we did find some age differences which may encourage developers to tailor medical websites to different age cohorts rather than designing for a prototypical "older adult." First, those aged 65 years or older tended to be more likely to rely on the guidance of physicians rather than wanting to share decision-making responsibilities. Thus, a medical website designed for Medicare recipients may want to include tools that allow users to communicate with on-staff physicians (e.g., video chat or E-mail) or view recommendations from their own physician (e.g., personal health record). In contrast, a webpage designed for baby boomers (aged 50-64 years) may want to incorporate self-diagnosis tools like a decision aid or alternative information (e.g., homeopathic or naturopathic information) that the user could consider. In addition, we found that participants aged 50-64 years, most who had used the old version of WebMD in the past, perceived greater cognitive effort when using the new version of WebMD. When updating an already available tool, web designers may want to include a detailed description of the changes made in order to facilitate use of the new version and decrease frustration by users who have had familiarity with the older version of the tool.

Conclusions

My study sought to explore the processes that older adults take during an online health information search as well as examine how an online search affects the construction of illness representations. We did not find any change in illness representations after an online search. However, this may be due to the time interval between measurements and the decision to use a vignette depicting an ill target. As a future direction, we propose to study this same paradigm, allowing the participant to search for information about a condition with which they have been previously diagnosed. Although this could introduce additional variability across participants, it would be a more ecologically valid way to study illness representation construction.

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In addition, my study attempted to compare the different search methodologies of Google and WebMD. The hypothesized effects of the different search methodologies were not found. Instead, the covariates of computer experience, lifetime experience with physical conditions, and preferred role in medical encounters seemed to be related to the variables of interest (e.g., cognitive effort and accuracy). Cohort differences were demonstrated for some aspects of the preferred role in medical encounters with participants aged 65 years or older being more likely to believe that one should rely on his/her physician. Thus, a future direction could examine preferred roles in medical encounters across wider age groups (e.g., middle-aged, young adult) to see preferred role patterns across cohorts and the relationship to online health information-seeking. In addition, there were no differences in feelings of competence depending upon the search method used. This, again, could be a result of preferred role in medical encounters. A future study could examine whether there is a relationship between feelings of empowerment and one's preferred medical role.

Few studies have systematically examined online health information-seeking of older adults or compared across older adult age groups. Although the findings do not favor one search method over another, some individual difference variables were related to responses to the information searches. The present results suggest a variety of additional questions and research directions. Hopefully, this will inspire researchers in the areas of human-computer interaction and health to continue to ponder this area.

المنارة للاستشارات

www.manaraa.com

REFERENCES

Adams, S., de Bont, A., & Berg, M. (2006). Looking for answers, constructing reliability: an exploration into how Dutch patients check web-based medical information. *International Journal of Medical Informatics*, *75*(1), 66-72. doi:10.1016/j.ijmedinf.2005.07.036

Ahmad, F., Hudak, P. L., Bercovitz, K., Hollenberg, E., & Levinson, W. (2006). Are physicians ready for patients with Internet-based health information? *Journal of Medical Internet Research*, *8*(3), e22. doi:10.2196/jmir.8.3.e22

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, *84*(5), 888-918. doi:10.1037/0033-2909.84.5.888

Alexa Internet, Inc. (n.d.). Webmd.com Site Info. Retrieved April 13, 2012, from http://www.alexa.com/siteinfo/webmd.com

Alonzo, A. (1986). The impact of the family and lay others on care-seeking during life-threatening episodes of suspected coronary artery disease. *Social Science & Medicine*, *22*(12), 1297-1311. doi:10.1016/0277-9536(86)90093-6

Aneshensel, C., & Frerichs, R. (1984). Depression and physical illness: A multiwave, nonrecursive causal model. *Journal of Health and Social Behavior*, *25*(4), 350-371. Retrieved from http://www.jstor.org/stable/10.2307/2136376

Arnold, V., Collier, P. A., Leech, S. A., & Sutton, S. G. (2004). Impact of intelligent decision aids on expert and novice decision-makers' judgments. *Accounting and Finance*, *44*(1), 1-26. doi:10.1111/j.1467-629x.2004.00099.x

Arnold, V., Collier, P. A., Leech, S. A., & Sutton, S. G. (2004). Impact of intelligent decision aids on expert and novice decision-makers' judgments. *Accounting and Finance*, *44*(1), 1-26. doi:10.1111/j.1467-629x.2004.00099.x

Bates, B. R., Romina, S., Ahmed, R., & Hopson, D. (2006). The effect of source credibility on consumers' perceptions of the quality of health information on the Internet. *Medical Informatics and the Internet in Medicine*, *31*(1), 45-52. doi:10.1080/14639230600552601

Baumann, L. J., Cameron, L. D., Zimmerman, R. S., & Leventhal, H. (1989). Illness representations and matching labels with symptoms. *Health Psychology*, *8*(4), 449-69. doi:10.1037/0278-6133.8.4.449

Becker, S. (2004). A study of web usability for older adults seeking online health resources. *ACM Trans Comput Hum Interact*, *11*(4), 387-406.

www.manaraa.com

Benbunan-Fich, R. (2001). Using protocol analysis to evaluate the usability of a commercial web site. *Information & Management*, *39*(2), 151-163. doi:10.1016/S0378-7206(01)00085-4

Berkanovic, E., & Telesky, C. (1981). Structural and social psychological factors in the decision to seek medical care for symptoms. *Medical Care*, *19*(7), 693-709. doi:10.1097/00005650-198107000-00001

Berkman, N., Sheridan, S., Donahue, K., Halpern, D., Viera, A., Crotty, K., Holland, A., et al. (2011). Health literacy interventions and outcomes: An updated systematic review. *Search*, *155*(2), 97-107. doi:10.1059/0003-4819-155-2-201107190-00005

Berry, D. (2006). *Health Communication: Theory And Practice*. New York: McGraw-Hill International. Retrieved from http://books.google.com/books?hl=en&lr=&id=AK_Mg2J5EhUC&pgis=1

Bettinghaus, E. P. (1986). Health promotion and the knowledge-attitude-behavior continuum. *Preventive Medicine*, *15*(5), 475-91. doi:10.1016/0091-7435(86)90025-3

Bishop, G. (1991). Understanding the understanding of illness: Lay disease representations. In J. A. Skelton & R. T. Croyle (Eds.), *Mental Representation in Health and Illness.* (pp. 32-60). New York: Springer-Verlag. doi:10.1007/978-1-4613-9074-9_3

Bishop, G. D., & Converse, S. A. (1986). Illness representations : A prototype approach. *Health Psychology*, *5*(2), 95-114. doi:10.1037/0278-6133.5.2.95

Bodie, G. D., & Dutta, M. J. (2008). Understanding health literacy for strategic health marketing: eHealth literacy, health disparities, and the digital divide. *Health Marketing Quarterly*, *25*(1-2), 175-203. doi:10.1080/07359680802126301

Breckons, M., Jones, R., Morris, J., & Richardson, J. (2008). What do evaluation instruments tell us about the quality of complementary medicine information on the internet? *Journal of Medical Internet Research*, *10*(1), e3. doi:10.2196/jmir.961

Burton, A. K., Waddell, G., Tillotson, M., & Summerton, N. (1999). Information and advice to patients with back pain can have a positive effect: A randomized controlled trial of a novel educational booklet in primary care. *Spine*, *24*(23), 2484-2491. Lippincott Williams & Wilkins. doi:10.1097/00007632-199912010-00010

Byrne, M. D. (2008). Cognitive architecture. In J. A. Jacko & A. Sears (Eds.), *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications* (2nd ed., pp. 97-117). New York: Lawrence Erlbaum Associates Inc. Retrieved from http://dl.acm.org/citation.cfm?id=772072.772082

www.manaraa.com

Cameron, L D, Leventhal, H., & Love, R. R. (1998). Trait anxiety, symptom perceptions, and illness-related responses among women with breast cancer in remission during a tamoxifen clinical trial. *Health Psychology*, *17*(5), 459-69. doi:10.1037//0278-6133.17.5.459

Cameron, L., Leventhal, E. a, & Leventhal, H. (1993). Symptom representations and affect as determinants of care seeking in a community-dwelling, adult sample population. *Health Psychology*, *12*(3), 171-9. doi:10.1037//0278-6133.12.3.171

Cameron, Linda D., & Leventhal, H. (Eds.). (2003). *The Self-Regulation of Health and Illness Behaviour.* New York: Routledge.

Campbell, R. J. (2008). Internet-based health information seeking among low-income, minority seniors living in urban residential centers. *Home Health Care Management & Practice*, *21*(3), 195-202. doi:10.1177/1084822308322648

Card, S., Moran, T. P., & Newell, A. (1983). *The Psychology of Human-Computer Interaction.* Hillsdale, New Jersey: Erlbaum. Retrieved from http://www.worldcat.org/title/psychology-of-human-computer-interaction/oclc/59953542

Carroll, J M. (1997). Human-computer interaction: Psychology as a science of design. *Annual Review of Psychology*, *48*, 61-83. doi:10.1146/annurev.psych.48.1.61

Carroll, John M., & Thomas, J. C. (1982). Metaphor and the cognitive representation of computing systems. *IEEE Transactions on Systems, Man, and Cybernetics*, *12*(2), 107-116. doi:10.1109/TSMC.1982.4308795

Carver, C. S., & Scheier, M. F. (2000). On the structure of behavioral self-regulation. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (p. 783). San Diego: Academic Press. doi:10.1016/B978-012109890-2/50030-5

Cashen, M., Gerber, B., & Dykes, P. (2004). E-health technology and internet resources: Barriers for vulnerable populations. *Journal of Cardiovascular Nursing*, *19*(3), 209-214.

Charnock, D., Shepperd, S., Needham, G., & Gann, R. (1999). DISCERN: An instrument for judging the quality of written consumer health information on treatment choices. *Journal of Epidemiology and Community Health*, *53*(2), 105-11. doi:10.1136/jech.53.2.105

Coderre, S., Mandin, H., Harasym, P. H., & Fick, G. H. (2003). Diagnostic reasoning strategies and diagnostic success. *Medical Education*, *37*(8), 695-703. doi:10.1046/j.1365-2923.2003.01577.x

المنارة للاستشارات

www.manaraa.com

Contrada, R. J., & Coups, E. J. (2003). Personality and self-regulation in health and disease: Toward an integrative perspective. In Linda Cameron & H. Leventhal (Eds.), *The Self-Regulation of Health and Illness* (pp. 66-94). London: Routledge.

Costa, P. T. J., & McCrae, R. R. (1987). Neuroticism, somatic complaints, and disease: Is the bark worse than the bite? *Journal of Personality*, *55*, 299-316. doi:10.1111/j.1467-6494.1987.tb00438.x

Cullen, R. (2006). *Health Information on the Internet: A Study of Providers, Quality, And Users*. Westport, CT: Greenwood Publishing Group. Retrieved from http://books.google.com/books?hl=en&lr=&id=Yp_iMsahVV0C&pgis=1

Cutilli, C. C., & Bennett, I. M. (2009). Understanding the health literacy of America: Results of the National Assessment of Adult Literacy. *Orthopaedic Nursing*, *28*(1), 27-32. doi:10.1097/01.NOR.0000345852.22122.d6

Cyr, D., Head, M., & Ivanov, A. (2009). Perceived interactivity leading to e-loyalty: Development of a model for cognitive–affective user responses. *International Journal of Human-Computer Studies*, *67*(10), 850-869. Elsevier. doi:10.1016/j.ijhcs.2009.07.004

Davidson, A. R., & Jaccard, J. J. (1979). Variables that moderate the attitude-behavior relation: Results of a longitudinal survey. *Journal of Personality and Social Psychology*, *37*(8), 1364-1376. doi:10.1037/0022-3514.37.8.1364

Dervin, B. (1976). Strategies for dealing with human information needs: Information or communication? *Journal of Broadcasting*, *20*(3), 323-333. Routledge. doi:10.1080/08838157609386402

Diefenbach, M. a, Leventhal, E. a, Leventhal, H., & Patrick-Miller, L. (1996). Negative affect relates to cross-sectional but not longitudinal symptom reporting: Data from elderly adults. *Health Psychology*, *15*(4), 282-8. doi:10.1037/0278-6133.15.4.282

Donnelly, L. S., Shaw, R. L., & van den Akker, O. B. a. (2008). E-health as a challenge to “expert” power: A focus group study of internet use for health information and management. *Journal of the Royal Society of Medicine*, *101*(10), 501-6. doi:10.1258/jrsm.2008.080156

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*, 273-288. doi:10.1207/S15327027HC1603

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), 0. doi:10.1111/j.1083-6101.2001.tb00126.x

المنارة للاستشارات

www.manaraa.com

Elstein, A. (1994). What goes around comes around: Return of the hypothetico-deductive strategy. *Teaching and Learning in Medicine*, *6*(2), 121-123. doi:10.1080/10401339409539658

Elstein, Arthur S, & Schwartz, A. (2002). Clinical problem solving and diagnostic decision making: Selective review of the cognitive literature. *BMJ*, *324*(7339), 729-32. doi:10.1258/jrsm.95.8.422

Elstein, Arthur Shirle, Shulman, L. S., & Sprafka, S. A. (1978). *Medical Problem Solving: An Analysis of Clinical Reasoning*. Cambridge, MA: Harvard University Press. Retrieved from http://books.google.com/books?id=IjxrAAAAMAAJ&pgis=1

Eysenbach, G., & Diepgen, T. L. (2001). The role of e-health and consumer health informatics for evidence-based patient choice in the 21st century. *Clinics in Dermatology*, *19*(1), 11-17. doi:10.1016/S0738-081X(00)00202-9

Eysenbach, G., & Köhler, C. (2002). How do consumers search for and appraise health information on the world wide web? Qualitative study using focus groups, usability tests, and in-depth interviews. *BMJ*, *324*(7337), 573-7. doi:10.1136/bmj.324.7337.573

Eysenbach, G., Powell, J., Kuss, O., & Sa, E.-R. (2002). Empirical studies assessing the quality of health information for consumers: A systematic review. *JAMA*, *287*(20), 2691-2700. doi:10.1001/jama.287.20.2691

Fallowfield, L., Hall, A., Maguire, G., & Baum, M. (1990). Psychological outcomes of different treatment policies in women with early breast cancer outside a clinical trial. *British Medical Journal*, *301*(September), 575-580. doi:10.1136/bmj.301.6752.575

Fallows, D. (2005). *How Women and Men Use the Internet* (pp. 1-45). Pew Internet and American Life Project. Retrieved from www.pewinternet.org.

Federman, A. D., Sano, M., Wolf, M. S., Siu, A. L., & Halm, E. a. (2009). Health literacy and cognitive performance in older adults. *Journal of the American Geriatrics Society*, *57*(8), 1475-80. doi:10.1111/j.1532-5415.2009.02347.x

Fiske, S. T., & Russell, A. M. (2010). Cognitive processes. In J. F. Dovidio, M. Hewstone, P. Glick, & V. M. Esses (Eds.), *The SAGE Handbook of Prejudice, Stereotyping and Discrimination* (pp. 65-81). Thousand Oaks, CA: SAGE. Retrieved from http://books.google.com/books?hl=en&lr=&id=PPkMy-CFZmIC&pgis=1

Fotheringham, M. (2002). Computer-mediated communication: A tool for public health; a barrier for healthy activity. *Advances in Psychology Research*, *12*, 105-140.

المنارة للاستشارات
www.manaraa.com

Fox, M. C., Ericsson, K. A., & Best, R. (2011). Do procedures for verbal reporting of thinking have to be reactive? A meta-analysis and recommendations for best reporting methods. *Psychological Bulletin*, *137*(2), 316-44. doi:10.1037/a0021663

Fox, S. (2011). *Health Topics*. (pp. 1-33). Pew Internet and American Life Project. Retrieved from www.pewinternet.org.

Frankel, R. M. (2001). Clinical care and conversational contingencies: The role of patients' self-diagnosis in medical encounters. *Text - Interdisciplinary Journal for the Study of Discourse*, *21*(1-2), 83-11. doi:10.1515/text.1.21.1-2.83

Freimuth, V. S., Stein, J. A., & Kean, T. J. (1989). *Searching for Health Information: The Cancer Information Service Model*. Philadelphia: University of Pennsylvania Press. Retrieved from http://books.google.com/books?hl=en&lr=&id=j1jX5f4pCYIC&pgis=1

Gagliardi, A., & Jadad, A. (2002). Examination of instruments used to rate quality of health information on the internet: Chronicle of a voyage with an unclear destination. *BMJ*, *324*(7337), 569-573. doi:10.1136/bmj.324.7337.569

Garg, A. X., Adhikari, N. K. J., McDonald, H., Rosas-Arellano, M. P., Devereaux, P. J., Beyene, J., Sam, J., et al. (2005). Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: A systematic review. *JAMA*, *293*(10), 1223-38. doi:10.1001/jama.293.10.1223

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *Management Information Systems Quarterly*, *27*(1), 51-90. doi:10.1109/TEM.2003.817277

Greenfield, S., Kaplan, S., & Ware, J. E. (1985). Expanding patient involvement in care. *Annals of Internal Medicine*, *102*, 520-528. Retrieved from http://www.annals.org/content/102/4/520.short

Hagquist, C., & Starrin, B. (1997). Health education in schools--from information to empowerment models. *Health Promotion International*, *12*(3), 225-232. doi:10.1093/heapro/12.3.225

Hart, A., Henwood, F., & Wyatt, S. (2004). The role of the Internet in patient-practitioner relationships: Findings from a qualitative research study. *Journal of Medical Internet Research*, *6*(3), e36. doi:10.2196/jmir.6.3.e36

Haubl, G., & Trifts, V. (2000). Consumer decision making in online shopping environments: The effects of interactive decision aids. *Marketing Science*, *19*(1), 4-21. doi:10.1287/mksc.19.1.4.15178

المنارة للاستشارات
www.manaraa.com

Henwood, F., Wyatt, S., Hart, A., & Smith, J. (2003). “Ignorance is bliss sometimes”: Constraints on the emergence of the “informed patient” in the changing landscapes of health information. *Sociology of Health and Illness*, *25*(6), 589-607. doi:10.1111/1467-9566.00360

Hibbard, J. H., Slovic, P., & Jewett, J. J. (1997). Informing consumer decisions in health care: Implications from decision-making research. *The Milbank Quarterly*, *75*(3), 395-414. doi:10.1111/1468-0009.00061

Hilt, M., & Lipschultz, J. (2004). Elderly Americans and the internet: E-Mail, TV news, information and entertainment websites. *Educational Gerontology*, *30*(1), 57-72. doi:10.1080/03601270490249166

Hollon, M. F. (2005). Direct-to-consumer advertising: a haphazard approach to health promotion. *JAMA*, *293*(16), 2030-3. doi:10.1001/jama.293.16.2030

Horne, R., James, D., Petrie, K., Weinman, J., & Vincent, R. (2000). Patients’ interpretation of symptoms as a cause of delay in reaching hospital during acute myocardial infarction. *Heart (British Cardiac Society)*, *83*(4), 388-93. doi:10.1136/heart.83.4.388

Howren, M. B., & Suls, J. (2011). The symptom perception hypothesis revised: depression and anxiety play different roles in concurrent and retrospective physical symptom reporting. *Journal of Personality and Social Psychology*, *100*(1), 182-95. doi:10.1037/a0021715

Hsu, L. M., & Field, R. (2003). Interrater agreement measures: Comments on Kappa n , Cohen’s Kappa, Scott's π, and Aickin's α. *Understanding Statistics*, *2*(3), 205-219. doi:10.1207/S15328031US0203_03

Ivanitskaya, L., O’Boyle, I., & Casey, A. (2006). Health information literacy and competencies of information age students: Results from the interactive online Research Readiness Self-Assessment (RRSA). *Journal of Medical Internet Research*, *8*(2), e6. doi:10.2196/jmir.8.2.e6

Iverson, S. a, Howard, K. B., & Penney, B. K. (2008). Impact of internet use on health-related behaviors and the patient-physician relationship: A survey-based study and review. *The Journal of the American Osteopathic Association*, *108*(12), 699-711. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19075034

Jansen, J. (2010). *Use of the internet in higher- income households* (pp. 1-13). Pew Internet and American Life Project. Retrieved from www.pewinternet.org.

Johnson, G., Bruner II, G., & Kumar, A. (2006). Interactivity and its facets revisited: Theory and empirical test. *Journal of Advertising*, *35*(4), 35-52. doi:10.2753/JOA0091-3367350403

المنارة للاستشارات

www.manaraa.com

Johnson, P. E., Duran, A. S., Hassebrock, F., Moller, J., & Prietula, M. (1981). Expertise and error in diagnostic reasoning. *Cognitive Science*, *5*, 235-283. doi:10.1016/S0364-0213(81)80014-6

Jonassen, D., & Cho, Y. H. (2008). Externalizing mental models with mindtools. *Understanding Models for Learning and Instruction*, *2*(1983), 145-159.

Joosten, E. a G., DeFuentes-Merillas, L., de Weert, G. H., Sensky, T., van der Staak, C. P. F., & de Jong, C. a J. (2008). Systematic review of the effects of shared decision-making on patient satisfaction, treatment adherence and health status. *Psychotherapy and Psychosomatics*, *77*(4), 219-26. doi:10.1159/000126073

Kawamoto, K., Houlihan, C. A., Balas, E. A., & Lobach, D. F. (2005). Improving clinical practice using clinical decision support systems: A systematic review of trials to identify features critical to success. *BMJ*, *330*(7494), 765. doi:10.1136/bmj.38398.500764.8F

Kerckhoff, A., & Back, K. (1968). *The June Bug: A Study of Hysterical Contagion*. New York: Appleton-Century-Crofts.

Kieras, D., & Bovair, S. (1984). The role of a mental model in learning to operate a device. *Cognitive Science*, *8*(3), 255-273. doi:10.1016/S0364-0213(84)80003-8

Kirscht, J. P., Haefner, D. P., Kegeles, S. S., & Rosenstock, I. M. (1966). A national study of health beliefs. *Journal of Health and Human Behavior*, *7*(4), 248-54. doi:10.2307/2948771

Kuipers, E., Watson, P., Onwumere, J., Bebbington, P., Dunn, G., Weinman, J., Fowler, D., et al. (2007). Discrepant illness perceptions, affect and expressed emotion in people with psychosis and their carers. *Social Psychiatry and Psychiatric Epidemiology*, *42*(4), 277-83. doi:10.1007/s00127-007-0165-4

Kutner, M., Greenberg, E., Jin, Y., & Paulsen, C. (2006). The health literacy of America's adults: Results From the 2003 National Assessment of Adult Literacy. *Education*, *6*, 1-59.

Lambert, S. D., & Loiselle, C. G. (2007). Health information seeking behavior. *Qualitative Health Research*, *17*(8), 1006-19. doi:10.1177/1049732307305199

Lau, R. R., Bernard, T. M., & Hartman, K. a. (1989). Further explorations of common-sense representations of common illnesses. *Health Psychology*, *8*(2), 195-219. doi:10.1037/0278-6133.8.2.195

Lehner, P. E., & Zirk, D. A. (1987). Cognitive factors in user/expert-system interaction. *Human Factors*, *29*(1), 97-109.

المنارة للاستشارات

www.manaraa.com

Lemire, M., Sicotte, C., & Paré, G. (2008). Internet use and the logics of personal empowerment in health. *Health Policy (Amsterdam, Netherlands)*, *88*(1), 130-40. doi:10.1016/j.healthpol.2008.03.006

Leventhal, E. A., & Crouch, M. (1997). Are there differences in perceptions of illness across the lifespan? In K. J. Petrie & J. Weinman (Eds.), *Perceptions of Illness And Health: Current Research and Applications* (pp. 77-102). Amsterdam, The Netherlands: Harwood Academic Publishers.

Leventhal, E. A., Leventhal, H., Schaefer, P., & Easterling, D. (1993). Conservation of energy, uncertainty reduction, and swift utilization of care among the elderly. *Journal of Gerontology*, *48*(2), 78-86.

Leventhal, H, Safer, M. A., & Panagis, D. M. (1983). The impact of communications on the self-regulation of health beliefs, decisions, and behavior. *Health Education & Behavior*, *10*(1), 3-29. doi:10.1177/109019818301000101

Leventhal, H., & Diefenbach, M. (1991). The active side of illness cognition. In J. A. Skelton & R. T. Croyle (Eds.), *Mental Representation in Health and Illness* (pp. 247-272). New York: Springer-Verlag. doi:10.1007/978-1-4613-9074-9_11

Leventhal, Howard, Brissette, I., & Leventhal, E. A. (2003). The common-sense model of self-regulation of health illness. In L. Cameron & H. Leventhal (Eds.), *The Self-Regulation of Health and Illness* (pp. 42-65). New York: Routledge.

Leventhal, Howard, & Cameron, L. (1987). Behavioral theories and the problem of compliance. *Patient Education and Counseling*, *10*(2), 117-138. doi:10.1016/0738-3991(87)90093-0

Leventhal, Howard, Diefenbach, M., & Leventhal, E. a. (1992). Illness cognition: Using common sense to understand treatment adherence and affect cognition interactions. *Cognitive Therapy and Research*, *16*(2), 143-163. doi:10.1007/BF01173486

Leventhal, Howard, Hudson, S., & Robitaille, C. (1997). Social comparison and health: A process model. In B. P. Buunk & F. X. Gibbons (Eds.), *Health, Coping, and Well-Being: Perspectives from Social Comparison Theory* (pp. 411-432). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Leventhal, Howard, Leventhal, E., & Contrada, R. (1998). Self-regulation, health, and behavior: A perceptual-cognitive approach. *Psychology & Health*, *13*(4), 717-733. doi:10.1080/08870449808407425

Leventhal, Howard, Meyer, D., & Nerenz, D. (1980). The common sense representation of illness danger. In S. Rachman (Ed.), *Contributions to Medical Psychology* (2nd ed., pp. 7-30). New York: Pergamon.

www.manaraa.com

Lim, K. H., Benbasat, I., & Todd, P. A. (1996). An experimental investigation of the interactive effects of interface style, instructions, and task familiarity on user performance. *ACM Transactions on Computer-Human Interaction*, *3*(1), 1-37. doi:10.1145/226159.226160

Loges, W. E., & Jung, J.-Y. (2001). Exploring the digital divide: Internet connectedness and age. *Communication Research*, *28*(4), 536-562. doi:10.1177/009365001028004007

Longo, D. R. (2005). Understanding health information, communication, and information seeking of patients and consumers: a comprehensive and integrated model. *Health Expectations : An International Journal of Public Participation in Health Care and Health Policy*, *8*(3), 189-94. doi:10.1111/j.1369-7625.2005.00339.x

Lustria, M. L. A. (2007). Can interactivity make a difference ? Effects of interactivity on the comprehension of and attitudes toward online health content. *Journal of the American Society for Information Science*, *58*(6), 766-776. doi:10.1002/asi.20557

Légaré, F., Ratté, S., Gravel, K., & Graham, I. D. (2008). Barriers and facilitators to implementing shared decision-making in clinical practice: update of a systematic review of health professionals' perceptions. *Patient Education and Counseling*, *73*(3), 526-35. doi:10.1016/j.pec.2008.07.018

Macfarlane, J., Prewett, J., Rose, D., & Gard, P. (1997). Prospective case-control study of role of infection in patients who reconsult after initial antibiotic treatment for lower respiratory tract infection in primary care. *BMJ*, *315*(April 1995), 1206-1210. doi:10.1136/bmj.315.7117.1206

Macias, W., & McMillan, S. (2008). The return of the house call: The role of internet-based interactivity in bringing health information home to older adults. *Health Communication*, *23*(1), 34-44. doi:10.1080/10410230701805174

Mancuso, C. a, Rincon, M., McCulloch, C. E., & Charlson, M. E. (2001). Self-efficacy, depressive symptoms, and patients' expectations predict outcomes in asthma. *Medical Care*, *39*(12), 1326-38. doi:10.1097/00005650-200112000-00008

Marchionini, G. (1992). Interfaces for end-user information seeking. *Journal of the American Society for Information Science*, *43*(2), 156-163. doi:10.1002/(SICI)1097-4571(199203)43:2<156::AID-ASI8>3.0.CO;2-U

Martin, R., Rothrock, N., Leventhal, H., & Leventhal, E. (2003). Common sense models of illness: Implications for symptom perception and health-related behaviors. In J. Suls & K. A. Wallston (Eds.), *Social Psychological Foundations of Health and Illness* (pp. 199-226). Malden, MA, USA: Blackwell Publishing Ltd. doi:10.1002/9780470753552

www.manaraa.com

McIntyre, S. H. (1982). An experimental study of the impact of judgment-based marketing models. *Management Science*, *28*(1), 17-33. doi:10.1287/mnsc.28.1.17

McKeown, B., & Thomas, D. (1988). *Q Methodology*. Newbury Park, California: Sage Publications. Retrieved from http://www.worldcat.org/title/q-methodology/oclc/44962237

McKinlay, J. (1973). Social networks, lay consultation and help-seeking behavior. *Social Forces*, *51*, 275-292. doi:10.1093/sf/51.3.275

McLellan, F. (1998). “Like hunger, like thirst”: Patients, journals, and the internet. *The Lancet*, *352*, S39-S43. doi:10.1016/S0140-6736(98)90301-4

McMillan, S., Avery, E. J., & Macias, W. (2008). From have nots to watch dogs: Understanding internet health communication behaviors of online senior citizens. *Information, Communication & Society*, *11*(5), 675-697. doi:10.1080/13691180802126745

McMillan, S. J., & Hwang, J.-S. (2002). Measures of perceived interactivity : An exploration of the role of direction of communication, user control , and time in shaping perceptions of interactivity. *Journal of Advertising*, *31*(3), 29-42.

McMullan, M. (2006). Patients using the internet to obtain health information: How this affects the patient-health professional relationship. *Patient Education and Counseling*, *63*(1-2), 24-8. doi:10.1016/j.pec.2005.10.006

Meyer, D., Leventhal, H., & Gutmann, M. (1985). Common-sense models of illness: The example of hypertension. *Health Psychology*, *4*(2), 115-35. doi:10.1037/0278-6133.4.2.115

Mintzes, B., Barer, M. L., Kravitz, R. L., Kazanjian, A., Bassett, K., Lexchin, J., Evans, R. G., et al. (2002). Influence of direct to consumer pharmaceutical advertising and patients’ requests on prescribing decisions: Two site cross sectional survey. *BMJ (Clinical research ed.)*, *324*(7332), 278-9. doi:10.1136/bmj.324.7332.278

Moller, A. C., Ryan, R. M., & Deci, E. L. (2006). Self-determination theory and public policy: Improving the quality of consumer decisions without using coercion. *Journal of Public Policy & Marketing*, *25*(1), 104-116. doi:10.1509/jppm.25.1.104

Mooney, G., & Ryan, M. (1993). Agency in health care: Getting beyond first principles. *Journal of Health Economics*, *2*, 125-135. doi:10.1016/0167-6296(93)90023-8

Moorsel, G. V. (2001). Do you mini-med school? *Medical Reference Services Quarterly*, *20*(4), 27-37. doi:10.1300/J115v20n04_02

المنارة للاستشارات
www.manaraa.com

Mora, P. a, Robitaille, C., Leventhal, H., Swigar, M., & Leventhal, E. a. (2002). Trait negative affect relates to prior-week symptoms, but not to reports of illness episodes, illness symptoms, and care seeking among older persons. *Psychosomatic Medicine*, *64*(3), 436-49. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12021417

Morrell, R. W. (2005). http://www.nihseniorhealth.gov: The process of construction and revision in the development of a model web site for use by older adults. *Universal Access in the Information Society*, *4*(1), 24-38. doi:10.1007/s10209-003-0085-3

Murphy, H., Dickens, C., Creed, F., & Bernstein, R. (1999). Depression, illness perception and coping in rheumatoid arthritis. *Journal of Psychosomatic Research*, *46*(2), 155-164. doi:10.1016/S0022-3999(98)00073-7

Murray, E., Lo, B., Pollack, L., Donelan, K., Catania, J., White, M., Zapert, K., et al. (2003). The impact of health information on the internet on the physician-patient relationship: Patient perceptions. *Archives of Internal Medicine*, *163*(14), 1727-34. doi:10.1001/archinte.163.14.1727

Nahm, E., Preece, J., Resnick, B., & Mills, M. E. (2004). Usability of health web sites for older adults. *CIN: Computers, Informatics, Nursing*, *22*(6), 326-334. doi:10.1097/00024665-200411000-00007

National Institute on Aging, & National Library of Medicine. (2001). Making your web site senior friendly: A checklist. Retrieved April 12, 2012, from http://www.nlm.nih.gov/pubs/staffpubs/od/ocpl/agingchecklist.html

Newman, J., & Vidler, E. (2006). Discriminating customers, responsible patients, empowered users: Consumerism and the modernization of health care. *Journal of Social Policy*, *35*(02), 193-209. doi:10.1017/S0047279405009487

Norman, C. D., & Skinner, H. a. (2006). E-health Literacy: Essential skills for consumer health in a networked world. *Journal of Medical Internet Research*, *8*(2), e9. doi:10.2196/jmir.8.2.e9

Norman, D. A. (1986). Cognitive engineering. In D.A. Norman & S. W. Draper (Eds.), *User Centered System Design* (pp. 31-61). New York: Lawrence Erlbraum and Associates.

Norman, K. (2008). *Cyberpsychology: An Introduction to Human-Computer Interaction*. New York: Cambridge University Press.

Olson, G. M., & Olson, J. S. (2003). Human-computer interaction: Psychological aspects of the human use of computing. *Annual Review of Psychology*, *54*, 491-516. doi:10.1146/annurev.psych.54.101601.145044

المنارة للاستشارات
www.manaraa.com

Paschalides, C., Wearden, J., Dunkerley, R., Bundy, C., Davies, R., & Dickens, C. M. (2004). The associations of anxiety, depression and personal illness representations with glycaemic control and health-related quality of life in patients with type 2 diabetes mellitus. *Journal of Psychosomatic Research*, *57*(6), 557-64. doi:10.1016/j.jpsychores.2004.03.006

Patel, V. L., & Groen, G. J. (1986). Knowledge-based solution strategies in medical reasoning. *Cognitive Science*, *10*, 91-116. doi:10.1016/S0364-0213(86)80010-6

Payne, J. W. (1982). Contingent decision behavior. *Psychological Bulletin*, *92*(2), 382-402. doi:10.1037/0033-2909.92.2.382

Pennebaker, J. W. (1982). *The Psychology of Physical Symptoms*. New York: Springer-Verlag. Retrieved from http://books.google.com/books?hl=en&lr=&id=8WT1GRrhZMkC&pgis=1

Petrie, K. J. (Ed.). (1997). *Perceptions Of Health And Illness: Current Research And Applications* (p. 501). Amsterdam, The Netherlands: Harwood Academic Publishers. Retrieved from http://books.google.com/books?id=2NJaUM6dXkMC&pgis=1

Potts, H. W. W., & Wyatt, J. C. (2002). Survey of doctors' experience of patients using the Internet. *Journal of Medical Internet Research*, *4*(1), e5. doi:10.2196/jmir.4.1.e5

Proctor, R. W., & Vu, K.-P. L. (2008). Human information processing: An overview for human-computer interaction. In J. A. Jacko & A. Sears (Eds.), *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications* (2nd ed., pp. 44-58). New York: Lawrence Erlbraum and Associates.

Prohaska, T., Leventhal, E., Leventhal, H., & Keller, M. L. (1985). Health practices and illness cognition in young, middle aged, and elderly adults. *Journal of Gerontology*, *40*(5), 569-578. doi:10.1093/geronj/40.5.569

Prohaska, T. R., Keller, M. L., Leventhal, E. A., & Leventhal, H. (1987). Impact of symptoms and attribution on emotions and aging coping. *Health Psychology*, *6*(6), 495-514. doi:10.1037/0278-6133.6.6.495

Robinson, J. C., & Ginsburg, P. B. (2009). Consumer-driven health care: Promise and performance. *Health Affairs (Project Hope)*, *28*(2), w272-81. doi:10.1377/hlthaff.28.2.w272

Robinson, T. N. (1998). An evidence-based approach to interactive health communication: A challenge to medicine in the information age. *JAMA: The Journal of the American Medical Association*, *280*(14), 1264-1269. doi:10.1001/jama.280.14.1264

المنارة للاستشارات

www.manaraa.com

Rodwell, C. M. (1996). An analysis of the concept of empowerment. *Journal of Advanced Nursing*, *23*(2), 305-313. doi:10.1111/j.1365-2648.1996.tb02672.x

Rouse, W., & Rouse, S. (1984). Human information seeking and design of information systems. *Information Processing & Management*, *20*(1), 129-138. doi:10.1016/0306-4573(84)90044-X

Rudd, R. E. (2003). Health literacy skills of U.S. adults. *American Journal of Health Behavior*, *31 Suppl 1*, S8-18. doi:10.5555/ajhb.2007.31.supp.S8

Ryan, A., & Wilson, S. (2008). Internet healthcare: Do self-diagnosis sites do more harm than good? *Expert Opin. Drug Saf.*, *7*(3), 227-229. doi:10.1517/14740338.7.3.227

Ryan, M. (1994). Agency in health care: Lessons for economists from sociologists. *American Journal of Economics and Sociology*, *53*(2), 207-217. doi:10.1111/j.1536-7150.1994.tb02588.x

Sainfort, F., Jacko, J. A., Edwards, P. J., & Booske, B. C. (2008). Human-computer interaction in health care. In J. A. Jacko & A. Sears (Eds.), *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications* (2nd ed., pp. 662-676). New York: Lawrence Erlbraum and Associates.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147-177. doi:10.1037/1082-989X.7.2.147

Schaie, K. W., & Willis, S. L. (2002). *Adult Development and Aging* (5th ed.). Upper Saddle River, NJ: Prentice Hall. Retrieved from http://books.google.com/books?id=BliuAAAAIAAJ&pgis=1

Schmidt, H., Norman, G., & Boshuizen, H. (1990). A cognitive perspective on medical expertise: Theory and implications. *Academic Medicine*, *65*, 611-621. doi:10.1097/00001888-199010000-00001

Selden, C. R., Zorn, M., Ratzan, S., & Parker, R. M. (2000). Health literacy. *Current Bibliographies in Medicine; no. 2000-1* (p. vi). Bethesda, MD: National Library of Medicine. Retrieved from http://www.nlm.nih.gov/pubs/cbm/hliteracy.html

Sharit, J., Hernandez, M. A., Czaja, S. J., & Pirolli, P. (2008). Investigating the roles of knowledge and cognitive abilities in older adult information seeking on the web. *ACM Trans Comput Hum Interact*, *15*(1), 1-29. doi:10.1145/1352782.1352785.Investigating

Sheldon, K., Williams, G., & Joiner, T. E. (2003). *Self-Determination Theory in the Clinic: Motivating Physical and Mental Health*. New Haven: Yale University Press. Retrieved from http://www.worldcat.org/title/self-determination-theory-in-the-clinic-motivating-physical-and-mental-health/oclc/182530521

المنارة للاستشارات
www.manaraa.com

Silberg, W., & Lundberg, G. (1997). Assessing, controlling, and assuring the quality of medical information on the Internet. *JAMA*, *277*(15), 1244-1245. doi:10.1001/jama.1997.03540390074039

Smith, A. (2010). *Home Broadband 2010*. Pew Internet and American Life Project. Retrieved from www.pewinternet.org

Smith, K., Clark, A., Kruger, E., Lejmanoski, L., Russell, A., & Tennant, M. (2006). Guided self-diagnosis: An innovative approach to triage for emergency dental care. *Australian Dental Journal*, *51*(1), 11-15. doi:10.1111/j.1834-7819.2006.tb00394.x

Smith, P. J., Geddes, N. D., & Beatty, R. (2008). Human-centered design of decision-support systems. In Jill A. Jacko & A. Sears (Eds.), *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications* (2nd ed., pp. 574-588). New York: Lawrence Erlbraum and Associates.

Smith, P., McCoy, C., & Layton, C. (1997). Brittleness in the design of cooperative problem-solving systems: The effects on user performance. *IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans*, *27*(3), 360-371. doi:10.1109/3468.568744

Sommerhalder, K., Abraham, A., Zufferey, M. C., Barth, J., & Abel, T. (2009). Internet information and medical consultations : Experiences from patients ' and physicians ' perspectives. *Patient Education and Counseling*, *77*, 266-271. doi:10.1016/j.pec.2009.03.028

Spreitzer, G. M. (1996). Social structural characteristics of psychological empowerment. S *Academy of Management Journal*, *39*(2), 483-504. doi:10.2307/256789

Suls, J., Martin, R., & Leventhal, H. (1997). Social comparison, lay referral, and the decision to seek medical care. In B. P. Buunk & F. X. Gibbons (Eds.), *Health, Coping, and Well-Being: Perspectives from Social Comparison Theory* (pp. 195-226). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Teo, H., Oh, L., Liu, C., & Wei, K. (2003). An empirical study of the effects of interactivity on web user attitude. *International Journal of Human-Computer Studies*, *58*(3), 281-305. doi:10.1016/S1071-5819(03)00008-9

Todd, P., & Benbasat, I. (1992). The use of information in decision making: An experimental investigation of the impact of computer-based decision aids. *MIS Quarterly*, *16*(3), 373-393. doi:10.2307/249534

Vick, S., & Scott, A. (1998). Agency in health care: Examining patients' preferences for attributes of the doctor-patient relationship. *Journal of Health Economics*, *17*(5), 587-605. doi:10.1016/S0167-6296(97)00035-0

المنارة للاستشارات
www.manaraa.com

Wagner, N., Hassanein, K., & Head, M. (2010). Computer use by older adults: A multi-disciplinary review. *Computers in Human Behavior*, *26*(5), 870-882. Elsevier Ltd. doi:10.1016/j.chb.2010.03.029

Wald, H. S., Dube, C. E., & Anthony, D. C. (2007). Untangling the Web--the impact of Internet use on health care and the physician-patient relationship. *Patient Education and Counseling*, *68*(3), 218-24. doi:10.1016/j.pec.2007.05.016

Wang, J., & Senecal, S. (2007). Measuring perceived website usability. *Journal of Internet Commerce*, *6*(4), 97-112. doi:10.1080/15332860802086318

Watson, D, Clark, L. a, & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063-70. doi:10.1037/0022-3514.54.6.1063

Watson, David, & Pennebaker, J. W. (1989). Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychological Review*, *96*(2), 234-254. doi:10.1037/0033-295X.96.2.234

Watson, David, & Pennebaker, J. W. (1991). Situational, dispositional, and genetic bases of symptom reporting. In J. A. Skelton & R. T. Croyle (Eds.), *Mental Representation in Health and Illness* (pp. 60-84). New York: Springer-Verlag. doi:10.1007/978-1-4613-9074-9_4

White, S., Chen, J., & Atchison, R. (2010). Relationship of preventive health practices and health literacy: a national study. *American Journal of Health Behavior*, *32*(3), 227-42. doi:10.5555/ajhb.2008.32.3.227

Wiegmann, D., Rich, A., & Zhang, H. (2001). Automated diagnostic aids: The effects of aid reliability on users' trust and reliance. *Theoretical Issues in Ergonomics Science*, *2*(4), 352-367. doi:10.1080/14639220110110306

Williams, G. C., McGregor, H. a, King, D., Nelson, C. C., & Glasgow, R. E. (2005). Variation in perceived competence, glycemic control, and patient satisfaction: Relationship to autonomy support from physicians. *Patient Education and Counseling*, *57*(1), 39-45. doi:10.1016/j.pec.2004.04.001

Wilson, P. (2002). How to find the good and avoid the bad or ugly: A short guide to tools for rating quality of health information on the internet. *BMJ*, *324*(7337), 598-602. doi:10.1136/bmj.324.7337.598

Wilson, T. (1997). Information behaviour: An interdisciplinary perspective. *Information Processing & Management*, *33*(4), 551-572. doi:10.1016/S0306-4573(97)00028-9

Wilson, T. D. (1999). Models in information behaviour research. *Journal of Documentation*, *55*(3), 249-270. doi:10.1108/EUM0000000007145

المنارة للاستشارات

www.manaraa.com

Zhang, Y. (2008). The influence of mental models on undergraduate students' searching behavior on the Web. *Information Processing & Management*, *44*(3), 1330-1345. doi:10.1016/j.ipm.2007.09.002

Ziefle, M., & Bay, S. (2004). Mental models of a cellular phone menu: Comparing older and younger novice users. In S. Brewster & M. Dunlop (Eds.), *MobileHCI* (pp. 25-37). Berlin: Springer-Verlag. Retrieved from http://www.springerlink.com/index/vyl1bbk926wfcww3.pdf

van Zuuren, F. J., & Wolfs, H. M. (1991). Styles of information seeking under threat: Personal and situational aspects of monitoring and blunting. *Personality and Individual Differences*, *12*(2), 141-149. doi:10.1016/0191-8869(91)90097-U

van der Veer, G. C., & del Carmen Puerta Melguizo, M. (2002). Mental models. In Julie A. Jacko & A. Sears (Eds.), *The Human-Computer Interaction Handbook* (1st ed., pp. 52-80). Hillsdale, NJ: Lawrence Erlbaum Associates Inc. Retrieved from http://dl.acm.org/citation.cfm?id=772072.772080

von Wagner, C., Semmler, C., Good, A., & Wardle, J. (2009). Health literacy and self-efficacy for participating in colorectal cancer screening: The role of information processing. *Patient Education and Counseling*, *75*(3), 352-7. doi:10.1016/j.pec.2009.03.015

المنارة للاستشارات

www.manaraa.com

APPENDIX A: TABLES OF QUANTITATIVE RESULTS

Table A1. Timeline Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Timeline	5.54	1	5.54	.56
Computer hours	1.77	1	1.77	.18
Computer years	.12	1	.12	.01
Depression	.80	1	.80	.08
Neuroticism	2.53	1	2.53	.25
Age	1.64	1	1.64	.17
Search method	5.94	2	2.97	.30
Illness	1.71	1	1.71	.17
Age*Search method	17.31	2	8.65	.87
Age*Illness	.01	1	.01	.00
Search method*Illness	6.69	2	3.34	.34
Age*Search method*Illness	17.56	2	8.78	.88
Error	626.59	63	9.95	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A2. Timeline Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Timeline	.69	1	.69	.08
Computer hours	2.15	1	2.15	.26
Computer years	.17	1	.17	.02
Depression	8.33	1	8.33	.99
Neuroticism	6.62	1	6.62	.79
Age	223.81	28	7.99	.95
Search method	11.51	2	5.76	.69
Illness	1.27	1	1.27	.15
Age*Search method	69.47	8	8.68	1.04
Age*Illness	286.28	12	23.86	2.85*
Search method*Illness	51.22	1	51.22	6.11*
Error	134.05	16	8.38	

$^*p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A3. Sidak Comparisons of Age for Timeline (Mononucleosis)

Comparisons	Mean Pre-post Timeline Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Younger[a] vs. Mean-aged[b]	1.81	2.38	-4.26	7.88
Younger vs. Older[c]	1.19	1.98	-3.86	6.24
Mean-aged vs. Older	-.62	2.30	-6.49	5.25

[a] = one *SD* below the mean; approximately aged 51 to 57 years

[b] = approximately age 57 to 64 years

[c] = one *SD* above the mean; approximately aged 64 to 84 years

Table A4. Sidak Comparisons of Age for Timeline (Scarlet Fever)

Comparisons	Mean Pre-post Timeline Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Younger[a] vs. Mean-aged[b]	1.13	2.56	-5.32	7.58
Younger vs. Older[c]	-.03	1.43	-3.64	3.57
Mean-aged vs. Older	-1.16	2.53	-7.55	5.23

[a] = one *SD* below the mean; approximately aged 51 to 57 years

[b] = approximately age 57 to 64 years

[c] = one *SD* above the mean; approximately aged 64 to 84 years

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Table A5. Sidak Comparisons of Search Method for Timeline (Mononucleosis)

Comparisons	Mean Pre-post Timeline Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-1.44	2.16	-6.96	4.08
Google vs. WebMD (new)	-.38	2.16	-4.08	6.96
WebMD (old) vs. WebMD (new)	1.07	2.13	-4.37	6.50

Table A6. Sidak Comparisons of Search Method for Timeline (Scarlet Fever)

Comparisons	Mean Pre-post Timeline Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.89	1.91	-5.70	3.93
Google vs. WebMD (new)	-2.13	2.38	-8.12	3.87
WebMD (old) vs. WebMD (new)	-1.24	2.36	-7.21	4.72

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Table A7. Confidence About Timeline Representation (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Timeline	7.80	1	7.80	.54
Computer hours	.02	1	.02	.00
Computer years	7.04	1	7.04	.49
Depression	10.95	1	10.95	.76
Neuroticism	29.42	1	29.42	2.05
Age	.04	1	.04	.00
Search method	20.20	2	10.10	.71
Illness	.10	1	.10	.01
Age*Search method	3.60	2	1.80	.13
Age*Illness	1.88	1	1.88	.13
Search method*Illness	13.68	2	6.84	.48
Age*Search method*Illness	3.23	2	1.61	.11
Error	902.93	63	14.33	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A8. Confidence About Timeline Representation (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Timeline	4.91	1	4.91	.26
Computer hours	2.88	1	2.88	.16
Computer years	27.40	1	27.40	1.47
Depression	2.90	1	2.90	.16
Neuroticism	36.21	1	36.21	1.95
Age	349.33	28	12.48	.67
Search method	3.71	2	1.85	.10
Illness	23.99	1	23.99	.27
Age*Search method	69.00	8	8.63	.46
Age*Illness	180.68	12	15.06	.81
Search method*Illness	27.56	1	27.56	1.48
Error	297.91	16	18.62	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A9. Consequence Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Consequence	10.55	1	10.55	1.42
Computer hours	12.86	1	12.86	1.73
Computer years	3.58	1	3.58	.48
Depression	4.40	1	4.40	.59
Neuroticism	2.72	1	2.72	.37
Age	20.37	1	20.37	2.75
Search method	10.58	2	5.29	.71
Illness	2.78	1	2.78	.38
Age*Search method	8.46	2	4.23	.57
Age*Illness	1.37	1	1.37	.19
Search method*Illness	13.75	2	6.88	.93
Age*Search method*Illness	7.16	2	3.58	.48
Error	467.14	63	7.42	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A10. Consequence Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Consequence	3.66	1	3.66	.37
Computer hours	1.55	1	1.55	.16
Computer years	.01	1	.01	.00
Depression	1.54	1	1.54	.16
Neuroticism	2.38	1	2.38	.24
Age	170.27	28	6.06	.62
Search method	3.13	2	1.57	.16
Illness	3.83	1	3.83	.39
Age*Search method	66.74	8	8.34	.85
Age*Illness	77.42	12	6.45	.67
Search method*Illness	14.31	1	14.31	1.46
Error	157.42	16	9.84	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A11. Confidence About Consequence Representation (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Consequence	.46	1	.46	.04
Computer hours	.00	1	.00	.00
Computer years	50.02	1	50.02	4.69*
Depression	46.38	1	46.38	4.35*
Neuroticism	31.32	1	31.32	2.94
Age	.00	1	.00	.00
Search method	48.54	2	24.27	2.28
Illness	.17	1	.17	.02
Age*Search method	11.45	2	5.72	.54
Age*Illness	3.68	1	3.68	.35
Search method*Illness	8.28	2	4.14	.39
Age*Search method*Illness	3.86	2	1.93	.18
Error	672.25	63	10.67	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A12. Confidence About Consequence Representation (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Consequence	2.21	1	2.21	.14
Computer hours	.96	1	.96	.06
Computer years	46.56	1	46.56	2.30
Depression	3.71	1	3.71	.24
Neuroticism	5.47	1	5.47	.35
Age	237.44	28	8.48	.55
Search method	3.67	2	1.84	.12
Illness	55.80	1	55.80	3.59
Age*Search method	72.05	8	9.01	.58
Age*Illness	97.31	12	8.12	.52
Search method*Illness	9.40	1	9.40	.62
Error	248.64	16	15.54	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A13. Personal Control Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Personal control	5.35	1	5.35	.70
Computer hours	12.74	1	12.74	1.66
Computer years	9.45	1	9.45	1.23
Depression	.13	1	.13	.02
Neuroticism	.00	1	.00	.00
Age	4.08	1	4.08	.53
Search method	22.28	2	11.14	1.45
Illness	11.81	1	11.81	1.54
Age*Search method	14.98	2	7.49	.98
Age*Illness	1.07	1	1.07	.14
Search method*Illness	25.97	2	12.98	1.69
Age*Search method*Illness	.13	2	.06	.01
Error	484.14	63	7.69	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A14. Personal Control Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Personal control	.22	1	.22	.05
Computer hours	2.88	1	2.88	.63
Computer years	22.91	1	22.91	5.01*
Depression	.80	1	.80	.18
Neuroticism	3.53	1	3.53	.77
Age	224.26	28	8.01	1.75
Search method	54.69	2	27.34	5.98**
Illness	2.09	1	2.09	.46
Age*Search method	86.90	8	10.86	2.38
Age*Illness	155.74	12	12.98	2.84*
Search method*Illness	1.17	2	1.17	.26
Error	73.13	16	4.57	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A15. Sidak Comparisons of Search Method for Personal Control

Comparisons	Mean Pre-post Personal Control Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.67	.77	-1.37	2.70
Google vs. WebMD (new)	-.71	1.03	-3.45	2.02
WebMD (old) vs. WebMD (new)	-1.38	1.17	-4.50	1.74

Table A16. Sidak Comparisons of Age for Personal Control (Mononucleosis)

Comparisons	Mean Pre-post Personal Control Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Younger[a] vs. Mean-aged[b]	.13	2.32	-5.79	6.05
Younger vs. Older[c]	.83	1.93	-4.09	5.75
Mean-aged vs. Older	.70	2.24	-5.02	6.42

[a] = one *SD* below the mean; approximately aged 51 to 57 years

[b] = approximately age 57 to 64 years

[c] = one *SD* above the mean; approximately aged 64 to 84 years

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Table A17. Sidak Comparisons of Age for Personal Control (Scarlet Fever)

Comparisons	Mean Pre-post Personal Control Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Younger[a] vs. Mean-aged[b]	-.15	2.28	-5.91	5.62
Younger vs. Older[c]	-.16	1.28	-3.39	3.06
Mean-aged vs. Older	-.02	2.26	-5.73	5.69

[a] = one *SD* below the mean; approximately aged 51 to 57 years

[b] = approximately age 57 to 64 years

[c] = one *SD* above the mean; approximately aged 64 to 84 years

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Table A18. Confidence About Personal Control Representation (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Personal control	9.96	1	9.96	1.09
Computer hours	.51	1	.51	.06
Computer years	33.71	1	33.71	3.70
Depression	51.69	1	51.69	5.67*
Neuroticism	6.37	1	6.37	.70
Age	.34	1	.34	.04
Search method	8.60	2	4.30	.47
Illness	1.32	1	1.32	.14
Age*Search method	15.96	2	7.98	.87
Age*Illness	21.05	1	21.05	2.31
Search method*Illness	1.73	2	.87	.10
Age*Search method*Illness	7.52	2	3.76	.41
Error	574.71	63	9.12	

*$p \le .05$, **$p \le .01$, ***$p \le .001$

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Table A19. Confidence About Personal Control Representation (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Personal control	1.00	1	1.00	.08
Computer hours	3.42	1	3.42	.26
Computer years	18.72	1	18.72	1.41
Depression	8.66	1	8.66	.65
Neuroticism	23.82	1	23.82	1.79
Age	228.97	28	8.18	.62
Search method	14.06	2	7.03	.53
Illness	25.27	1	25.27	1.90
Age*Search method	49.32	8	6.16	.46
Age*Illness	158.52	12	13.21	.99
Search method*Illness	2.41	1	2.41	.18
Error	212.62	16	13.29	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A20. Treatment Control Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Treatment control	9.29	1	9.29	1.51
Computer hours	2.66	1	2.66	.43
Computer years	10.19	1	10.19	1.66
Depression	.34	1	.34	.06
Neuroticism	.54	1	.54	.09
Age	2.44	1	2.44	.40
Search method	1.62	2	.81	.13
Illness	18.44	1	18.44	2.30
Age*Search method	11.24	2	5.62	.91
Age*Illness	8.53	1	8.53	1.39
Search method*Illness	22.28	2	11.14	1.81
Age*Search method*Illness	13.07	2	6.54	1.06
Error	387.63	63	6.15	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A21. Treatment Control Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Treatment control	11.53	1	11.53	2.36
Computer hours	.42	1	.42	.09
Computer years	7.47	1	7.47	1.53
Depression	8.45	1	8.45	1.73
Neuroticism	11.67	1	11.67	2.39
Age	178,01	28	6.36	1.30
Search method	3.94	2	1.97	.40
Illness	5.67	1	5.67	1.16
Age*Search method	59.81	8	7.48	1.53
Age*Illness	64.63	12	5.39	1.10
Search method*Illness	13.45	1	13.45	2.75
Error	78.23	16	4.89	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A22. Confidence About Treatment Control Representation (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Treatment control	2.29	1	2.29	.28
Computer hours	3.71	1	3.71	.45
Computer years	16.19	1	16.19	1.97
Depression	29.87	1	29.87	3.64
Neuroticism	9.62	1	9.62	1.17
Age	7.97	1	7.97	.97
Search method	1.73	2	.86	.11
Illness	3.16	1	3.16	.39
Age*Search method	20.58	2	10.29	1.25
Age*Illness	8.86	1	8.86	1.08
Search method*Illness	.52	2	.26	.03
Age*Search method*Illness	3.85	2	1.92	.23
Error	517.08	63	8.21	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A23. Confidence About Treatment Control Representation (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Treatment control	2.65	1	2.65	.26
Computer hours	6.52	1	6.52	.64
Computer years	19.32	1	19.32	1.90
Depression	.62	1	.62	.06
Neuroticism	1.16	1	1.16	.11
Age	222.12	28	7.97	.78
Search method	26.08	2	13.04	1.28
Illness	34.08	1	34.08	3.35
Age*Search method	67.41	8	8.43	.83
Age*Illness	86.05	12	7.17	.70
Search method*Illness	1.42	1	1.42	.14
Error	163.02	16	10.19	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A24. Coherence Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Coherence	.41	1	.41	.05
Computer hours	56.20	1	56.20	6.23*
Computer years	48.12	1	48.12	5.34*
Depression	1.76	1	1.76	.20
Neuroticism	16.35	1	16.35	1.81
Age	6.85	1	6.85	.76
Search method	3.59	2	1.79	.20
Illness	7.26	1	7.26	.81
Age*Search method	32.78	2	16.39	1.82
Age*Illness	1.20	1	1.20	.13
Search method*Illness	14.41	2	7.20	.80
Age*Search method*Illness	22.39	2	11.19	1.24
Error	568.10	63	9.02	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A25. Coherence Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Coherence	4.23	1	4.23	.46
Computer hours	5.54	1	5.54	.60
Computer years	4.75	1	4.75	.51
Depression	.00	1	.00	.00
Neuroticism	7.95	1	7.95	.86
Age	304.79	28	10.89	1.17
Search method	5.71	2	2.86	.31
Illness	7.90	1	7.90	.85
Age*Search method	31.58	8	3.95	.43
Age*Illness	141.36	12	11.78	1.27
Search method*Illness	1.76	1	1.76	.19
Error	148.46	16	9.28	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A26. Confidence About Coherence Representation (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Coherence	.27	1	.27	.05
Computer hours	.11	1	.11	.02
Computer years	.06	1	.06	.01
Depression	19.90	1	19.90	3.55
Neuroticism	.12	1	.12	.02
Age	11.65	1	11.65	2.08
Search method	7.20	2	3.60	.64
Illness	4.11	1	4.11	.73
Age*Search method	25.14	2	12.57	2.24
Age*Illness	7.55	1	7.55	1.35
Search method*Illness	.08	2	.04	.01
Age*Search method*Illness	20.03	2	10.01	1.78
Error	353.65	63	5.61	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A27. Confidence About Coherence Representation (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Coherence	11.38	1	11.38	1.33
Computer hours	2.31	1	2.31	.27
Computer years	14.20	1	14.20	1.67
Depression	1.97	1	1.97	.23
Neuroticism	5.64	1	5.64	.66
Age	160.46	28	5.73	.67
Search method	10.23	2	5.12	.60
Illness	15.55	1	15.55	1.82
Age*Search method	78.87	8	9.86	1.16
Age*Illness	79.61	12	6.63	.78
Search method*Illness	.01	1	.01	.00
Error	136.43	16	8.53	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A28. Cyclical Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Cyclical	8.72	1	8.72	2.72
Computer hours	2.60	1	2.60	.81
Computer years	.03	1	.03	.01
Depression	.87	1	.87	.27
Neuroticism	8.58	1	8.58	2.67
Age	.02	1	.02	.01
Search method	10.07	2	5.04	1.57
Illness	13.01	1	13.01	4.05*
Age*Search method	7.95	2	3.98	1.24
Age*Illness	.43	1	.43	.14
Search method*Illness	24.65	2	12.32	3.84*
Age*Search method*Illness	9.93	2	4.97	1.55
Error	202.23	63	3.21	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A29. Sidak Comparisons of Illness for Cyclical Representation

Comparisons	Mean Pre-post Cyclical Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Mono vs. Scarlet Fever	-.49	.64	-1.76	.78

Table A30. Sidak Comparisons of Search Method for Cyclical Representation (Mononucleosis)

Comparisons	Mean Pre-post Cyclical Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.46	.81	-1.60	2.52
Google vs. WebMD (new)	-.79	1.07	-3.52	1.95
WebMD (old) vs. WebMD (new)	-1.25	1.11	-4.07	1.58

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Table A31. Sidak Comparisons of Search Method for Cyclical Representation (Scarlet Fever)

Comparisons	Mean Pre-post Cyclical Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	1.34	.91	-.96	3.64
Google vs. WebMD (new)	-.59	1.37	-4.04	2.86
WebMD (old) vs. WebMD (new)	-1.93	1.47	-5.63	1.77

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Table A32. Cyclical Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Cyclical	6.51	1	6.51	1.40
Computer hours	7.43	1	7.43	1.59
Computer years	1.07	1	1.07	.23
Depression	2.26	1	2.26	.49
Neuroticism	2.76	1	2.76	.59
Age	71.54	28	2.56	.55
Search method	5.93	2	2.97	.64
Illness	5.54	1	5.54	1.19
Age*Search method	17.61	8	2.20	.47
Age*Illness	54.52	12	4.54	.98
Search method*Illness	6.22	1	6.22	1.34
Error	74.56	16	4.66	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A33. Confidence About Cyclical Representation (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Cyclical	.07	1	.07	.01
Computer hours	.80	1	.80	.12
Computer years	.02	1	.02	.00
Depression	8.57	1	8.57	1.32
Neuroticism	.96	1	.96	.15
Age	1.75	1	1.75	.27
Search method	.70	2	.35	.05
Illness	1.88	1	1.88	.29
Age*Search method	18.49	2	9.25	1.42
Age*Illness	4.19	1	4.19	.65
Search method*Illness	.54	2	.27	.04
Age*Search method*Illness	13.99	2	6.70	1.08
Error	409.02	63	6.49	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A34. Confidence About Cyclical Representation (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Cyclical	.20	1	.20	.03
Computer hours	1.00	1	1.00	.13
Computer years	1.61	1	1.61	.20
Depression	.17	1	.17	.02
Neuroticism	.06	1	.06	.01
Age	139.08	28	4.97	.62
Search method	2.47	2	1.23	.16
Illness	3.35	1	3.35	.42
Age*Search method	82.08	8	10.26	1.29
Age*Illness	65.45	12	5.45	.68
Search method*Illness	.37	1	.37	.05
Error	127.65	16	7.98	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A35. Emotion Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Emotion	9.08	1	9.08	.91
Computer hours	9.36	1	9.36	.94
Computer years	.77	1	.77	.08
Depression	2.34	1	2.34	.24
Neuroticism	25.31	1	25.31	2.55
Age	6.56	1	6.56	.66
Search method	24.09	2	12.05	1.21
Illness	.00	1	.00	.00
Age*Search method	7.12	2	3.56	.36
Age*Illness	3.03	1	3.03	.31
Search method*Illness	2.17	2	1.09	.11
Age*Search method*Illness	23.07	2	11.54	1.16
Error	626.17	63	9.94	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A36. Emotion Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Emotion	3.12	1	3.12	.23
Computer hours	5.33	1	5.33	.40
Computer years	20.46	1	20.46	1.52
Depression	.25	1	.25	.02
Neuroticism	.91	1	,91	.07
Age	330.26	28	11.80	.88
Search method	10.82	2	5.41	.40
Illness	5.00	1	5.00	.37
Age*Search method	52.62	8	6.58	.49
Age*Illness	77.28	12	6.44	.48
Search method*Illness	10.59	1	10.59	.79
Error	215.76	16	13.49	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A37. Confidence About Emotion Representation (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Emotion	.01	1	.01	.00
Computer hours	.18	1	.18	.04
Computer years	6.07	1	6.07	1.28
Depression	12.69	1	12.69	2.68
Neuroticism	7.70	1	7.70	1.63
Age	12.98	1	12.98	2.74
Search method	8.16	2	4.08	.86
Illness	2.47	1	2.47	.52
Age*Search method	13.14	2	6.57	1.39
Age*Illness	4.46	1	4.46	.94
Search method*Illness	1.45	2	.73	.15
Age*Search method*Illness	7.34	2	3.67	.78
Error	298.08	63	4.73	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A38. Confidence About Emotion Representation (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Emotion	.04	1	.04	.01
Computer hours	.49	1	.49	.06
Computer years	7.27	1	7.27	.95
Depression	9.19	1	9.19	1.20
Neuroticism	5.20	1	5.20	.68
Age	82.28	28	2.94	.38
Search method	17.92	2	8.96	1.17
Illness	.88	1	.88	.12
Age*Search method	24.40	8	3.05	.40
Age*Illness	89.84	12	7.49	.98
Search method*Illness	1.82	1	1.82	.24
Error	122.90	16	7.68	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A39. Timeline Repeated Measures ANCOVA (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Timeline	5.00	1	5.00	.54
Computer hours	1.19	1	1.19	.13
Computer years	.00	1	.00	.00
Depression	.03	1	.03	.00
Neuroticism	.90	1	.90	.10
Change	9.89	1	9.89	1.07
Error	677.41	73	9.28	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A40. Confidence About Timeline Representation (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Timeline	11.00	1	11.00	.89
Computer hours	4.81	1	4.81	.39
Computer years	32.97	1	32.97	2.66
Depression	.79	1	.79	.06
Neuroticism	46.21	1	46.21	3.73
Change	47.16	1	47.16	3.80
Error	904.86	73	12.40	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A41. Consequence Repeated Measures ANCOVA (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Consequence	28.59	1	28.59	3.84*
Computer hours	9.09	1	9.09	1.22
Computer years	6.78	1	6.78	.91
Depression	1.54	1	1.54	.21
Neuroticism	10.30	1	10.30	1.38
Change	.00	1	.00	.00
Error	644.20	73	7.46	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A42. Confidence in Consequence Representation (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Consequence	.70	1	.70	.07
Computer hours	3.71	1	3.71	.37
Computer years	72.19	1	72.19	7.19**
Depression	24.14	1	24.14	2.41
Neuroticism	32.70	1	32.70	3.26
Change	20.59	1	20.59	2.05
Error	732.51	73	10.03	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A43. Personal Control Repeated Measures ANCOVA (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Personal control	.59	1	.59	.08
Computer hours	5.37	1	5.37	.71
Computer years	2.11	1	2.11	.28
Depression	.21	1	.21	.03
Neuroticism	.12	1	.12	.02
Change	1.52	1	1.52	.20
Error	550.75	73	7.54	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A44. Confidence About Personal Control Representation (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Personal control	.49	1	.49	.06
Computer hours	5.09	1	5.09	.59
Computer years	30.06	1	30.06	3.48
Depression	35.72	1	35.72	4.13*
Neuroticism	27.32	1	27.32	3.16
Change	26.39	1	26.39	3.06
Error	630.77	73	8.64	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A45. Treatment Control Repeated Measures ANCOVA (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Treatment control	7.51	1	7.51	1.21
Computer hours	2.35	1	2.35	.38
Computer years	.52	1	.52	.08
Depression	.19	1	.19	.03
Neuroticism	3.27	1	3.27	.53
Change	4.31	1	4.31	.70
Error	452.47	73	6.20	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A46. Confidence About Treatment Control Representation (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Treatment control	.08	1	.08	.01
Computer hours	6.08	1	6.08	.80
Computer years	6.42	1	6.42	.85
Depression	23.29	1	23.29	3.07
Neuroticism	10.77	1	10.77	1.42
Change	4.23	1	4.23	.56
Error	553.19	73	7.58	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A47. Coherence Repeated Measures ANCOVA (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Coherence	6.25	1	6.25	.68
Computer hours	44.34	1	44.34	4.79*
Computer years	8.03	1	8.03	.87
Depression	1.68	1	1.68	.18
Neuroticism	7.79	1	7.79	.84
Change	8.52	1	8.52	.92
Error	675.34	73	9.25	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A48. Confidence About Coherence Representation (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Coherence	1.19	1	1.19	.22
Computer hours	1.55	1	1.55	.28
Computer years	7.20	1	7.20	1.31
Depression	17.69	1	17.69	3.23
Neuroticism	1.21	1	1.21	.22
Change	41.50	1	41.50	7.58**
Error	399.96	73	5.48	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table A49. Sidak Comparisons of Change of Diagnosis for Confidence About Coherence

Comparisons	Mean Pre-post Coherence Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
No Change vs. Change	.08	.69	-1.29	1.44

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Table A50. Cyclical Repeated Measures ANCOVA (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Cyclical	7.22	1	7.22	2.00
Computer hours	3.16	1	3.16	.88
Computer years	5.36	1	5.36	1.49
Depression	.47	1	.47	.13
Neuroticism	15.95	1	15.95	4.42*
Change	4.31	1	4.31	1.20
Error	263.40	73	3.61	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A51. Confidence About Cyclical Representation (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Cyclical	.27	1	.27	.05
Computer hours	9.47	1	9.47	1.67
Computer years	3.59	1	3.59	.63
Depression	7.02	1	7.02	1.24
Neuroticism	10.62	1	10.62	1.88
Change	64.61	1	64.61	11.40***
Error	413.68	73	5.67	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

Table A52. Sidak Comparisons of Change of Diagnosis for Confidence in Cyclical Representation

Comparisons	Mean Pre-post Cyclical Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
No Change vs. Change	.87	.74	-.61	2.34

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Table A53. Emotion Repeated Measures ANCOVA (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Emotion	3.45	1	3.45	.38
Computer hours	16.59	1	16.59	1.81
Computer years	2.01	1	2.01	.22
Depression	.02	1	.02	.00
Neuroticism	17.61	1	17.61	1.92
Change	18.70	1	18.70	2.04
Error	668.61	73	9.16	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A54. Confidence About Emotion Representation (Change of Diagnosis)

Source	Sum of Squares	df	Mean Square	F
Emotion	.08	1	.08	.02
Computer hours	1.39	1	1.39	.28
Computer years	8.17	1	8.17	1.64
Depression	12.66	1	12.66	2.54
Neuroticism	8.17	1	8.17	1.64
Change	6.98	1	6.98	1.40
Error	363.87	73	4.98	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A55. Timeline Repeated Measures ANCOVA (Gender)

Source	Sum of Squares	df	Mean Square	F
Timeline	3.89	1	3.89	.41
Computer hours	3.03	1	3.03	.32
Computer years	1.05	1	1.05	.11
Depression	.10	1	.10	.01
Neuroticism	.01	1	.01	.00
Gender	1.67	1	1.67	.18
Error	685.63	73	9.39	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A56. Confidence About Timeline Representation (Gender)

Source	Sum of Squares	df	Mean Square	F
Timeline	8.10	1	8.10	.62
Computer hours	1.33	1	1.33	.10
Computer years	13.29	1	13.29	1.02
Depression	2.25	1	2.25	.17
Neuroticism	27.41	1	27.41	2.12
Gender	.17	1	.17	.01
Error	951.84	73	13.04	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A57. Consequence Repeated Measures ANCOVA (Gender)

Source	Sum of Squares	df	Mean Square	F
Consequence	29.68	1	29.68	4.01*
Computer hours	7.12	1	7.12	.96
Computer years	8.36	1	8.36	1.13
Depression	.75	1	.75	.10
Neuroticism	12.18	1	12.18	1.65
Gender	4.14	1	4.14	.56
Error	540.06	73	7.34	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A58. Confidence About Consequence Representation (Gender)

Source	Sum of Squares	df	Mean Square	F
Consequence	1.20	1	1.20	.12
Computer hours	2.04	1	2.04	.20
Computer years	53.48	1	53.48	5.19*
Depression	25.60	1	25.60	2.48
Neuroticism	23.29	1	23.29	2.26
Gender	.82	1	.82	.08
Error	752.28	73	10.31	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A59. Personal Control Repeated Measures ANCOVA (Gender)

Source	Sum of Squares	df	Mean Square	F
Personal control	.77	1	.77	.10
Computer hours	4.15	1	4.15	.55
Computer years	1.29	1	1.29	.17
Depression	.43	1	.43	.06
Neuroticism	.00	1	.00	.00
Gender	.36	1	.36	.05
Error	551.91	73	7.56	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A60. Confidence About Personal Control Representation (Gender)

Source	Sum of Squares	df	Mean Square	F
Personal control	1.20	1	1.20	.13
Computer hours	1.77	1	1.77	.20
Computer years	16.39	1	16.39	1.83
Depression	42.61	1	42.61	4.74*
Neuroticism	15.84	1	15.84	1.76
Gender	1.44	1	1.44	.16
Error	655.72	73	8.98	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A61. Treatment Control Repeated Measures ANCOVA (Gender)

Source	Sum of Squares	df	Mean Square	F
Treatment control	6.17	1	6.17	1.00
Computer hours	5.09	1	5.09	.83
Computer years	1.74	1	1.74	.28
Depression	1.12	1	1.12	.18
Neuroticism	1.20	1	1.20	.19
Gender	7.16	1	7.16	1.16
Error	449.62	73	6.16	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A62. Confidence About Treatment Control Representation (Gender)

Source	Sum of Squares	df	Mean Square	F
Treatment control	.11	1	.11	.02
Computer hours	6.03	1	6.03	.79
Computer years	3.33	1	3.33	.44
Depression	21.39	1	21.39	2.82
Neuroticism	9.13	1	9.13	1.20
Gender	3.10	1	3.10	.41
Error	554.31	73	7.59	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A63. Coherence Repeated Measures ANCOVA (Gender)

Source	Sum of Squares	df	Mean Square	F
Coherence	7.99	1	7.99	.86
Computer hours	56.46	1	56.46	6.10*
Computer years	14.85	1	14.85	1.61
Depression	4.06	1	4.06	.44
Neuroticism	14.84	1	14.84	1.60
Gender	8.21	1	8.21	.89
Error	675.65	73	9.26	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A64. Confidence About Coherence Representation (Gender)

Source	Sum of Squares	df	Mean Square	F
Coherence	2.16	1	2.16	.36
Computer hours	.26	1	.26	.04
Computer years	.20	1	.20	.03
Depression	20.05	1	20.05	3.33
Neuroticism	.13	1	.13	.02
Gender	1.25	1	1.25	.21
Error	440.22	73	6.03	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A65. Cyclical Repeated Measures ANCOVA (Gender)

Source	Sum of Squares	df	Mean Square	F
Cyclical	5.78	1	5.78	1.64
Computer hours	6.77	1	6.77	1.93
Computer years	3.77	1	3.77	1.07
Depression	2.02	1	2.02	.58
Neuroticism	10.75	1	10.75	3.06
Gender	10.95	1	10.95	3.11
Error	256.76	73	3.52	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A66. Confidence About Cyclical Representation (Gender)

Source	Sum of Squares	df	Mean Square	F
Cyclical	.00	1	.00	.00
Computer hours	4.23	1	4.23	.65
Computer years	.88	1	.88	.13
Depression	9.83	1	9.83	1.50
Neuroticism	2.02	1	2.02	.31
Gender	.55	1	.55	.08
Error	477.75	73	6.54	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A67. Emotion Repeated Measures ANCOVA (Gender)

Source	Sum of Squares	df	Mean Square	F
Emotion	2.29	1	2.29	.24
Computer hours	10.51	1	10.51	1.12
Computer years	.00	1	.00	.00
Depression	.49	1	.49	.05
Neuroticism	9.71	1	9.71	1.03
Gender	1.65	1	1.65	.18
Error	685.66	73	9.39	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A68. Confidence About Emotion Representation (Gender)

Source	Sum of Squares	df	Mean Square	F
Emotion	.20	1	.20	.04
Computer hours	.74	1	.74	.15
Computer years	4.22	1	4.22	.83
Depression	13.44	1	13.44	2.65
Neuroticism	5.34	1	5.34	1.05
Gender	.13	1	.13	.03
Error	370.72	73	5.08	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A69. Stress Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Stress	1.37	1	1.37	1.87
Computer hours	.11	1	.11	.15
Computer years	3.31	1	3.31	4.50*
Depression	.00	1	.00	.00
Neuroticism	.08	1	.08	.10
Age	8.12	1	8.12	11.05***
Search method	6.86	2	3.43	4.67*
Illness	.04	1	.04	.05
Age*Search method	5.54	2	2.77	3.77*
Age*Illness	.38	1	.38	.52
Search method*Illness	.25	2	.13	.17
Age*Search method*Illness	1.74	2	.87	1.18
Error	46.29	63	.74	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A70. Sidak Comparisons of Age for Stress as a Cause

Comparisons	Mean Pre-post Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs vs. 65 plus yrs.	.05	.17	-.30	.39

Table A71. Sidak Comparisons of Search Method for Stress as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.09	.17	-.32	.50
Google vs. WebMD (new)	-.16	.24	-.75	.42
WebMD (old) vs. WebMD (new)	-.25	.25	-.87	.36

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Table A72. Sidak Comparisons of Search Method for Stress as a Cause (50-64 Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.03	.24	-.57	.63
Google vs. WebMD (new)	-.21	.36	-1.12	.70
WebMD (old) vs. WebMD (new)	-.24	.38	-1.21	.73

Table A73. Sidak Comparisons of Search Method for Stress as a Cause (65 Plus Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.11	.25	-.52	.74
Google vs. WebMD (new)	-.27	.40	-1.27	.73
WebMD (old) vs. WebMD (new)	-.38	.42	-1.45	.68

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Table A74. Stress Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Stress	1.56	1	1.56	1.38
Computer hours	.46	1	.46	.41
Computer years	1.14	1	1.14	1.01
Depression	1.25	1	1.25	1.12
Neuroticism	1.49	1	1.49	1.32
Age	17.78	28	.64	.56
Search method	.67	2	.34	.30
Illness	.87	1	.87	.77
Age*Search method	12.65	8	1.58	1.40
Age*Illness	4.54	12	.38	.34
Search method*Illness	.23	1	.23	.20
Error	18.03	16	1.13	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A75. Heredity Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Heredity	2.70	1	2.70	3.01
Computer hours	.01	1	.01	.01
Computer years	5.79	1	5.79	6.52*
Depression	1.59	1	1.59	1.79
Neuroticism	.23	1	.23	.26
Age	1.69	1	1.69	1.90
Search method	4.00	2	2.00	2.26
Illness	1.20	1	1.20	1.35
Age*Search method	1.88	2	.94	1.06
Age*Illness	.24	1	.24	.28
Search method*Illness	2.32	2	1.16	1.31
Age*Search method*Illness	1.71	2	.86	.97
Error	55.88	63	.89	

$^*p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A76. Heredity Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Heredity	1.97	1	1.97	2.06
Computer hours	.19	1	.19	.19
Computer years	3.53	1	3.53	3.69
Depression	.02	1	.02	.02
Neuroticism	.65	1	.65	.68
Age	23.86	28	.85	.89
Search method	.49	2	.24	.25
Illness	2.32	1	2.32	2.43
Age*Search method	5.32	8	.67	.70
Age*Illness	8.70	12	.73	.76
Search method*Illness	.10	1	.10	.75
Error	15.30	16	.96	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A77. Germ Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Germ	1.23	1	1.23	.90
Computer hours	1.05	1	1.05	.76
Computer years	2.11	1	2.11	1.54
Depression	.01	1	.01	.00
Neuroticism	.11	1	.11	.08
Age	.04	1	.04	.03
Search method	1.97	2	.99	.72
Illness	.00	1	.00	.00
Age*Search method	.09	2	.05	.03
Age*Illness	.02	1	.02	.01
Search method*Illness	1.45	2	.72	.53
Age*Search method*Illness	.21	2	.11	.08
Error	86.17	63	1.37	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A78. Germ Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Germ	2.03	1	2.03	1.80
Computer hours	.50	1	.50	.45
Computer years	3.05	1	3.05	2.71
Depression	1.85	1	1.85	1.64
Neuroticism	1.64	1	1.64	1.46
Age	38.14	28	1.36	1.21
Search method	1.02	2	.51	.45
Illness	1.45	1	1.45	1.29
Age*Search method	9.43	8	1.18	1.05
Age*Illness	16.76	12	1.40	.34
Search method*Illness	.06	1	.06	.05
Error	18.03	16	1.13	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A79. Diet Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Diet	4.87	1	4.87	3.77
Computer hours	2.90	1	2.90	2.24
Computer years	7.97	1	7.97	6.16
Depression	.05	1	.05	.04
Neuroticism	.09	1	.09	.07
Age	4.47	1	4.47	3.45
Search method	1.35	2	.68	.52
Illness	.30	1	.30	.23
Age*Search method	5.22	2	2.61	.14
Age*Illness	.04	1	.04	.03
Search method*Illness	.12	2	.06	.05
Age*Search method*Illness	.86	2	.43	.33
Error	81. 54	63	1.29	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A80. Diet Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Diet	2.63	1	2.63	3.57
Computer hours	1.89	1	1.89	2.57
Computer years	3.24	1	3.24	4.41*
Depression	2.36	1	2.36	3.21
Neuroticism	1.35	1	1.35	1.84
Age	30.65	28	1.10	1.49
Search method	2.42	2	1.21	1.64
Illness	.75	1	.75	1.00
Age*Search method	11.57	8	1.45	1.97
Age*Illness	12.85	12	1.07	1.46
Search method*Illness	.02	1	.02	.03
Error	11.77	16	.74	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A81. Chance Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Chance	.81	1	.81	.69
Computer hours	.35	1	.35	.30
Computer years	.32	1	.32	.27
Depression	.79	1	.79	.67
Neuroticism	.98	1	98	.83
Age	1.87	1	1.87	1.58
Search method	.37	2	.19	.16
Illness	1.10	1	1.10	.86
Age*Search method	4.68	2	2.34	1.98
Age*Illness	1.53	1	1.53	1.29
Search method*Illness	1.01	2	.51	.43
Age*Search method*Illness	.01	2	.01	.01
Error	74.51	63	1.18	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A82. Chance Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Chance	1.96	1	1.96	1.27
Computer hours	1.01	1	1.01	.65
Computer years	2.22	1	2.22	1.44
Depression	1.14	1	1.14	.74
Neuroticism	.93	1	.93	.60
Age	26.30	28	.94	.61
Search method	1.40	2	.70	.45
Illness	4.32	1	4.32	2.79
Age*Search method	15.13	8	1.89	1.22
Age*Illness	13.40	12	1.12	.72
Search method*Illness	.26	1	.26	.17
Error	24.75	16	1.55	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A83. Poor Medical Care Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Medical Care	.00	1	.00	.00
Computer hours	3.85	1	3.85	3.65
Computer years	.01	1	.01	.01
Depression	.00	1	.00	.00
Neuroticism	.11	1	.11	.10
Age	2.66	1	2.66	2.52
Search method	.13	2	.07	.06
Illness	1.08	1	1.08	1.03
Age*Search method	2.89	2	1.45	1.37
Age*Illness	1.37	1	1.37	1.30
Search method*Illness	1.68	2	.84	.80
Age*Search method*Illness	3.25	2	1.62	1.54
Error	66.39	63	1.05	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A84. Poor Medical Care Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Medical Care	2.84	1	2.84	3.53
Computer hours	7.33	1	7.33	9.13**
Computer years	4.04	1	4.04	5.03*
Depression	.27	1	.27	.34
Neuroticism	.28	1	.28	.35
Age	38.19	28	1.36	1.70
Search method	6.56	2	3.28	4.08*
Illness	3.52	1	3.52	4.38*
Age*Search method	3.75	8	.47	.58
Age*Illness	9.65	12	.80	1.00
Search method*Illness	1.46	1	1.46	1.82
Error	12.85	16	.80	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A85. Sidak Comparisons of Search Method for Medical Care as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.35	.16	-.75	.05
Google vs. WebMD (new)	-.33	.23	-.90	.25
WebMD (old) vs. WebMD (new)	.02	.25	-.58	.63

Table A86. Sidak Comparisons of Illness for Medical Care as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Mononucleosis vs. Scarlet Fever	-.08	.18	-.43	.27

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Table A87. Pollution Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Pollution	.18	1	.18	.15
Computer hours	3.34	1	3.34	2.79
Computer years	.77	1	.77	.64
Depression	.80	1	.80	.67
Neuroticism	.23	1	.23	.20
Age	.87	1	.87	.72
Search method	1.88	2	.94	.79
Illness	1.13	1	1.13	.95
Age*Search method	2.88	2	1.44	1.21
Age*Illness	.77	1	.77	.65
Search method*Illness	.39	2	.19	.16
Age*Search method*Illness	5.30	2	2.65	2.22
Error	75.36	63	1.20	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A88. Pollution Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Pollution	.06	1	.06	.07
Computer hours	.09	1	.09	.09
Computer years	1.52	1	1.52	1.64
Depression	.96	1	.96	1.04
Neuroticism	.20	1	.20	.21
Age	23.93	28	.86	.92
Search method	2.52	2	1.26	1.36
Illness	.00	1	.00	.00
Age*Search method	12.89	8	1.61	1.74
Age*Illness	26.66	12	2.22	2.40*
Search method*Illness	.40	1	.40	.44
Error	14.82	16	.93	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A89. Sidak Comparisons of Age for Pollution as a Cause (Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Younger[a] vs. Mean-aged[b]	.60	.47	-.60	1.80
Younger vs. Older[c]	-.30	.39	-1.03	.97
Mean-aged vs. Older	-.63	.45	-1.78	.53

[a] = one *SD* below the mean; approximately aged 51 to 57 years

[b] = approximately age 57 to 64 years

[c] = one *SD* above the mean; approximately aged 64 to 84 years

Table A90. Sidak Comparisons of Age for Pollution as a Cause (Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Younger[a] vs. Mean-aged[b]	.05	.39	-.92	1.02
Younger vs. Older[c]	-.22	.22	-.76	.32
Mean-aged vs. Older	-.27	.38	-1.23	.69

[a] = one *SD* below the mean; approximately aged 51 to 57 years

[b] = approximately age 57 to 64 years

[c] = one *SD* above the mean; approximately aged 64 to 84 years

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Table A91. Behavior Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Behavior	.15	1	.15	.18
Computer hours	.02	1	.02	.03
Computer years	.81	1	.81	.95
Depression	.04	1	.04	.05
Neuroticism	.64	1	.64	.75
Age	5.06	1	5.06	5.95*
Search method	.85	2	.42	.50
Illness	.55	1	.55	.64
Age*Search method	1.23	2	.61	.72
Age*Illness	.00	1	.00	.00
Search method*Illness	.76	2	.38	.45
Age*Search method*Illness	.37	2	.19	.22
Error	53.58	63	.85	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A92. Sidak Comparisons of Age for Behavior as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.26	.18	-.10	.61

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Table A93. Behavior Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Behavior	2.39	1	2.39	5.87*
Computer hours	.42	1	.42	1.02
Computer years	2.78	1	2.78	6.83*
Depression	3.24	1	3.24	7.96**
Neuroticism	2.47	1	2.47	6.06*
Age	33.32	28	1.19	2.92**
Search method	4.92	2	2.46	6.05**
Illness	2.24	1	2.24	5.51*
Age*Search method	6.28	8	.79	1.93
Age*Illness	10.32	12	.86	2.11
Search method*Illness	.03	1	.03	.07
Error	6.51	16	.41	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A94. Sidak Comparisons of Age for Behavior as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Younger[a] vs. Mean-aged[b]	-.11	.32	-.88	.67
Younger vs. Older[c]	-.38	.23	-.94	.18
Mean-aged vs. Older	-.28	.31	-1.03	.48

[a] = one *SD* below the mean; approximately aged 51 to 57 years

[b] = approximately age 57 to 64 years

[c] = one *SD* above the mean; approximately aged 64 to 84 years

Table A95. Sidak Comparisons of Search Method for Behavior as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.40	.27	-.25	1.05
Google vs. WebMD (new)	-.16	.30	-.90	.58
WebMD (old) vs. WebMD (new)	-.56	.30	-1.28	.17

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Table A96. Sidak Comparisons of Illness for Behavior as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Mononucleosis vs. Scarlet Fever	.37	.23	-.08	.83

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Table A97. Mental Attitude Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Mental attitude	1.80	1	1.80	2.46
Computer hours	2.18	1	2.18	2.98
Computer years	5.34	1	5.34	7.31**
Depression	.37	1	.37	.51
Neuroticism	.00	1	.00	.01
Age	5.29	1	5.29	7.24**
Search method	1.04	2	.52	.71
Illness	.01	1	.01	.01
Age*Search method	3.79	2	1.90	2.60
Age*Illness	.03	1	.03	.05
Search method*Illness	1.23	2	.62	.84
Age*Search method*Illness	1.79	2	.89	1.22
Error	46.04	63	.73	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A98. Sidak Comparisons of Age for Mental Attitude as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.09	.15	-.20	.38

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Table A99. Mental Attitude Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Mental Attitude	.96	1	.96	1.22
Computer hours	.98	1	.98	1.25
Computer years	1.79	1	1.79	2.29
Depression	1.82	1	1.82	2.33
Neuroticism	.50	1	.50	.64
Age	16.34	28	.58	.75
Search method	.27	2	.13	.17
Illness	.63	1	.63	.81
Age*Search method	6.30	8	.79	1.01
Age*Illness	9.02	12	.75	.96
Search method*Illness	1.45	1	1.45	1.85
Error	12.53	16	.78	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A100. Family Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Family	.22	1	.22	.23
Computer hours	1.37	1	1.37	1.44
Computer years	4.01	1	4.01	4.20*
Depression	.73	1	.73	.76
Neuroticism	.46	1	.46	.49
Age	6.02	1	6.02	6.29*
Search method	.82	2	.41	.43
Illness	.04	1	.04	.04
Age*Search method	4.90	2	2.45	2.56
Age*Illness	.35	1	.35	.37
Search method*Illness	.71	2	.35	.37
Age*Search method*Illness	2.91	2	1.45	1.52
Error	60.26	63	.96	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A101. Sidak Comparisons of Age for Family as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.28	.15	-.02	.59

Table A102. Sidak Comparisons of Search Method for Family as a Cause (50-64 Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.15	.25	-.79	.49
Google vs. WebMD (new)	-.36	.38	-1.33	.61
WebMD (old) vs. WebMD (new)	-.21	.41	-1.25	.82

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Table A103. Sidak Comparisons of Search Method for Family as a Cause (65 Plus Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.26	.18	-.19	.71
Google vs. WebMD (new)	.27	.28	-.44	.99
WebMD (old) vs. WebMD (new)	.02	.30	-.74	.76

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Table A104. Family Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Family	.03	1	.03	.02
Computer hours	1.17	1	1.17	1.06
Computer years	.98	1	.98	.89
Depression	.86	1	.86	.77
Neuroticism	.07	1	.07	.06
Age	29.85	28	1.07	.96
Search method	.69	2	.34	.31
Illness	.89	1	.89	.80
Age*Search method	4.37	8	.55	.49
Age*Illness	5.35	12	.45	.40
Search method*Illness	1.12	1	1.12	1.01
Error	17.75	16	1.11	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A105. Overwork Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Overwork	.07	1	.07	.10
Computer hours	2.68	1	2.68	4.23*
Computer years	1.40	1	1.40	2.23
Depression	.11	1	.11	.18
Neuroticism	.37	1	.37	.59
Age	7.96	1	7.96	12.70***
Search method	.29	2	.14	.23
Illness	.40	1	.40	.64
Age*Search method	1.03	2	.51	.82
Age*Illness	.00	1	.00	.00
Search method*Illness	.21	2	.10	.16
Age*Search method*Illness	.188	2	.94	1.50
Error	39.49	63	.63	

*$p \le .05$, **$p \le .01$, ***$p \le .001$

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Table A106. Sidak Comparisons of Age for Overwork as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.10	.17	-.24	.45

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Table A107. Overwork Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Overwork	4.94	1	4.94	6.51*
Computer hours	4.85	1	4.85	6.39*
Computer years	4.82	1	4.82	6.35*
Depression	4.99	1	4.99	6.58*
Neuroticism	3.36	1	3.36	4.42*
Age	26.44	28	.94	1.25
Search method	1.55	2	.77	1.02
Illness	6.54	1	6.54	8.62*
Age*Search method	5.48	8	.69	.90
Age*Illness	8.24	12	.69	.91
Search method*Illness	.89	1	.89	1.18
Error	12.14	16	.76	

$^*p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A108. Sidak Comparisons of Illness for Overwork as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Mononucleosis vs. Scarlet Fever	.64	.09	.44	.83

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Table A109. Emotional State Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Emotional state	.23	1	.23	.30
Computer hours	3.40	1	3.40	4.42*
Computer years	1.78	1	1.78	2.32
Depression	1.77	1	1.77	2.30
Neuroticism	.30	1	.30	.38
Age	9.50	1	9.50	12.35***
Search method	2.90	2	1.45	1.88
Illness	.30	1	.30	.39
Age*Search method	5.16	2	2.58	3.35*
Age*Illness	1.98	1	1.98	2.58
Search method*Illness	.20	2	.10	.13
Age*Search method*Illness	1.35	2	.68	.88
Error	48.49	63	.77	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A110. Sidak Comparisons of Age for Emotional State as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.25	.15	-.06	.56

Table A111. Sidak Comparisons of Search Method for Emotional State as a Cause (50-64 Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.25	.24	-.87	.37
Google vs. WebMD (new)	-.20	.37	-1.14	.74
WebMD (old) vs. WebMD (new)	.05	.39	-.95	1.05

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Table A112. Sidak Comparisons of Search Method for Emotional State as a Cause (65 Plus Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.06	.18	-.41	.53
Google vs. WebMD (new)	.44	.29	-.30	1.18
WebMD (old) vs. WebMD (new)	.38	.31	-.41	1.17

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Table A113. Emotional State Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Emotional state	3.74	1	3.74	5.45*
Computer hours	2.84	1	2.84	4.13
Computer years	4.12	1	4.12	6.01*
Depression	4.16	1	4.16	6.06*
Neuroticism	2.33	1	2.33	3.39
Age	19.00	28	.68	.99
Search method	1.88	2	.94	1.37
Illness	2.42	1	2.42	3.53
Age*Search method	15.21	8	1.90	2.77*
Age*Illness	10.14	12	.85	1.23
Search method*Illness	.77	1	.77	1.12
Error	10.98	16	.69	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A114. Sidak Comparisons of Search Method for Emotional State as a Cause (Younger Age)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.10	.25	-.60	.41

Table A115. Sidak Comparisons of Search Method for Emotional State as a Cause (Older Age)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.19	.34	-.67	1.06
Google vs. WebMD (new)	.41	.36	-.51	1.33
WebMD (old) vs. WebMD (new)	.22	.24	-.41	.84

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Table A116. Aging Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Aging	1.08	1	1.08	1.16
Computer hours	.24	1	.24	.25
Computer years	7.63	1	7.63	8.17**
Depression	.18	1	.18	.19
Neuroticism	.16	1	.16	.17
Age	1.37	1	1.47	1.47
Search method	.02	2	.01	.01
Illness	2.92	1	2.92	3.13
Age*Search method	10.02	2	5.01	5.37**
Age*Illness	.12	1	.12	.12
Search method*Illness	1.98	2	.99	1.06
Age*Search method*Illness	3.64	2	1.82	1.95
Error	58.78	63	.93	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A117. Sidak Comparisons of Search Method for Aging as a Cause (50-64 Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.19	.18	-.26	.64
Google vs. WebMD (new)	-.16	.27	-.84	.53
WebMD (old) vs. WebMD (new)	-.35	.29	-1.08	.38

Table A118. Sidak Comparisons of Search Method for Aging as a Cause (65 Plus Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.14	.21	-.39	.68
Google vs. WebMD (new)	.10	.33	-.75	.94
WebMD (old) vs. WebMD (new)	-.05	.36	-.94	.85

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Table A119. Aging Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Aging	.14	1	.14	.15
Computer hours	2.50	1	2.50	2.76
Computer years	2.90	1	2.90	3.20
Depression	.09	1	.09	.10
Neuroticism	.48	1	.48	.53
Age	28.18	28	1.01	1.11
Search method	3.52	2	1.76	1.94
Illness	1.40	1	1.40	1.55
Age*Search method	11.97	8	1.50	1.65
Age*Illness	10.81	12	.90	.99
Search method*Illness	.02	1	.02	.02
Error	14.51	16	.91	

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A120. Alcohol Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Alcohol	.00	1	.00	.00
Computer hours	1.21	1	1.21	1.87
Computer years	3.15	1	3.15	4.87*
Depression	.00	1	.00	.00
Neuroticism	.89	1	.89	1.37
Age	.89	1	.89	1.38
Search method	1.59	2	.80	1.23
Illness	.64	1	.64	.99
Age*Search method	1.70	2	.85	1.31
Age*Illness	.25	1	.25	.38
Search method*Illness	1.42	2	.71	1.10
Age*Search method*Illness	5.65	2	2.82	4.37*
Error	40.72	63	.65	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A121. Sidak Comparisons of Search Method for Alcohol as a Cause (50-64 Years, Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.01	.33	-.93	.94
Google vs. WebMD (new)	.07	.57	-1.52	1.67
WebMD (old) vs. WebMD (new)	.07	.58	-1.55	1.68

Table A122. Sidak Comparisons of Search Method for Alcohol as a Cause (50-64 Years, Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.11	.21	-.47	.69
Google vs. WebMD (new)	-1.10	.30	-1.92	-.27
WebMD (old) vs. WebMD (new)	-1.21	.37	-2.21	-.20

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Table A123. Sidak Comparisons of Search Method for Alcohol as a Cause (65 Plus Years, Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.37	.21	-.23	.96
Google vs. WebMD (new)	.08	.29	-.71	.87
WebMD (old) vs. WebMD (new)	-.28	.31	-1.15	.58

Table A124. Sidak Comparisons of Search Method for Alcohol as a Cause (65 Plus Years, Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.70	.33	-.19	1.59
Google vs. WebMD (new)	.05	.57	-1.47	1.57
WebMD (old) vs. WebMD (new)	-.65	.54	-2.11	.81

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Table A125. Alcohol Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Alcohol	1.64	1	1.64	2.30
Computer hours	2.97	1	2.97	4.17
Computer years	5.89	1	5.89	8.28*
Depression	.16	1	.16	.23
Neuroticism	.05	1	.05	.07
Age	22.61	28	.81	1.13
Search method	1.14	2	.57	.80
Illness	1.68	1	1.68	2.36
Age*Search method	7.14	8	.89	1.25
Age*Illness	4.28	12	.36	.50
Search method*Illness	1.23	1	1.23	1.73
Error	11.39	16	.71	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A126. Smoking Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Smoking	.00	1	.00	.00
Computer hours	.12	1	.12	.13
Computer years	1.40	1	1.40	1.58
Depression	.25	1	.25	.28
Neuroticism	.09	1	.09	.10
Age	1.32	1	1.32	1.49
Search method	.73	2	.37	.41
Illness	1.17	1	1.17	1.32
Age*Search method	3.02	2	1.51	1.71
Age*Illness	4.44	1	4.44	5.01*
Search method*Illness	1.15	2	.58	.65
Age*Search method*Illness	9.71	2	4.86	5.48**
Error	55.81	63	.89	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A127. Sidak Comparisons of Age for Smoking as a Cause (Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.25	.29	-.35	.85

Table A128. Sidak Comparisons of Age for Smoking as a Cause (Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.36	.21	-.06	.78

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Table A129. Sidak Comparisons of Search Method for Smoking as a Cause (50-64 Years, Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.50	.47	-1.81	.83
Google vs. WebMD (new)	.68	.80	-1.57	2.92
WebMD (old) vs. WebMD (new)	1.17	.81	-1.11	3.44

Table A130. Sidak Comparisons of Search Method for Smoking as a Cause (50-64 Years, Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.45	.28	-1.22	.31
Google vs. WebMD (new)	-.74	.40	-1.83	.35
WebMD (old) vs. WebMD (new)	-.29	.49	-1.62	1.04

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Table A131. Sidak Comparisons of Search Method for Smoking as a Cause (65 Plus Years, Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.09	.33	-1.00	.82
Google vs. WebMD (new)	.35	.44	-.86	1.56
WebMD (old) vs. WebMD (new)	.44	.48	-.89	1.76

Table A132. Sidak Comparisons of Search Method for Smoking as a Cause (65 Plus Years, Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.11	.31	-.72	.94
Google vs. WebMD (new)	-.26	.53	-1.68	1.16
WebMD (old) vs. WebMD (new)	-.37	.51	-1.73	.99

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Table A133. Smoking Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Smoking	.24	1	.24	.26
Computer hours	1.07	1	1.07	1.14
Computer years	1.09	1	1.09	1.16
Depression	.02	1	.02	.03
Neuroticism	.01	1	.01	.01
Age	25.09	28	.90	.96
Search method	.07	2	.03	.04
Illness	1.48	1	1.48	1.58
Age*Search method	2.21	8	.28	.30
Age*Illness	5.35	12	.45	.48
Search method*Illness	.37	1	.37	.39
Error	15.00	16	.94	

$^*p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A134. Accident Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Accident	1.45	1	1.45	2.09
Computer hours	2.47	1	2.47	3.55
Computer years	6.67	1	6.67	9.61**
Depression	.26	1	.26	.38
Neuroticism	.14	1	.14	.20
Age	5.31	1	5.31	7.65**
Search method	.97	2	.48	.70
Illness	3.36	1	3.36	4.84*
Age*Search method	9.28	2	4.64	6.68**
Age*Illness	.50	1	.50	.72
Search method*Illness	2.94	2	1.47	2.12
Age*Search method*Illness	2.18	2	1.09	1.57
Error	43.74	63	.69	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A135. Sidak Comparisons of Age for Accident as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	-.02	.12	-.25	.22

Table A136. Sidak Comparisons of Illness for Accident as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Mononucleosis vs. Scarlet Fever	.03	.12	-.21	.27

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Table A137. Sidak Comparisons of Search Method for Accident as a Cause (50-64 Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.01	.15	-.38	.40
Google vs. WebMD (new)	-.51	.23	-1.10	.08
WebMD (old) vs. WebMD (new)	-.52	.25	-1.15	.10

Table A138. Sidak Comparisons of Search Method for Accident as a Cause (65 Plus Years)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.46	.16	.05	.87
Google vs. WebMD (new)	-.22	.26	-.88	.43
WebMD (old) vs. WebMD (new)	-.68	.28	-1.38	.02

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Table A139. Accident Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Accident	.22	1	.22	.20
Computer hours	2.14	1	2.14	1.97
Computer years	1.68	1	1.68	1.55
Depression	.01	1	.01	.01
Neuroticism	.09	1	.09	.09
Age	21.68	28	.77	.71
Search method	6.32	2	2.66	2.45
Illness	.47	1	.47	.44
Age*Search method	3.17	8	.40	.37
Age*Illness	5.32	12	.44	.41
Search method*Illness	.00	1	.00	.00
Error	17.37	16	1.09	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A140. Personality Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Personality	1.17	1	1.17	1.86
Computer hours	.28	1	.28	.45
Computer years	4.77	1	4.77	7.56**
Depression	.05	1	.05	.08
Neuroticism	.06	1	.06	.10
Age	3.72	1	3.72	5.89*
Search method	1.62	2	.81	1.28
Illness	.36	1	.36	.58
Age*Search method	3.57	2	1.79	2.83
Age*Illness	1.53	1	1.53	2.43
Search method*Illness	.41	2	.21	.33
Age*Search method*Illness	5.64	2	2.82	4.47*
Error	39.77	63	.63	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A141. Sidak Comparisons of Age for Personality as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.12	.12	-.11	.35

Table A142. Sidak Comparisons of Search Method for Personality as a Cause (50-64 Years, Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.13	.22	-.50	.75
Google vs. WebMD (new)	.13	.38	-.93	1.19
WebMD (old) vs. WebMD (new)	.00	.38	-1.08	1.08

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Table A143. Sidak Comparisons of Search Method for Personality as a Cause (50-64 Years, Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.16	.24	-.50	.81
Google vs. WebMD (new)	-.67	.34	-1.60	.27
WebMD (old) vs. WebMD (new)	-.82	.42	-1.96	.32

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Table A144. Sidak Comparisons of Search Method for Personality as a Cause (65 Plus Years, Mononucleosis)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.33	.26	-1.04	.38
Google vs. WebMD (new)	-.19	.34	-1.13	.76
WebMD (old) vs. WebMD (new)	.15	.37	-.89	1.18

Table A145. Sidak Comparisons of Search Method for Personality as a Cause (65 Plus Years, Scarlet Fever)

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	.47	.28	-.28	1.22
Google vs. WebMD (new)	.29	.48	-.99	1.56
WebMD (old) vs. WebMD (new)	-.18	.46	-1.41	1.04

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Table A146. Personality Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Personality	1.06	1	1.07	1.20
Computer hours	.45	1	.45	.50
Computer years	3.04	1	3.04	3.43
Depression	.01	1	.01	.01
Neuroticism	.05	1	.05	.06
Age	17.35	28	.62	.70
Search method	.20	2	.10	.12
Illness	1.04	1	1.04	1.18
Age*Search method	6.33	8	.79	.89
Age*Illness	2.51	12	.21	.24
Search method*Illness	.09	1	.09	.11
Error	14.21	16	.89	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A147. Immunity Repeated Measures ANCOVA (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Immunity	.10	1	.10	.11
Computer hours	.00	1	.00	.00
Computer years	.29	1	.29	.32
Depression	1.27	1	1.27	1.39
Neuroticism	.16	1	.16	.18
Age	3.81	1	3.81	4.17*
Search method	.06	2	.03	.03
Illness	.08	1	.08	.09
Age*Search method	2.23	2	1.12	1.22
Age*Illness	.43	1	.43	.48
Search method*Illness	1.28	2	.64	.70
Age*Search method*Illness	.24	2	.12	.13
Error	57.51	63	.91	

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A148. Sidak Comparisons of Age for Immunity as a Cause

Comparisons	Mean Cause Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
50-64 yrs. vs. 65 plus yrs.	.10	.19	-.27	.47

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Table A149. Immunity Repeated Measures ANCOVA (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Immunity	.24	1	.24	.38
Computer hours	.14	1	.14	.23
Computer years	.10	1	.10	.16
Depression	.95	1	.95	1.51
Neuroticism	.69	1	.69	1.10
Age	19.29	28	.69	1.10
Search method	.17	2	.09	.14
Illness	.20	1	.20	.32
Age*Search method	8.93	8	1.12	1.78
Age*Illness	17.37	12	1.45	2.31
Search method*Illness	.47	1	.47	.74
Error	10.03	16	.63	

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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Table A150. Cognitive Effort of Using the Computer (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Computer years	14.99	1	14.99	7.84**
Education level	.13	1	.13	.07
Computer hours	4.53	1	4.53	2.37
Age	.11	1	.11	.06
Search method	16.24	2	8.12	4.25*
Age*Search method	6.79	2	3.40	1.78

*p ≤ .05, **p ≤ .01, ***p ≤ .001

Table A151. Sidak Comparisons of Search Method for Cognitive Effort of Using Computer

Comparisons	Mean Cognitive Effort Difference	SE	95% Confidence Level Lower Bound	95% Confidence Level Upper Bound
Google vs. WebMD (old)	-.20	.35	-1.05	.66
Google vs. WebMD (new)	-1.37	.47	-2.53	-.22
WebMD (old) vs. WebMD (new)	-1.18	.50	-2.41	.05

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Table A152. Cognitive Effort of Using the Computer (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Computer years	.91	1	.91	.45
Education level	.01	1	.01	.00
Computer hours	3.97	1	3.97	1.94
Age	52.98	28	1.89	.93
Search method	14.23	2	7.11	3.48*
Age*Search method	42.52	21	2.03	.99

*p ≤ .05, **p ≤ .01, ***p ≤ .001

Table A153. Sidak Comparisons of Search Method for Cognitive Effort of Using Computer

Comparisons	Mean Cognitive Effort Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	-.35	.41	-1.39	.69
Google vs. WebMD (new)	-1.09	.60	-2.63	.45
WebMD (old) vs. WebMD (new)	-.74	.60	-2.29	.81

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Table A154. Cognitive Effort of Making a Diagnosis (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Computer years	.16	1	.16	.80
Education level	5.71	1	5.71	2.32
Computer hours	1.47	1	1.47	.60
Age	.01	1	.01	.96
Search method	7.32	2	3.66	1.49
Age*Search method	6.38	2	3.19	1.30

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A155. Cognitive Effort of Making a Diagnosis (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Computer years	1.80	1	1.80	.66
Education level	.09	1	.09	.03
Computer hours	.79	1	.79	.29
Age	43.39	28	1.55	.57
Search method	.92	2	.46	.17
Age*Search method	62.52	21	2.98	1.10

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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Table A156. Cognitive Effort of Making a Diagnosis (Relationship to Accuracy)

Source	Sum of Squares	df	Mean Square	F
Computer years	1.97	1	1.97	0.90
Education level	2.69	1	2.69	1.23
Computer hours	.00	1	.00	.00
Accuracy	25.08	1	25.08	11.46***

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table A157. Covariate Adjusted Estimates of Accuracy for Cognitive Effort of Making a Diagnosis

Accurate?	Mean	SE	95% CI Lower Bound	95% CI Upper Bound
No	5.22	.22	4.78	5.66
Yes	4.02	.27	3.48	4.55

Means are adjusted by mean level covariates: computer years = 18.17, education level = 5.18, computer years = 18.77

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Table A158. Interactivity (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Computer years	352.02	1	352.02	6.12*
Computer hours	58.09	1	58.09	1.01
Age	166.27	1	166.27	2.89
Search method	105.16	2	52.58	.91
Age*Search method	692.62	2	346.31	6.01**

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A159. Sidak Comparisons of Search Method for Interactivity (50-64 Years)

Comparisons	Mean Interactivity Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	-3.30	2.73	-10.17	3.56
Google vs. WebMD (new)	9.09	4.09	-1.21	19.38
WebMD (old) vs. WebMD (new)	12.39	4.34	1.47	23.32

Table A160. Sidak Comparisons of Search Method for Interactivity (65 Plus Years)

Comparisons	Mean Interactivity Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	-.24	2.86	-7.41	6.92
Google vs. WebMD (new)	-6.96	3.94	-16.83	2.91
WebMD (old) vs. WebMD (new)	-6.72	4.19	-17.20	3.76

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Table A161. Interactivity (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Computer years	.83	1	.83	.02
Computer hours	321.72	1	321.72	6.89*
Age	1399.12	28	49.97	1.07
Search method	281.23	2	140.61	3.01
Age*Search method	2572.30	21	122.49	2.62**

*p ≤ .05, **p ≤ .01, ***p ≤ .001

Table A162. Sidak Comparisons of Search Method for Interactivity (Younger Age)

Comparisons	Mean Interactivity Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	-8.83	5.42	-25.10	7.44
Google vs. WebMD (new)	-6.66	9.54	-35.32	22.00
WebMD (old) vs. WebMD (new)	2.17	10.92	-30.63	34.97

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Table A163. Sidak Comparisons of Search Method for Interactivity (Mean Age)

Comparisons	Mean Interactivity Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	-.29	2.76	-7.38	6.81
Google vs. WebMD (new)	15.04	3.95	4.91	25.18
WebMD (old) vs. WebMD (new)	15.33	4.01	5.04	25.62

Table A164. Sidak Comparisons of Search Method for Interactivity (Older Age)

Comparisons	Mean Interactivity Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	.42	3.04	-7.25	8.09
Google vs. WebMD (new)	-6.51	4.02	-16.63	3.61
WebMD (old) vs. WebMD (new)	-6.93	4.32	-17.80	3.95

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Table A165. Logistic Regression Analysis of Interactivity and Accuracy

Predictor	B	SE	Wald χ^2	df	Sig.	Exp(B)
Constant	-2.93	1.17	6.28	1	.01	.05
Computer hours	.05	.02	4.56	1	.03	1.05
Computer years	.04	.03	1.50	1	.22	1.04
Interactivity	.03	.03	1.04	1	.31	1.03

Table A166. Logistic Regression Model Statistics

	χ^2	df	Sig.
Omnibus Test	8.75	3	.03

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Table A167. Feelings of Choice (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Computer years	7.05	1	7.05	2.40
Computer hours	.76	1	.76	.26
Sex	.16	1	.16	.06
Recent health history	.63	1	.63	.22
Chronic health history	.15	1	.15	.05
Age	1.10	1	1.10	.37
Search method	77.34	2	38.67	13.16***
Age*Search method	5.56	2	2.78	.95

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A168. Sidak Comparisons of Search Method for Feelings of Choice (Age Dichotomized)

Comparisons	Mean Choice Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	2.00	.44	.91	3.09
Google vs. WebMD (new)	2.19	.59	.74	3.64
WebMD (old) vs. WebMD (new)	.19	.62	-1.33	1.71

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Table A169. Feelings of Choice (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Computer years	1.06	1	1.06	.55
Computer hours	1.82	1	1.82	.94
Sex	7.17	1	7.17	3.70
Recent health history	.97	1	.97	.50
Chronic health history	11.48	1	11.48	5.92*
Age	90.28	28	3.22	1.66
Search method	36.41	2	18.20	9.40***
Age *Search method	99.39	21	4.73	2.44*

$^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$

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Table A170. Sidak Comparisons of Search Method for Feelings of Choice (Age Continuous)

Comparisons	Mean Choice Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	1.87	.42	.78	2.95
Google vs. WebMD (new)	1.80	.63	.19	3.42
WebMD (old) vs. WebMD (new)	-.07	.60	-1.48	1.62

Table A171. Sidak Comparisons of Search Method for Feelings of Choice (Younger Age)

Comparisons	Mean Choice Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	1.66	2.30	-6.45	9.76
Google vs. WebMD (new)	-1.86	5.19	-20.12	16.40
WebMD (old) vs. WebMD (new)	-3.52	6.54	-26.54	19.50

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Table A172. Sidak Comparisons of Search Method for Feelings of Choice (Mean Age)

Comparisons	Mean Choice Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	2.71	.62	1.11	4.31
Google vs. WebMD (new)	2.95	.85	.74	5.17
WebMD (old) vs. WebMD (new)	.24	.87	-2.01	2.50

Table A173. Sidak Comparisons of Search Method for Feelings of Choice (Older Age)

Comparisons	Mean Choice Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	2.11	.77	.16	4.05
Google vs. WebMD (new)	1.32	1.00	-1.23	3.86
WebMD (old) vs. WebMD (new)	-.79	1.07	-3.49	1.92

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Table A174. Feelings of Choice (Relationship to Accuracy)

Source	Sum of Squares	df	Mean Square	F
Computer years	.17	1	.17	.04
Computer hours	.65	1	.65	.17
Sex	2.26	1	2.26	.58
Recent health history	.02	1	.02	.00
Chronic health history	1.48	1	1.48	.38
Accuracy	6.15	1	6.15	1.57

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A175. Feelings of Competence (Age Dichotomized)

Source	Sum of Squares	df	Mean Square	F
Computer years	50.53	1	50.53	2.04
Computer hours	.53	1	.53	.02
Sex	101.53	1	101.53	4.09*
Recent health history	3.81	1	3.81	.15
Chronic health history	152.30	1	152.30	6.14*
Age	28.44	1	28.44	1.15
Search method	30.68	2	15.34	.62
Age*Search method	25.17	2	15.59	.51

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A176. Feelings of Competence (Age Continuous)

Source	Sum of Squares	df	Mean Square	F
Computer years	2.37	1	2.37	.19
Computer hours	2.57	1	2.57	.20
Sex	68.65	1	68.65	5.35*
Recent health history	63.93	1	63.93	4.50*
Chronic health history	165.05	1	165.05	12.87***
Age	757.93	28	27.07	2.11*
Search method	15.65	2	7.83	.61
Age*Search method	717.33	21	34.16	2.66*

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

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Table A177. Sidak Comparisons of Age for Feelings of Competence

Comparisons	Mean Competence Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Younger vs. Mean Age	4.33	2.26	-1.21	9.87
Younger vs. Older	4.46	2.12	-.76	9.65
Mean Age vs. Older	.12	1.41	-3.33	3.56

Table A178. Sidak Comparisons of Search Method for Feelings of Competence (Younger Age)

Comparisons	Mean Competence Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	-3.49	4.52	-19.40	12.42
Google vs. WebMD (new)	-22.99	10.19	-58.83	12.86
WebMD (old) vs. WebMD (new)	-19.49	12.84	-64.68	25.70

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Table A179. Sidak Comparisons of Search Method for Feelings of Competence (Mean Age)

Comparisons	Mean Competence Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	1.90	2.47	-4.50	8.29
Google vs. WebMD (new)	4.36	3.42	-4.50	13.23
WebMD (old) vs. WebMD (new)	2.47	3.48	-6.56	11.49

Table A180. Sidak Comparisons of Search Method for Feelings of Competence (Older Age)

Comparisons	Mean Competence Difference	SE	95% CI Lower Bound	95% CI Upper Bound
Google vs. WebMD (old)	-.91	1.98	-5.93	4.11
Google vs. WebMD (new)	-1.10	2.60	-7.67	5.48
WebMD (old) vs. WebMD (new)	-.19	2.76	-7.18	6.81

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Table A181. Feelings of Competence (Relationship to Accuracy)

Source	Sum of Squares	df	Mean Square	F
Computer years	20.56	1	20.56	.84
Computer hours	1.64	1	1.64	.07
Sex	65.42	1	65.42	2.68
Recent health history	3.59	1	3.59	.15
Chronic health history	118.84	1	118.84	4.88*
Accuracy	58.10	1	58.10	2.38

*p ≤ .05, **p ≤ .01, ***p ≤ .001

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APPENDIX B: QUALITATIVE CODING DICTIONARIES

Think-Aloud Coding Dictionary

Action Plan: An action that could be taken to achieve the goal of diagnosing, Participant makes a plan of how to diagnose e.g. ("Let's look at this" or "I am going to start with fever.")

NOTE: Does not include plans for computer actions.

Hypothesis: Participant makes a guess about what the diagnosis could be (uses a particular disease name).

Reading: Participant reads directly from the vignette or web screen.

Paraphrasing text: Participant states information found in the story or web screen. Participant gives no reason or explanation for text, simply states a few words or phrases.

Symptom: Participant selects a specific symptom **from the story** on which to focus and search for.

Cause: Participant talks about a potential cause of the illness (e.g., a virus or germ).

Judgment of relevancy: Participant decides whether to use the information or not (e.g., "This is not what I need").

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Credibility: Participant discusses the source of the information or how well they trust the information.

Confusion: Participant asks questions or makes statements which reflect confusion about the content.

Discussing unknowns: Participant talks about the information that is unknown or uncertain. (Participant is not necessarily confused, simply talking about what they don't know).

Web Orientation: Participant makes comments about the layout or features of the website (e.g., "The information is at the top of the screen").

Web Navigation: Participant talks about the direct actions that they are taking on the computer (e.g., "I am going to go to Google" or "I will click there").

Previous experience: Participant relates the symptoms or diagnosis to personal experiences.

Previous knowledge: Participant relates the symptoms or diagnosis to information which they had previously (before searching on the computer)

Confirmation: Participant matches the symptoms in the story with information about a particular diagnosis.

Negation: Participant finds a difference between the symptoms in the story and a particular diagnosis (mismatch).

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Internet problem: Participant has trouble or an issue using Google or WebMD.

Suggested action: Participant discusses what they would do if they had the symptoms (e.g., “It would be time to go to the doctor”).

Confidence: Participant states that they are unsure of their diagnosis or don’t know about a specific diagnosis.

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Screen Shots Coding Dictionary

Google

Time spent on each website: Record the time the participant spends viewing each website (each website will have a separate time recorded).

Number of websites visited: Count the number of websites (distinct URLs/domain names) to which the participant browses. **NOTE**: Clicking a link on a webpage would not be considered a new website unless it brings the participant to an entirely new domain name.

Websites visited: Record the URL of each website that the participant visits.

Type of website visited: Categorize the website as a) government or hospital (e.g., NIH, Mayo Clinic), b) commercial health site (e.g., WebMD, MedicineNet), c) user content (e.g., Wikipedia or Discussion board/thread), or d) Other [write description].

Number of terms inputted in search bar: Count the number of phrases (string of words that have meaning) that the participant typed into the Google search bar.

Type of terms inputted in search bar: Categorize the terms as a) symptoms (e.g., fever, headache), b) a specific website (e.g., Mayo Clinic), c) symptom checker, d) Other [description].

Number of backtracks: Count the number of times that the participant hits the 'Back' button to return to a previous page.

WebMD

Time spent using application: Record the total amount of time spent using WebMD's Symptom Checker

Part of the body: Record the specific part of the body that the participant selects on the Symptom Checker avatar (figure of the body).

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Tailored questions: Record the additional questions that WebMD asked the participant about a symptom (i.e., "Symptom is associated with recent injury or trauma or none of the above").

Tailored questions answers: Record the answer that the participant selected to the WebMD additional question (i.e., "None of the above").

Number of symptoms: Count the number of symptoms that the participant inputted in the program.

Specific symptoms: Record the symptoms that the participant selected (appear in the 'Your Selected Symptoms' window).

Number of conditions reviewed: Count the number of conditions on which the participant clicks to get more information.

Conditions reviewed: Record the conditions that the participant selected to get more information.

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APPENDIX C: ILLNESS VIGNETTES

Mononucleosis

Please read the following story:

I've been feeling sick for almost a week. I feel exhausted, and I have a mild fever. My throat is really sore. In the past few days, the lymph nodes in my armpits and neck have swollen. My left side, right below my ribs, is a little sore too. I wish I would feel better soon.

Scarlet Fever

Please read the following story:

I've been feeling sick for almost a week. I have a high fever and the lymph nodes in my neck are swollen. I also have this weird, red rash on my neck and arms. My tongue has red bumps on it too. I wish I would feel better soon.

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APPENDIX D: THINK ALOUD INSTRUCTIONS SCRIPT

In this study, I'll be asking you to read a story about the symptoms of an illness and then to diagnose those symptoms, first on your own, and then using the computer. The most important thing for you to remember is that this is not a test of your ability- there is no right or wrong way to complete the exercise. We are looking to test the computer system, not you, and to see whether the system works for you, so if something doesn't make sense, don't worry. That's exactly the information that we are looking for. Also, participation in this study is completely voluntary. So, although I don't anticipate that this will happen, if you become uncomfortable in any way, at any time, you can stop and you will still receive your community gift card.

We are interested in two things: how you go about diagnosing the illness on the computer and what you think about while you diagnose. You'll be asked to "think aloud"; it's basically like you're talking to yourself, but loud enough for other people to hear.

So, when I say "think aloud", what I mean is that you should say whatever is on your mind while you diagnose the illness. I want you to tell me EVERYTHING that you are thinking from the time you begin the exercise until you finish it. I would like you to think aloud as CONTINUOUSLY as possible- even if the only thing you are thinking is "I'm drawing a blank."

I want to hear about what you're looking for or what you're trying to do, even if it seems obvious. If you hesitate or are indecisive, describe what is causing your hesitation. Don't try to plan out what to say or try to explain or qualify what you are thinking. Don't hold back guesses, wild ideas, or negative comments. These things will help us a lot. Just try to act as if you are alone, speaking to yourself- only a little louder.

You can ask me questions if you get stuck, but I can't explain to you HOW you should diagnose the illness. If you forget to think aloud, I'll say, "Please keep talking."

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Also, I won't tell you when you have completed the exercise. You should determine on your own when you are finished diagnosing the illness. Do you have any questions before we try practicing?

Okay, so now I'm going to show you how I think aloud while I open up a browser window.

<*demonstrate thinking aloud while opening an internet browser window*>

Now, I'd like you to try thinking aloud. I'm going to have you go to the University of Iowa's website, and find the name of the University's President. Remember, you should say everything that you are thinking while you look for the University President's name.

Great! Do you have any questions about thinking aloud? Ok, I have just a few final instructions for you.

Remember to think aloud as continuously as possible. You will first be diagnosing the illness on your own, without the computer. Then, you will diagnose the illness using [Google/a program called WebMD Symptom Checker]. It's okay if you've never used the program before. Again, we are interested in whether the computer program works for you, and there is no right or wrong way to complete the exercise. Do you have any final questions?

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APPENDIX E: FIGURES

Figure E1. Study Procedure Flowchart

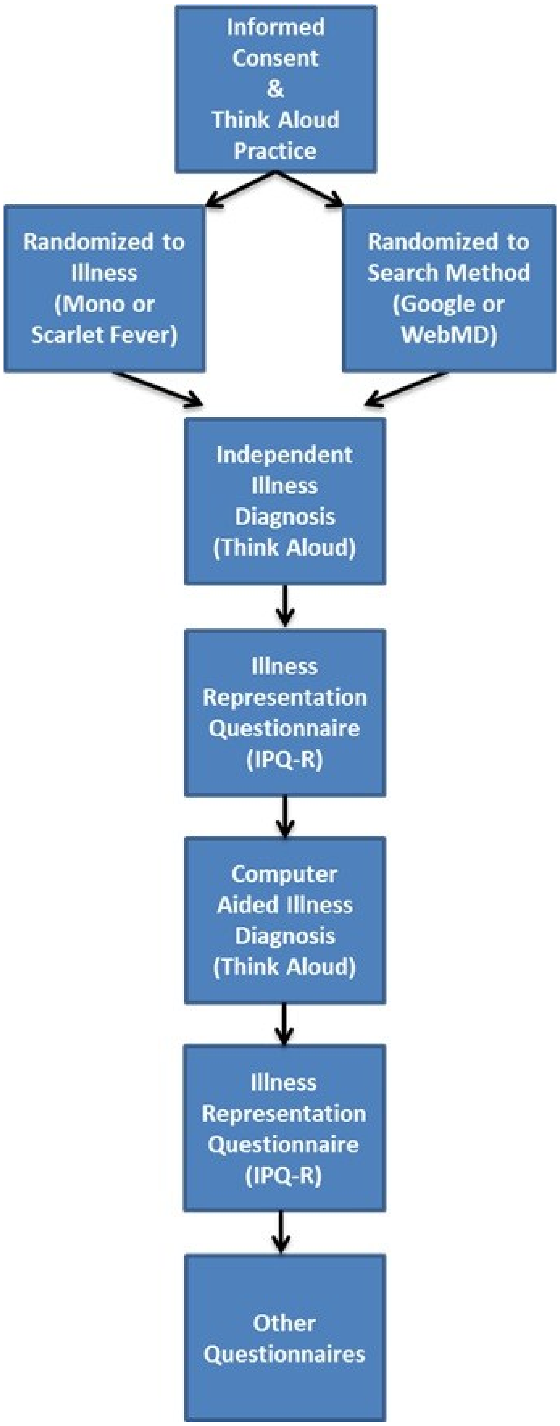

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Figure E2. Screen Shot of Google Search (from December 2011)

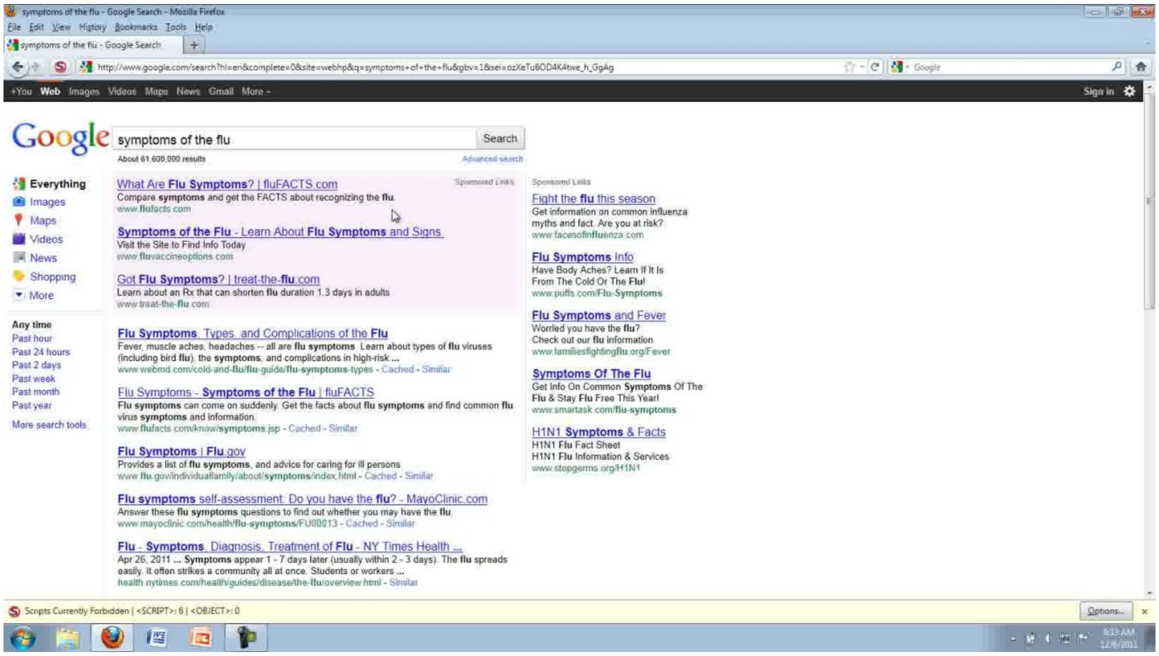

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Figure E3. Screen Shot of WebMD Symptom Checker (old version; from January 2012)

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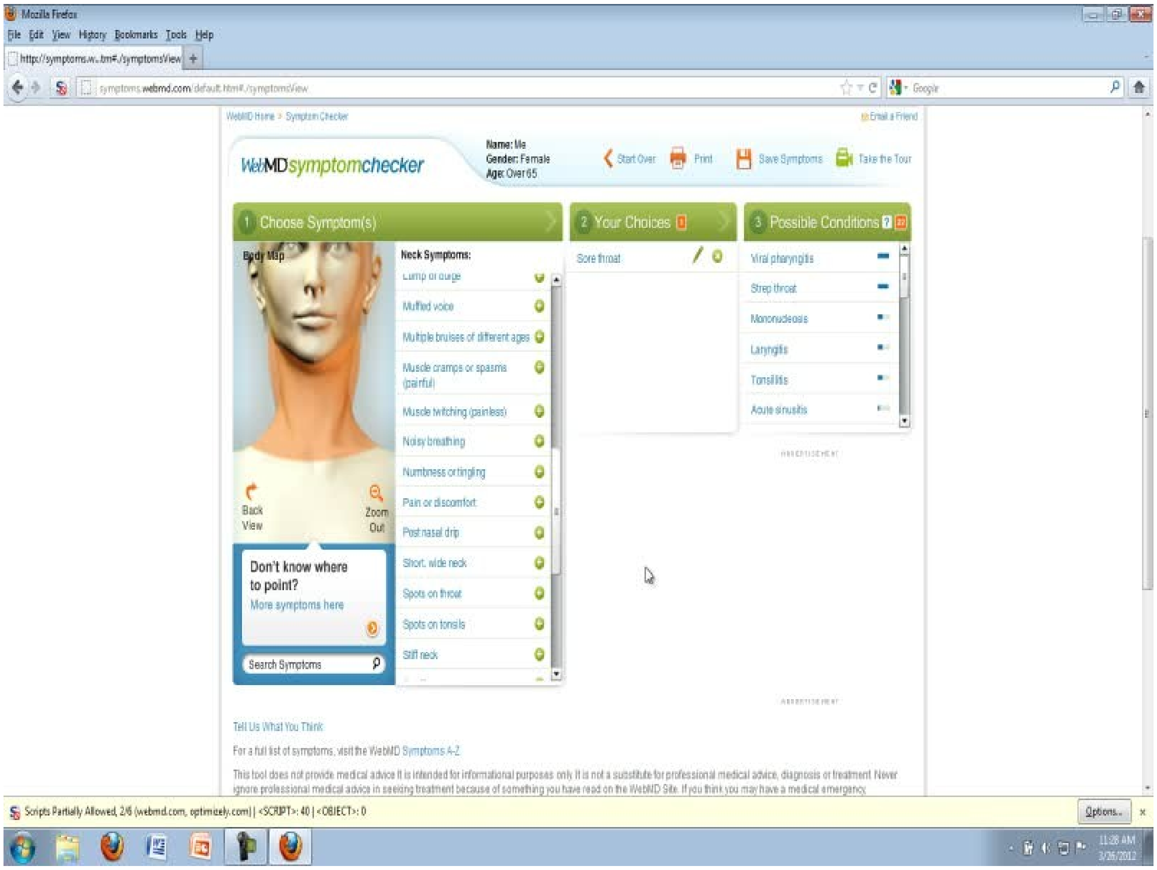
Figure E4. Screen Shot of WebMD Symptom Checker (new version; from March 2012)



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