To test the cognitive mediation model (CMM), a virtual lab study was carried out where participants (N = 602) read 1 of 5 cancer news articles and completed a knowledge posttest (assessing recognition and comprehension). Results were consistent with the CMM and past news learning research, as (a) news surveillance motivation was positively related to story comprehension (but not recognition of specific facts), (b) elaboration mediated the relationship between surveillance and comprehension, and (c) attention to health news moderated the size of the indirect relationships. The results support and extend the CMM as well as validate past research suggesting a connection between attention and cancer information gain.


Recent content analyses suggest that news coverage contains a wealth of cancer information (Cohen et al., 2008; Jensen, Moriarty, Hurley, & Stryker, 2010; Slater, Long, Bettinghaus, & Reineke, 2008). As a source of cancer information, news media have the ability to shape attitudes, beliefs, and behaviors central to cancer control, either directly through exposure or indirectly through conversations with others (Chew, Palmer, & Kim, 1995; O’Keefe, Boyd, & Brown, 1998). Cancer research, for example, typically reaches the public by way of Internet stories, newspaper reports, or nightly newscasts. Surveys suggest that some Americans pay close attention to this information (Roper Starch Worldwide, 1997; Viswanath et al., 2006) and that others likely hear about the same stories from their attentive peers.

Despite a dramatic increase in coverage, cancer news only seems to affect certain people. For example, Stryker, Moriarty, and Jensen (2008) found that increased cancer news coverage was positively related to cancer preventive behaviors, but only for news consumers who routinely paid attention to health news. In other words, there seemed to be an attention threshold for cancer news learning. Passive or incidental learning...
was rare or nonexistent and increased coverage alone was unrelated to knowledge gain.

Thus, for those interested in using cancer news coverage as a vehicle for cancer communication and control, a current challenge is identifying why some news consumers are affected by coverage and others are not. It is interesting that attention to health news seems to separate news consumers in this regard as attention has been identified as a key predictor of news learning (Eveland, 2002; Romantant, Hornik, Price, Cappella, & Viswanath, 2008). In fact, attention is a central variable in a prominent news learning theory, the cognitive mediation model (CMM).

Originally proposed by Eveland (1998), the CMM postulates that news learning is predicted by three factors: news surveillance motivation, attention, and elaboration. The basic idea of the model is that news surveillance motivation—that is, monitoring the news for potentially important information—indirectly predicts learning by increasing an individual’s level of attention to the news (i.e., attention) and amount of information-relevant thinking (i.e., elaboration). Only a handful of studies have tested the model, with some showing general support (Eveland, 2002, 2004; Eveland, Cortese, Park, & Dunwoody, 2004; Eveland & Dunwoody, 2002) and others demonstrating areas that may need to be refined (Eveland, 2001; Eveland, Marton, & Seo, 2004; Eveland, Shah, & Kwak, 2003). Currently, additional tests of the model are needed to clarify relationships among variables as well as the generalizability of the framework across contexts.

This study tests the CMM in a new context (cancer news coverage), with context-specific predictor variables (e.g., health motivation), and a reconceptualization of the role of attention (i.e., as a moderator rather than a mediator). Past CMM research has typically analyzed survey data to test the model, but this study utilizes a virtual lab environment where issues of causality and direction can be more carefully observed. The long-term goal of the project is to better understand the factors that predict learning from cancer news, as learning (or the lack thereof) may explain some of the disconnect between exposure and personal change.

**News learning research**

Communication researchers have long been interested in what audiences learn from the media. In the beginning, research on learning from the media typically assumed a simple direct effects model. For instance, a standard direct effects research design consisted of measuring both exposure to some media stimulus (e.g., a televised political debate) and recall of factual knowledge of that event (e.g., topics discussed during the debate, the names of the candidates debating) and then looking for relationships between the variables (where increased exposure was thought to predict greater recall).

As tempting as the direct effects model of news processing is, research suggests that people function quite differently. Studies have found that audiences struggle to recall factual information from a media message (Graber, 1988; Gunter, 1987; van Dijk, 1988) even when their exposure is controlled (Yeaton, Smith, & Rogers, 1990). In fact, news consumers appear to completely disregard or only temporarily retain
most of the information they encounter. Research studies have found that people totally ignore 67% of stories in a newspaper (Graber, 1988) and that they remember less than 5% of the news stories they do attend to (Findahl, 2001).

To test the assumption that people remember very little of the news they consume, van Dijk (1988) asked participants to examine a 1-month-old newspaper and attempt to recall information from the articles they claimed to have read. Only one-third of participants were able to successfully recall the main points of previously read articles. van Dijk concluded that specific details included in news stories were quickly lost and that most people only retained a general imprint of the information they consumed (if anything at all). This imprint allowed participants to recognize previously read articles but not recall any concrete information contained therein. This is not a unique finding in the literature (see, e.g., Neuman, 1976).

Of course, the aforementioned research points to a complexity that a direct effects model cannot explain, namely the lack of strong relationship between exposure and recall. Recognition of this complexity has led mass communication scholars to rethink both their notions of what learning entails and their basic approach to learning research.

Learning: Recognition and comprehension

One potential shortcoming of media-learning research is that the dependent variable, learning, is frequently operationalized as the ability to remember factual information (Berry, 1983; Woodall, Davis, & Sahin, 1983). Several approaches have been used to assess people’s ability to remember the news. Free recall is an individual’s ability to correctly remember a previously encountered stimulus with no prompt. A cued recall measure provides some sort of aid or cue to help an individual remember a previously encountered stimulus. Recognition is an individual’s ability to correctly identify a stimulus when presented with the stimulus after it has been previously encountered. Media-learning research has utilized all these measures (often more than one at a time) to represent learning (e.g., Gunter, 1987; Katz, Adoni, & Parness, 1977).

Previous research has demonstrated that people struggle to remember specific details from the news. One explanation of this finding is that existing measures are not adequate to assess learning (Findhal & Höijer, 1985). Indeed, learning seems to encompass more than just the ability to correctly remember or identify a previously encountered stimulus.

Some have argued that a more valid measure of learning might be comprehension, an individual’s ability to apply the content of a message to another domain (Woodall et al., 1983). Measurement techniques that assess whether an individual can utilize information in additional scenarios capture the idea of comprehension. For example, researchers have measured comprehension by asking people to explain the purpose of a message or to demonstrate mastery of the material in a hypothetical situation (Woodall et al., 1983).

Graber (1988) has argued that people may comprehend the news a good deal more than simple recall or recognition tests convey. She found that people often
failed to remember specific details while still managing to grasp the basic ideas or points of the news stories they consumed. Findahl (2001) described the situation well:

The fact that so little specific information can be remembered from a news story does not mean that no learning takes place. The informative base from which conclusions are drawn can be forgotten while the conclusions remain. This appears to be more a rule than an exception. (p. 119)

In other words, it is possible that human beings ignore concrete details in favor of the bottom line. Everything is processed and stored according to this more generalized information template. In addition, if an individual understands a message, then that person should be able to take the underlying idea and apply it to another situation (Graber, 1988; Woodall et al., 1983). For instance, if a person understands a medicine bottle label (i.e., containing dosage information), then that person should be able to answer questions about when and how much to take of the medicine (beyond just repeating what is written on the bottle). Reliable health literacy measures have utilized this technique (see, e.g., Baker, Williams, Parker, Gazmararian, & Nurss, 1999).

Unfortunately, very little research has attempted to measure how much audiences comprehend the news. To date, Findahl and Hőijer (1985) represent the best attempt to measure news comprehension. They measured both recognition and comprehension by assessing participant’s ability to remember “essential parts” of a news article (p. 384). They argued that remembering essential parts of a news article demonstrated a grasp of the overall narrative (a similar approach to measuring comprehension can be found in text comprehension literature, see, e.g., Kintsch & van Dijk, 1978). Their measures captured the idea that people are more likely to extract bottom-line information than random surface details (a key aspect of understanding as a construct), but they were unable to test whether a person could apply the information in another situation. Thus, even though their research is a step in the right direction, it is still an incomplete test of news learning.

Indirect effects models: The CMM

The inability of direct effects models to account for the lack of a strong relationship between exposure and learning also led mass communication scholars to reconsider their basic approach to learning research. Instead of looking for direct effects between exposure and recall, mass communication researchers, inspired by information-processing research, started to explore indirect effects models (see, e.g., Fleming, Thorson, & Zhang, 2006; Geiger & Newhagen, 1993; Gunter, 1987; Woodhall, Davis, & Sahin, 1983). Indirect effects models assume that relationships between variables are often mediated or moderated by other variables. In the case of learning from the media, it is possible that exposure and recall are mediated, for example, by a consumer’s attention, depth of processing, or informational utility (Eveland,
This, in turn, implies that mass communication researchers need to dedicate more time to understanding and measuring cognitive processes that might influence learning. Examples of media-learning models grounded in what has been called the information-processing perspective are the limited capacity model (Lang, 2000), the informational utility model (Knobloch et al., 2003), and the CMM (Eveland, 1998).

The present study is a test of the CMM (Eveland, 1998). The CMM is based on the information-processing perspective, the elaboration likelihood model (Petty & Cacioppo, 1986), and uses and gratifications research (Katz, Blumler, & Gurevitch, 1974). According to the CMM, three factors predict learning from the news: motivation (namely, news surveillance motivation), attention, and elaboration (Eveland, 1998).

Eveland (1998) operationalized motivation by means of surveillance gratification measures borrowed from the uses and gratifications tradition. He viewed surveillance as the driving motivation behind learning from the news. This narrow definition is countered by relatively broad definitions for both attention and elaboration. By attention, Eveland means conscious or controlled (i.e., top-down) direction of the mind toward a stimulus. He acknowledged that attention has been measured in many ways and ultimately recommended the use of standard attention to news measures as an adequate proxy for the construct. Elaboration is the most ambiguous factor in the CMM. Eveland intended the construct to be indicative of depth of processing and degree of cognitive rehearsal. After surveying different measures of elaboration, he concluded,

Based on the converging survey research on learning strategies, mental effort investment, audience activity, and information processing strategies, it appears evident that some form of self-report measure developed from one or a combination of these literatures could serve as an analog of elaborative processing. (p. 21)

In other words, the development or selection of a single measure for the construct of elaboration is still an unresolved issue in the CMM. Until this issue is resolved, researchers have the option to measure elaboration with (a) survey items modeled after those used in educational psychology (e.g., Eveland, Marton, & Seo, 2004) or (b) the thought-listing technique (Cacioppo & Petty, 1981). One or both are likely to serve as the basis for the final measure of elaboration in the CMM.

The CMM is not a simple direct effects model of news learning. Surveillance motivations are hypothesized to indirectly affect learning by increasing attention and elaboration (i.e., the latter two variables are thought to mediate the relationship). Eveland (1998) argued that “surveillance gratifications-seeking should lead those who expose themselves to the news media to pay greater attention and process the content more deeply than those who do not endorse surveillance gratifications” (p. 22). Attention is thought to directly affect both elaboration and learning. That
is, the more a person attends to a message the more he or she can elaborate on and ultimately learn from the message. The last variable, elaboration, is only hypothesized to directly influence learning.

Although few studies have perfectly upheld the CMM, several have found support for most of the model’s predictions (Eveland, 2001, 2002, 2004; Eveland, Cortese, et al., 2004; Eveland & Dunwoody, 2002). Researchers interested in theory testing, however, are less concerned with studies that have supported a theory and more concerned with studies that have not. Hence, the following discussion focuses on studies that have identified aspects of the model that may need refinement.

In an analysis of three different survey datasets, Eveland (2001) found almost complete support for the model. The only aspect of the model that failed to materialize was the prediction that attention would mediate the relationship between surveillance motivations and learning. On a similar note, several studies have failed to find a relationship between elaboration and recall or recognition of factual information (Eveland, Marton, & Seo, 2004; Eveland et al., 2002). Finally, Eveland et al. (2003) conducted a panel study that suggested that relationships in the CMM may be mutually causal (instead of unidirectional).

Taken as a whole, it is too early to definitively assess either the validity of the CMM or the conclusions of most research testing the model. The number of studies testing the model is still quite low and, more importantly, they are all focused on political news. Continued research, especially in nonpolitical contexts, will allow for a more accurate assessment of the CMM.

Modifying the CMM

The CMM is a good starting framework for the present study. However, a few modifications of the model are in order. First, the CMM was originally designed to analyze survey data (Eveland, 1998). In a survey, attention and elaboration are typically measured as routine activities or traits. In an experimental setting, researchers have the opportunity to measure situational processing following exposure to a stimulus; therefore, decisions have to be made concerning how to treat attention and elaboration. In the past, researchers have opted to drop attention from the model and just measure situational processing (e.g., Eveland, Marton, & Seo, 2004).

Rather than cut attention from the model, the present study opted to distinguish attention from elaboration by treating the former as an enduring characteristic and the latter as a measure of situational processing (for a similar argument concerning the transactional model, see McLeod & Becker, 1974). This change means that attention should be reconceptualized as a moderator of (a) the relationship between motivation and elaboration and (b) the relationship between elaboration and learning. In other words, whether individuals generally pay attention to health news will likely influence the size of the relationships between other variables in the model (e.g., surveillance and elaboration). Past research also suggests that attention to health news (rather
than attention to news in general) is a more fitting moderator for predicting learning in a health news context (Stryker et al., 2008).

According to the modified model, it is hypothesized that news surveillance motivation will predict news learning.

**H1a:** News surveillance motivation will be positively related to recognition.

**H1b:** News surveillance motivation will be positively related to comprehension.

Elaboration is hypothesized to mediate the relationship between news surveillance motivation and learning. Attention to health news, however, is hypothesized to moderate the relationships between surveillance and elaboration and elaboration and learning.

**H2a:** The positive relationships between news surveillance and recognition will be mediated by elaboration and the relationships between (a) surveillance motivation and elaboration and (b) elaboration and recognition will be moderated by attention to health news.

**H2b:** The positive relationship between news surveillance and comprehension will be mediated by elaboration and the relationships between (a) surveillance motivation and elaboration and (b) elaboration and comprehension will be moderated by attention to health news.

Second, previous research has suggested that motivations other than surveillance could produce different processing models (e.g., Beaudoin & Thorson, 2004; Eveland, 2005). Surveillance-gratifications seeking may predict learning from cancer news, but several other motivations are equally compelling. One motivation that has been consistently related to a variety of health behaviors, including learning, is health motivation (Champion, 1993). Health motivation is “the degree of need or drive for competency and self-determinism in health behaviors” (Carter & Kulbok, 2002, p. 319). Individuals with high health motivation are more health focused and therefore may be more likely to attend to health information (including news).

**H3a:** Health motivation will be positively related to recognition.

**H3b:** Health motivation will be positively related to comprehension.

**H4a:** The positive relationship between health motivation and recognition will be mediated by elaboration and the relationships between (a) health motivation and elaboration and (b) elaboration and recognition will be moderated by attention to health news.

**H4b:** The positive relationship between health motivation and comprehension will be mediated by elaboration and the relationships between (a) health motivation and elaboration and (b) elaboration and comprehension will be moderated by attention to health news.

Motivations aside, the CMM does not currently account for affective elements. For example, research has found that health information processing can be influenced by
cancer worry (Millar & Millar, 1998). Thus, it is possible that participants’ processing of cancer news coverage might be highly dependent on how much they tend to worry about cancer.

Early models suggested a quadratic (reverse U-shape) relationship between cancer worry and information processing (Miller, Shoda, & Hurley, 1996). Both low and high cancer worry were thought to be negatively related to information processing. To date, research has not supported a quadratic relationship. Most research studies have observed a positive, linear trend where increased worry resulted in greater information processing (e.g., Hay, McCaul, & Magnan, 2006). Thus, cancer worry seems to function similar to motivation. As a result, it is hypothesized that cancer worry will be positively related to learning and, similar to motivation, moderated by attention to health news and mediated by elaboration.

**H5a:** Cancer worry will be positively related to recognition.

**H5b:** Cancer worry will be positively related to comprehension.

**H6a:** The positive relationship between cancer worry and recognition will be mediated by elaboration and the relationships between (a) cancer worry and elaboration and (b) elaboration and recognition will be moderated by attention to health news.

**H6b:** The positive relationship between cancer worry and comprehension will be mediated by elaboration and the relationships between (a) cancer worry and elaboration and (b) elaboration and comprehension will be moderated by attention to health news.

Whether health motivation and cancer worry function similar to surveillance motivation in the CMM is a theoretically compelling question, but it is also worthwhile to consider other ways in which these variables might fit within the larger framework of the model. One possibility is that both health motivation and cancer worry could be related to surveillance motivation and attention to health news coverage. That is, surveying the news for information, especially cancer information, could be driven by health motivation and the extent to which individuals worry about cancer. This would be consistent with the notion that motivation is a key predictor of active processing (e.g., Petty & Cacioppo, 1986).

**RQ1:** Are health motivation and cancer worry significantly related to surveillance motivation?

**RQ2:** Are health motivation and cancer worry significantly related to attention to health news?

On a similar note, health motivation and cancer worry could interact with surveillance motivation to influence learning.

**RQ3:** Is there an interaction between surveillance motivation, health motivation, and/or cancer worry that is significantly related to recognition?

**RQ4:** Is there an interaction between surveillance motivation, health motivation, and/or cancer worry that is significantly related to comprehension?
Method

Design
All participants \((N = 602)\) were randomly assigned to read one of five newspaper articles. Participants completed a pretest (measuring constructs such as news surveillance), read a news article, and then completed a posttest (measuring constructs such as recognition). The purpose of this study was to test the CMM in a virtual lab environment.

Sample
Six hundred and two college students participated in the study for extra credit. Slightly more women (56%) participated than men (44%). The mean age was 19.6 years \((SD = 1.3)\). The racial background of the participants was similar to the demographics of the United States: 71% Caucasian, 11% African American, 8% Asian, 6% Hispanic, and 4% described themselves as “other.”

Procedure
To recruit participants, a researcher visited a variety of communication courses at a large university in the midwestern United States. Participants interested in the study wrote down their names and e-mail addresses on a sign-up sheet circulated by the researcher. The researcher then thanked the participants and left the classroom. Later that evening, participants who had expressed interest in the study were sent an e-mail message briefly explaining the study and providing a link to a password-protected Web site (the password was in the message). Participants who visited the Web site encountered all of the following: a consent form (they clicked a button to express consent), a series of demographic questions, a news article (embedded in a Chicago Sun Times Web page; all news articles appeared to come from the online version of that newspaper), a series of questions measuring variables of interest, and a debriefing form. Participants’ responses were tracked using an online software program. The completion rate was high; of those solicited, 86% completed the study.

Stimuli
A random number generator was used to select news articles from a pool of cancer stories retrieved via Lexis-Nexis (for more details, see Jensen, 2008). To qualify, a news article had to have at least three sentences containing cancer information (i.e., to eliminate articles where cancer is just mentioned in a laundry list of other illnesses) and have a research study or set of studies as its primary focus (e.g., clinical trials, studies on cancer causes/treatments/risks, new reports of cancer incidence). The aforementioned criteria were taken from a recent content analysis of U.S. cancer news coverage (for more details, see Jensen et al., 2010).

Independent variables
News surveillance motivation
Participants’ news surveillance motivation was assessed using a modified version of Levy’s (1977) television news surveillance-reassurance index. The questions in
Levy’s original index were altered so that they referred to media consumption in general and not just the consumption of television news. The final news surveillance index consisted of six statements (e.g., “I follow the news so I won’t be surprised by higher prices and things like that”) evaluated using 7-point scales (strongly disagree to strongly agree). Responses to the seven questions were averaged to form a single scale (Cronbach’s $\alpha = .67; M = 3.53, SD = .87$).

**Health motivation**
Participants’ health motivation was measured using the health motivation subscale of Champion’s (1993) health belief model scale. The health motivation subscale consists of seven statements (e.g., “I search for health information to improve my health”) evaluated using 5-point scales (strongly disagree to strongly agree). Responses to the seven questions were averaged to form a single scale (Cronbach’s $\alpha = .72; M = 3.86, SD = .61$).

**Cancer worry**
Cancer worry was measured using two questions from the impact of event scale (Horowitz, Wilner, & Alvarez, 1979). The two questions (“I have thought about cancer when I didn’t mean to,” “I have had trouble falling asleep or staying asleep because of pictures or thoughts about cancer”) were evaluated using 5-point scales (not at all, rarely, sometimes, often, almost all the time). Responses to the two questions were averaged to form a single scale (Cronbach’s $\alpha = .80; M = 3.64, SD = 1.34$).

**Moderator**

**Attention to health news**
Instead of removing attention from the model, this study opted to reconceptualize the variable as a moderator. In addition, attention was assessed using a content-specific measure (i.e., attention to health news). A single question (“In general, how much attention do you pay to information about health or medical topics [in the news]?”) borrowed from the Health Information National Trends Survey (HINTS) (Nelson et al., 2004) was evaluated using a 4-point scale (none, a little, some, a lot; $M = 2.53, SD = 0.72$).

**Mediator**

**Elaboration**
Elaboration or depth of processing was measured using the thought-listing technique (Cacioppo & Petty, 1981). Participants were presented with 12 blank “text boxes” and prompted to write down what they were thinking about while reading the news article. Participants’ responses were coded by a team of two graduate students. Coders distinguished between issue-relevant thoughts (i.e., thoughts about the contents of the news article) and nonissue-relevant thoughts (i.e., all other thoughts). To assess reliability, the thoughts of 300 participants were coded by two people and intercoder reliability was calculated using Krippendorf’s alpha (Hayes & Krippendorf, 2007).
Intercoder reliability was quite high (Krippendorf’s $\alpha = .93$) and disagreements were resolved by discussion. Elaboration was scored as the number of issue-relevant thoughts a participant had ($M = 5.83, SD = 2.63$).

**Dependent variables**

**Recognition**

Recognition was measured using a battery of five multiple-choice questions. The five questions were tailored to fit each news story; however, the basic structure of the questions remained consistent. Responses to each question were coded as correct (1) or incorrect (0) and then added together to form a single scale ($M = 1.80, SD = .81$). Higher scores indicated more questions answered correctly (i.e., a score of 2 means the participant answered two questions correctly).

**Comprehension**

Comprehension was measured using a battery of three multiple-choice questions. The three questions were tailored to fit each news story; however, the basic structure of the questions remained consistent. The comprehension questions tested whether participants could apply information from the news articles to new situations. For example, questions assessed whether participants could correctly identify whether hypothetical others should have specific cancer treatments or tests. Responses to each question were coded as correct (1) or incorrect (0) and then added together to form a single scale ($M = 1.50, SD = .81$). Higher scores indicated more questions answered correctly.

Consistent with past research on media learning (Graber, 1988), participants in this study struggled to recognize individual facts from news stories (i.e., recognition), but fared much better at remembering basic ideas or principles (i.e., comprehension). The average participant answered 36% of recognition questions correctly and 50% of comprehension questions correctly. However, one should not infer that different scores reflects more learning or knowledge gain, as one type of question (e.g., comprehension) could be easier to answer than the other (e.g., recognition).

**Results**

**Preliminary analyses: Testing the original CMM**

Before testing the modified version of the CMM, it seemed reasonable to examine whether the original CMM would accurately describe the data. This can be assessed relatively simply as the key difference between the original and modified CMM is the role of attention to health news. According to the original CMM, attention to health news should directly predict elaboration, recognition, and comprehension. Linear regression analyses revealed that attention was significantly related to comprehension, $R = .11, R^2 = .012, F(1, 601) = 7.58, p = .006$, but not recognition, $R = .02, R^2 = .001, F(1, 601) = 0.32, p = .56$, or elaboration, $R = .06, R^2 = .004, F(1, 601) = 2.64, p = .11$. On a similar note, a hierarchical linear regression (Block 1: surveillance
motivation; Block 2: attention to health news; Block 3: the Surveillance × Attention interaction; reported at Block 3) found that only the interaction of surveillance and attention significantly predicted elaboration, $R = .11, R^2 = .012, F(1, 601) = 2.44, p = .03$. Therefore, as suspected, attention to health news may need to be conceptualized as a moderator in this situation. The following analyses take up this question.

**H1a–H2b: News surveillance**

H1a and H1b predicted that news surveillance motivation would be positively related to both recognition and comprehension. Linear regression analyses found that surveillance motivation was significantly related to comprehension, $R = .10, R^2 = .01, F(1, 601) = 6.82, p = .009$, but not recognition, $R = .03, R^2 = .001, F(1, 601) = 0.73, p = .39$. Thus, H1b was supported by the data.

H2a and H2b predicted that the relationships between news surveillance and recognition/comprehension would be mediated by elaboration and that the relationships between (a) surveillance motivation and elaboration and (b) elaboration and comprehension would be moderated by attention to health news. It should be noted that even though there was no direct relationship between news surveillance and recognition (as posited by H1a), it is still possible for moderated mediation to occur (i.e., H2a can still be supported; Preacher, Rucker, & Hayes, 2007).

To test H2a and H2b, moderated mediation analyses were carried out using statistical methods outlined in Preacher et al. (2007). Their methods are situated within “a regression or path analytic framework” (p. 187) and allow researchers to test for both the presence and strength of conditional indirect effects. Put another way, this approach allows researchers to identify the specific levels at which one variable impacts the relationship between the other variables. This allows researchers to investigate, for example, situations where moderated mediation are thought to occur.

Two regression analyses were conducted for each hypothesis to test for conditional indirect effects; in this case, whether mediation was conditional on the value of a moderator. For H2a, there was no evidence of moderated mediation; however, consistent with H2b, the analyses confirmed that (a) elaboration mediated the relationship between surveillance and comprehension (i.e., the significant surveillance effect vanishes in the mediator model) and (b) attention to health news moderated all of the indirect relationships (Table 1). Concerning the latter, attention to health news moderated the relationship between surveillance and elaboration (interaction coefficient $= 0.04, p = .03$) as well as the relationship between elaboration and comprehension (interaction coefficient $= 0.03, p = .03$). In other words, if they routinely paid attention to the news, then participants with high surveillance motivation were more likely to elaborate about the news story and high elaborators were more likely to comprehend the news story.

One of the strengths of moderated mediation analysis is that researchers can identify the levels at which moderators or mediators become important. In this study, an examination of the conditional indirect effect at specific values of the moderator (Table 1) revealed all of the aforementioned relationships materialized
Table 1  News Surveillance Moderated Mediation Analysis

<table>
<thead>
<tr>
<th></th>
<th>( B ) (SE)</th>
<th>( T )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mediation variable model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>7.94 (.47)</td>
<td>5.38***</td>
</tr>
<tr>
<td>Surveillance</td>
<td>-.11 (.06)</td>
<td>-1.84†</td>
</tr>
<tr>
<td>Attention</td>
<td>-.96 (.58)</td>
<td>-1.63†</td>
</tr>
<tr>
<td>Surveillance ( \times ) Attention</td>
<td>0.04 (.02)</td>
<td>2.09*</td>
</tr>
<tr>
<td><strong>Dependent variable model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.43 (.50)</td>
<td>2.85**</td>
</tr>
<tr>
<td>Surveillance</td>
<td>0.00 (.01)</td>
<td>.24</td>
</tr>
<tr>
<td>Attention</td>
<td>-.17 (.19)</td>
<td>-.91</td>
</tr>
<tr>
<td>Surveillance ( \times ) Attention</td>
<td>0.00 (.00)</td>
<td>.31</td>
</tr>
<tr>
<td>Elaboration</td>
<td>-.04 (.04)</td>
<td>-1.02</td>
</tr>
<tr>
<td>Elaboration ( \times ) Attention</td>
<td>0.03 (.01)</td>
<td>2.16*</td>
</tr>
</tbody>
</table>

\( N = 602 \)

Conditional Indirect Effect at Specific Values of the Moderator

<table>
<thead>
<tr>
<th>Attention</th>
<th>( B ) (SE)</th>
<th>( Z )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>.000 (.002)</td>
<td>.27</td>
</tr>
<tr>
<td>2.00</td>
<td>.000 (.000)</td>
<td>-.53</td>
</tr>
<tr>
<td>3.00</td>
<td>.002 (.001)</td>
<td>1.49†</td>
</tr>
<tr>
<td>4.00</td>
<td>.008 (.004)</td>
<td>1.77†</td>
</tr>
</tbody>
</table>

Note: The table reports the results of a moderated mediation analysis.

\( † p < .10. * p < .05. ** p < .01. *** p < .001. \)

only when attention to health news was 3 or higher (on a 4-point scale). This suggests a threshold effect where a certain level of attention is necessary before surveillance and elaboration matter. The modified CMM and H2b both posited that attention (and elaboration) would function in this manner. Thus, H2b was supported by the data.

**H3a–H4b: Health motivation**

H3a and H3b predicted that news health motivation would be positively related to both recognition and comprehension. Linear regression analyses found that health motivation was not significantly related to recognition, \( R = .02, R^2 = .001, F(1, 601) = 0.45, p = .50 \), or comprehension, \( R = .06, R^2 = .004, F(1, 601) = 2.612, p = .10 \). Thus, H3a and H3b were not supported.

H4a and H4b predicted that the direct relationships hypothesized in H3a and H3b would be moderated by attention to health news and mediated by elaboration. Even though H3a and H3b were not supported, it is still possible for moderation mediation to occur (Preacher et al., 2007). Moderated mediation analyses were carried out for both relationships, but there was no evidence of conditional indirect effects. H4b and H4b were not supported.
H5a–H6b: Cancer worry
H5a and H5b predicted that cancer worry would be positively related to both recognition and comprehension. Linear regression analyses found that cancer worry was not significantly related to recognition, $R = .009$, $R^2 < .001$, $F(1, 601) = 0.05$, $p = .82$, or comprehension, $R < .001$, $R^2 < .001$, $F(1, 601) < .001$, $p = .998$. A linear trend was not present, but it has also been suggested that there may be a quadratic relationship (upside down U-shape) between cancer worry and learning (Miller et al., 1996). However, curve estimation failed to support this idea, as there was no quadratic trend between cancer worry and recognition, $R^2 < .001$, $F(1, 599) = 0.11$, $p = .89$, or comprehension, $R^2 < .001$, $F(1, 599) = 0.06$, $p = .94$. Thus, H5a and H5b were not supported.

H6a and H6b predicted that the direct relationships hypothesized in H5a and H5b would be moderated by attention to health news and mediated by elaboration. Moderated mediation analyses were carried out for both relationships, but there was no evidence of conditional indirect effects. H6a and H6b were not supported.

RQ1–RQ2: Predicting surveillance and attention
RQ1 and RQ2 questioned whether health motivation and cancer worry were significantly related to surveillance motivation and attention to health news. Hierarchical linear regression analyses found that three predictor variables (Block 1: health motivation; Block 2: cancer worry; Block 3: the Health Motivation × Cancer Worry interaction; reported at Block 3) significantly predicted surveillance motivation, $R = .24$, $R^2 = .05$, $F(1, 601) = 12.26$, $p < .001$, and attention to health news, $R = .36$, $R^2 = .13$, $F(1, 601) = 30.14$, $p < .001$. These results are consistent with the idea that health motivation and cancer worry may promote news surveillance and attention to health news.

RQ3–RQ4: Interactions with surveillance
RQ3 and RQ4 questioned whether there was an interaction between surveillance motivation, health motivation, and/or cancer worry that might be significantly related to recognition or comprehension. Three interactions were examined: Surveillance Motivation × Health Motivation, Surveillance Motivation × Cancer Worry, and Health Motivation × Cancer Worry. Hierarchical linear regression analyses revealed that only one interaction—Health Motivation × Cancer Worry—was significantly related to learning (Block 1: health motivation; Block 2: cancer worry; Block 3: the Health Motivation × Cancer Worry interaction; reported at Block 3). Health motivation and cancer worry were positively related to comprehension, $R = .11$, $R^2 = .01$, $F(1, 601) = 2.76$, $p = .01$, but not recognition, $R = .03$, $R^2 = .001$, $F(1, 601) = 0.19$, $p = .84$.

As a follow-up analysis, the significant Health Motivation × Cancer Worry interaction was tested as a substitute for surveillance motivation in the modified CMM. Two regression analyses were conducted to test for the presence and strength of a conditional indirect effect; in this case, whether mediation was conditional on the value of a moderator. Table 2 shows the results of these analyses according to
Table 2 Health Motivation × Cancer Worry Moderated Mediation Analysis

<table>
<thead>
<tr>
<th></th>
<th>B (SE)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mediation variable model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>6.68 (.92)</td>
<td>7.24***</td>
</tr>
<tr>
<td>HM × CW</td>
<td>-.21 (.13)</td>
<td>-1.63†</td>
</tr>
<tr>
<td>Attention</td>
<td>-.39 (.37)</td>
<td>-1.05</td>
</tr>
<tr>
<td>(HM × CW) × Attention</td>
<td>.09 (.05)</td>
<td>1.82†</td>
</tr>
<tr>
<td><strong>Dependent variable model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.43 (.37)</td>
<td>3.78***</td>
</tr>
<tr>
<td>HM × CW</td>
<td>.01 (.04)</td>
<td>.40</td>
</tr>
<tr>
<td>Attention</td>
<td>-.08 (.14)</td>
<td>-.55</td>
</tr>
<tr>
<td>(HM × CW) × Attention</td>
<td>-.01 (.01)</td>
<td>-.41</td>
</tr>
<tr>
<td>Elaboration</td>
<td>-.05 (.04)</td>
<td>-1.18</td>
</tr>
<tr>
<td>Elaboration × Attention</td>
<td>.03 (.01)</td>
<td>2.36*</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>602</td>
<td></td>
</tr>
</tbody>
</table>

**Conditional Indirect Effect at Specific Values of the Moderator**

<table>
<thead>
<tr>
<th>Attention</th>
<th>B (SE)</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>.001 (.004)</td>
<td>0.37</td>
</tr>
<tr>
<td>2.00</td>
<td>-.001 (.001)</td>
<td>-0.58</td>
</tr>
<tr>
<td>3.00</td>
<td>.003 (.003)</td>
<td>1.21</td>
</tr>
<tr>
<td>4.00</td>
<td>.015 (.009)</td>
<td>1.58†</td>
</tr>
</tbody>
</table>

Note: The table reports the results of a moderated mediation analysis. HM × CM = Health Motivation × Cancer Worry interaction.
†p < .10. *p < .05. ***p < .001.

the outcome variable of interest. Consistent with the modified CMM, the analysis revealed that (a) elaboration mediated the relationship between comprehension and the Health Motivation × Cancer Worry interaction (i.e., the significant Health Motivation × Cancer Worry effect vanishes in the mediator model) and (b) attention to health news moderated all of the indirect relationships. Concerning the latter, attention to health news moderated the relationship between elaboration and the Health Motivation × Cancer Worry interaction (interaction coefficient = 0.09, p = .06) as well as the relationship between elaboration and comprehension (interaction coefficient = 0.03, p = .01). In other words, if they routinely paid attention to the news, then participants with high health motivation and cancer worry were more likely to elaborate about the news story and high elaborators were more likely to comprehend the news story.

An examination of the conditional indirect effect (Table 2) suggests that the indirect effect only materialized for individuals with an attention to health news score of a 4 (on a 4-point scale). This indicates that incidental knowledge gain is rare, as individuals only seemed to acquire knowledge from the news articles if they routinely set out to find such information.
Discussion

Cancer news coverage is increasingly common. The present study suggests that some news consumers will benefit more than the others from this explosion of information. Individuals who routinely survey the news and pay close attention to health stories will gain more than their peers. This finding is in line with the basic tenets of the CMM (Eveland, 1998) and confirms as well as explains past research suggesting a link between attention to health news and news learning (Romantan et al., 2008; Stryker et al., 2008).

Researchers studying news learning have observed that people can remember basic concepts from a story, but not specific details (Graber, 1988). A similar pattern was found in this study as active news processors (i.e., high news surveillance, attention, elaboration) scored better than their less active peers on comprehension tests but not recognition tests. The information processing perspective holds that this pattern should emerge as people favor a bottom-line approach to information processing and storage (Eveland, 1998).

News learning research has long relied on recall or recognition-based measures of learning; however, both theory and research suggest that news learning should be assessed using measures of story comprehension. The present study measured comprehension by testing whether participants could apply information from stories to new situations. The validity of this approach is supported by the fact that the CMM successfully predicted comprehension scores but not recognition scores. Still, news comprehension is a construct in need of more refined measures. Researchers would benefit from a validated question template that can serve as the basis for comprehension-focused studies. Work on text comprehension (Kintsch & van Dijk, 1978), knowledge structure density (Eveland, Marton, & Seo, 2004), and transfer tests (Mayer, 1997) could serve as innovative models as this research moves forward.

Research on comprehension of cancer news will likely require additional work examining what people extract from science stories. That is, researchers can only measure comprehension if they can consistently identify the basic concepts of interest within a news story. For example, some have argued that scientific uncertainty may be a central component of cancer news coverage (Jensen, 2008). In a larger sense, communication researchers should begin to theorize about how message features might interact with the CMM. Are certain message features attractive to individuals engaged in news surveillance? How do news consumers who routinely attend to health news identity relevant articles? These are just a few of the questions that communication researchers could engage.

On a related note, researchers will want to consider how news routines intersect with the idea that people store bottom-line information. Journalists utilize story structures that focus on current facts and details because these formats are thought to be attractive to news audiences and to distance writers from their topic of study (Bennett, 2007). However, mounting research suggests that there could be a more
optimal approach. Alternative story structures should be proposed and evaluated by mass communication researchers; for example, Yaros (2006) recently carried out an experiment comparing the traditional inverted pyramid structure to a newly proposed explanatory structure. This type of research, both in scientific and nonscientific contexts, will help to connect research on news learning with current journalistic practices.

People favor a bottom-line approach to news processing and they seem to be driven by their own motivations and routines. In this study, news surveillance and elaboration only influenced story comprehension for individuals who routinely monitored the news for health information. Even in a virtual lab setting where participants were provided with a cancer news article, only those individuals predisposed to seeking out such information seemed to extract more information than their peers. The implications of this finding are substantial as news consumers are increasingly in a self-guided news environment. Interactive media and fragmentation have converged to create a news landscape perpetually sensitive to individual interest. Bennett and Iyengar (2008) recently expressed concern that this media environment encouraged small “like-minded subsets” of news consumers as well as media messages that reinforced rather than challenged attitudes, beliefs, and knowledge (p. 724). The present study further complicates this situation. News consumers who routinely pay attention to health news will increasingly self-select such information and benefit from the knowledge gain. Meanwhile, their less attentive peers will manage to avoid the majority of health news stories and, most likely, fail to extract equal information from the few stories they do encounter. In other words, this is a situation with significant potential to increase rather than reduce health and knowledge gaps (Viswanath et al., 2006).

If individual motivations and routines are central to news comprehension, then it is important to identify what factors predict these variables. For participants in this study, surveillance motivation and attention to health news were both significantly related to health motivation and cancer worry. This finding is consistent with the information processing perspective and the notion that motivations trigger active processing (e.g., Petty & Cacioppo, 1986). That is, individuals have their own anxieties and priorities that drive surveillance and attention to health news.

Limitations
The present study is limited in several ways. First, college students differ from the general populations in terms of their education and typical economic background. The purpose of this study was to examine cognitive processes, but it is always possible that the college-student sample behaves in ways uncharacteristic of the population at large. Second, several of the measures utilized in this study had low reliability (e.g., surveillance motivation) or were single-item measures (e.g., attention to health news). Researchers should work to further explicate and validate strong measures of the central constructs in the model.
Conclusion
There is mounting evidence that the CMM is a good predictor of news learning. Refinement of the model could involve the addition of new variables or continued examination of the relationships between current variables (e.g., Eveland, 2005). However, a strength of the CMM is its simplicity, a feature that allows it to be transported successfully to other contexts/designs. Maintaining this eloquence should be a goal of future research.

Acknowledgments
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References


阅读关于癌症的文章后的知识获取：对认知调解模型的研究

Jakob D. Jensen, 普渡大学

【摘要：】

为测试认知调解模型（CMM），参与者（N=602）在该虚拟实验中阅读五条癌症新闻之一，并完成了知识后测（用于评估识别和理解）。结果与 CMM 和过去新闻信息获取研究相一致：（一）新闻监督动机与对新闻的理解呈正相关（但对具体事实的认知并非如此），（二）详尽阐述影响新闻监督和理解的关系（三）对健康新闻的关注缓和间接关系的大小。结果支持和扩展了 CMM 并验证了以往的注意力和癌症信息获取之间联系的研究。
Wissensaneignung nach der Rezeption von Nachrichtenartikeln zum Thema Krebs: Ein Test des Kognitiven Mediationsmodells

Zum Test des Kognitiven Mediationsmodells wurde eine Studie im virtuellen Labor durchgeführt, bei der die Teilnehmer (N=602) einen von 5 Nachrichtenbeiträgen zum Thema Krebs lesen mussten und danach an einem Wissenstest (Erinnerung und Verständnis) teilnahmen. Die Ergebnisse waren mit dem Kognitiven Mediationsmodell und bekannten Studien zum Lernen aus Nachrichten konsistent, insofern als dass (a) die Motivation zur Beobachtung von Nachrichten positiv mit dem Verstehen der Geschichte korrelierte (aber nicht mit dem Erinnern spezifischer Fakten), (b) Elaboration die Beziehung zwischen Beobachtung und Verständnis vermittelte und (c) Interesse für Gesundheitsnachrichten das Ausmaß der indirekten Zusammenhänge moderierte. Die Ergebnisse stützen und erweitern das Kognitive Mediationsmodell und validieren bestehende Befunde, die einen Zusammenhang zwischen Aufmerksamkeit und Zuwachs an Informationen zum Thema Krebs postulieren.

Schlüsselbegriffe: Kognitives Mediationsmodell, Nachrichten zum Thema Krebs, Lernen, Aufmerksamkeit, Beunruhigung durch Botschaften zum Thema Krebs
암관련 뉴스 보도에 대한 노출에 따른 지식 습득: 인지 중재 모델의 테스트

Jakob D. Jensen, Purdue University

요약

인지 중재모델 (CMM)을 테스트하기 위하여, 602 명의 참여자들이 암관련 다섯개중 하나의 신문뉴스를 알고 인지도와 이해력을 측정하기 위한 사후지식 테스트를 실시하였다. 결과들은 CMM 과 과거 뉴스 획득 연구와 일관된 것으로 나왔다. 이들은 1) 뉴스 수집 동기는 이야기 이해(특정한 사실의 인지가 아닌)에 긍정적으로 연계되었으며, 2) 공들여 하는 노력이 감시와 이해 사이의 관계를 중재하였으며, 그리고 3) 건강관련 뉴스에 대한 주목은 간접적인 관계들의 크기를 중재하였다. 결과들은 CMM 을 지지하고 확대하였을뿐 아니라 과거 연구를 유용성을 증명하였는데, 이는 관심과 암 정보획득사이의 관계를 보여주는 것이라고 볼 수 있다.
La Adquisición de Conocimiento Seguida de la Exposición a los Artículos de

Noticias sobre el Cáncer:

Una prueba del Modelo de Mediación Cognitiva

Jakob D. Jensen, Purdue University

Resumen

Para poner a prueba el modelo de la mediación cognitiva (CMM), un laboratorio virtual fue llevado a cabo donde los participantes ($N = 602$) leyeron uno de cinco artículos de noticias sobre el cáncer y completaron una prueba posterior de conocimiento (evaluando el reconocimiento y la comprensión). Los resultados fueron consistentes con el CMM y la investigación previa sobre el aprendizaje de las noticias, que (a) la motivación por la vigilancia de noticias fue positivamente relacionada con la comprensión de la historia (pero no por el reconocimiento de los hechos específicos), (b) la elaboración mediaba la relación entre la vigilancia y la comprensión, y (c) la atención a las noticias de la salud moderó el tamaño de las relaciones indirectas. Los resultados apoyan y extienden el CMM así como también validan la investigación pasada sugiriendo una conexión entre la atención y la ganancia de la información sobre el cáncer.

Palabras Claves: Modelo de mediación cognitiva, noticias sobre el cáncer, aprendizaje, atención, preocupación sobre el cáncer
L’acquisition des connaissances à la suite d’une exposition à des articles d’actualité concernant le cancer : une vérification du modèle de médiation cognitive

Résumé

Pour vérifier le modèle de médiation cognitive (MMC), une étude en laboratoire virtuel fut menée, au cours de laquelle les participants (*N* = 602) lisaient l’un de cinq articles d’actualité sur le cancer et complétaient un test de rappel de connaissances (évaluant la reconnaissance et la compréhension). Les résultats concordaient avec le MMC et avec la recherche sur l’apprentissage de l’actualité, puisque (a) la motivation à surveiller l’actualité était positivement associée à la compréhension des articles (mais non à la reconnaissance de faits spécifiques), (b) l’élaboration influençait l’association entre la surveillance et la compréhension et (c) l’attention portée à l’actualité sur la santé influençait l’importance de l’association indirecte. Les résultats appuient et développent le MMC en plus de valider la recherche précédente qui suggérait un lien entre l’attention et l’acquisition d’informations à propos du cancer.

Mots-clés : modèle de médiation cognitive, actualité sur le cancer, apprentissage, attention, inquiétude à propos du cancer