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Selective Exposure to Health Information: The Role of Headline Features in the Choice of Health Newsletter Articles

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Keywords

selective exposure, message effects, health communication, internet, news

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Abstract

This study investigated how content and context features of headlines drive selective exposure when choosing between headlines of a monthly e-mail health newsletter in a naturalistic setting over a period of nine months. Study participants received a monthly e-mail newsletter and could freely open it and click any headline to read the accompanying article. In each e-mail newsletter, nine headlines competed with each other for selection. Textual and visual information of the headlines was content-analyzed, and clickstream data on the headlines were collected automatically. The results showed that headlines invited more frequent audience selections when they provided efficacy-signaling information in an imperative voice, when they used a moderate number of negative emotion words, when they presented negative thumbnail images while mentioning cancer or other diseases, and when they were placed higher in position.

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The Internet plays a central role in the emerging information environment. In particular, the Internet and digital technologies have turned information consumption into an increasingly *selective* communication behavior. Selective exposure is everywhere in today's public communication environment, where information sources and channels proliferate and people have a high level of control over what to choose (Cappella, Kim, & Albarracín, 2014; Napoli, 2011; Sunstein, 2007). It is therefore important to identify its determinants and

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consequences, particularly in relation to understanding media effects (Knobloch-Westerwick, 2014, 2015; Slater, 2007). In the case of public health communication, scholars have suggested that achieving an adequate level of exposure is a prerequisite to the effectiveness of persuasive health messages (Hornik, 2002; Hornik et al., 2013). However, achieving adequate exposure levels is increasingly difficult because health messages on the Internet compete with many others for attention.

In a broad sense, selective exposure research seeks to identify determinants of "message selection for consumption" (Zillmann & Bryant, 1985, p. 6; for an overview, see Knobloch-Westerwick, 2015). Previous research has largely focused on individual characteristics and psychological motivations as determinants of selective exposure. Early research investigated the role of confirmation-seeking motivation in selective exposure to media messages (e.g., Lazarsfeld, Berelson, & Gaudet, 1968), and this research tradition has recently been revived in relation to the increasing availability of partisan news outlets (e.g., Garrett, 2009; Iyengar & Hahn, 2009; Stroud, 2011). Another line of research has examined selective exposure behaviors in terms of mood management or adjustment, under the assumption that people manage their mood states by adjusting their information environment (e.g., Knobloch, 2003; Zillmann, 1988).

Despite the research outlined above, relatively little attention has been paid to the role that message-related features play in shaping selective exposure. Little is known about which content and context features of media messages make certain messages chosen more frequently than others, regardless of individual differences (Sperber, 1996). Only recently has research begun to expand in this direction (e.g., Cappella et al., 2014; Hastall & Knobloch-Westerwick, 2013b; Kim, 2015; Kim, Lee, Cappella, Vera, & Emery, 2013; Knobloch-Westerwick & Sarge, 2015). The present study aims to fill this gap in the literature by examining message-related drivers of selective exposure in a context where individuals could choose between headlines of a monthly e-mail health newsletter over a nine-month period in a naturalistic setting. Specifically, this study focuses on how content (informational utility and emotional negativity) and context (presentation order) features of headlines affect audience selection.

Informational Utility and Selective Exposure

Scholars have suggested that messages conveying more useful or practical information are more likely to be selected than less useful or practical messages (Atkin, 1973; Hastall, 2009; Knobloch-Westerwick, 2008, 2015). Most notably, Knobloch-Westerwick and colleagues have identified four dimensions of informational utility that affect selective exposure in the context of individuals' response to external stimuli accompanied by potential threats or opportunities to the individuals. The four dimensions are perceived *magnitude* of challenges or gratifications, perceived *likelihood* of their materialization, perceived proximity in time or *immediacy*, and perceived *efficacy* to influence external stimuli (Hastall, 2009; Knobloch-Westerwick, 2008, 2015; Knobloch-Westerwick, Dillman Carpentier, & Blumhoff, 2005; Knobloch, Dillman Carpentier, & Zillmann, 2003). A meta-analysis also highlights the role of informational utility in selective exposure (Hart et al., 2009). The meta-analysis found that while people generally show a congeniality bias, preferring supportive over unsupportive information, an uncongeniality bias emerges when uncongenial information has higher utility than congenial information.

Of the dimensions of informational utility, this study tests efficacy-signaling information as a content-level driver of health message selection (Knobloch-Westerwick, 2015). Knobloch-Westerwick, Hastall, Grimmer, and Brück (2005, as cited in Knobloch-Westerwick, 2015) showed that people are more likely to be exposed to news stories with high-efficacy information than those with low-efficacy information (cf. Hastall & Knobloch-Westerwick, 2013b; Knobloch-Westerwick & Sarge, 2015). In addition, a meta-analysis found that high-efficacy messages are more effective than low-efficacy messages in changing health-related persuasive outcomes (Witte & Allen, 2000), a finding that underscores the high utility of efficacy information (Bandura, 2004). Therefore, we hypothesize that headlines that contain efficacy-signaling information will have an advantage in triggering audience selection in the context of selective exposure to headlines of an e-mail health newsletter (e.g., a headline whose teaser copy says "Trying to lose weight? You may want to make sure to include this in your diet as part of your weight-loss plan.").

H1 Headlines that present efficacy-signaling information will be more frequently selected than those without such information.

Health newsletters sometimes use imperative verbs to emphasize suggestions and recommendations about health behaviors. For example, an article from the *NIH News in Health*, a monthly newsletter from the National Institute of Health, is titled, "Arm Yourself for Good Health: Stay Up-to-Date on Vaccines." The verbs in the imperative form, "arm" and "stay" signal recommendations. The headline teaser stated that "One of the best ways to guard you and your family against infectious disease is to stay up-to-date with your vaccines" (Arm Yourself for Good Health, 2008). Using the imperative mood as a delivery vehicle (or stylistic feature) might lend credibility (or authority) to article content (Ng & Bradac, 1993), which could boost the likelihood of inviting audience selection. Moreover, when coupled with efficacy-signaling information (as is the case for the above example), the use of imperative mood might carry an implicit message that the article has a strong piece of advice to offer and thereby increase the effectiveness of efficacy-signaling information in fostering selective exposure. However, few studies have examined how the use of imperative mood impacts audience message selection, either independently or in conjunction with efficacy-signaling information. Therefore, we pose research questions about the main and moderating effects of imperative mood.

RQ1 How does the use of imperative mood in headlines affect audience selection?

RQ2 How does the use of imperative mood in headlines interact with the use of efficacy-signaling information to affect audience selection?

This study also posits that citing expert sources of health information indicates high informational utility in headlines. Research has suggested that an explicit identification of information sources in persuasive messages has a significant impact on attitude change (O'Keefe, 1998). Previous studies have also shown that health information provided by expert sources (e.g., medical doctors) is perceived as more credible than health information without an association to such sources (Eastin, 2001; Hu & Sundar, 2010). A recent study further revealed that online health messages from high-credibility sources such as NIH invite a longer duration of exposure than those from less credible sources (Knobloch-Westerwick, Johnson, & Westerwick, 2013). Considering this literature, we hypothesize the following:

H2 Headlines that cite professional sources of health information will be more frequently selected than those without such citations.

Negativity Bias and Selective Exposure

It is widely recognized that negative information tends to be more powerful, efficacious, and influential than positive information (Rozin & Royzman, 2001). This psychological principle, called *negativity bias*, has also been supported by studies of selective exposure (i.e., sensational value of information; Knobloch-Westerwick, 2015). Zillmann, Chen, Knobloch, and Callison (2004) found that people spend more time reading news stories whose leads are negatively framed (e.g., conflict and agony) than those with other lead frames (e.g., factual or economy frame). Similarly, Knobloch, Hastall, Zillmann, and Callison (2003) showed that online news articles with relevant threatening photographs are selected more frequently and read longer than articles with relevant but innocuous photographs or those with no photographs. In light of the theoretical discussion and the empirical findings, we predict that negativity bias operates in the choice of headlines. Specifically, we examine negativity bias effects focusing on the following textual and visual components of headlines: (a) use of negative emotion words such as *fear* (Kim et al., 2013), (b) mention of cancer or other diseases (Millar & Millar, 1995), and (c) negativity of thumbnail images (e.g., a picture of a person with a headache; Knobloch, Hastall, et al., 2003).

H3 Headlines that contain more negative emotion words will be more frequently selected than those with fewer such words.

H4 Headlines that mention cancer or other disease will be more frequently selected than those without such mention.

H5 Headlines with more negative thumbnail images will be more frequently selected than those with less negative ones.

In addition to the independent effects of textual (negative emotion words, mention of cancer or other diseases) and visual (negativity of thumbnail images) dimensions of content valence, the two content modalities might also interact to produce a more complex pattern of negativity bias in selective exposure. The between-modality interaction might be synergistic, such that headlines with greater negativity in both textual and visual modalities invite more frequent selections. Or, alternatively, textual negativity and visual negativity might exert compensatory effects on audience selection (i.e., antagonistic interaction). We believe that both are likely patterns of between-modality interactions and that there is currently insufficient empirical evidence to opt for one over the other. All in all, two research questions are introduced for exploration:

RQ3 How does the negativity of thumbnail images interact with the number of negative emotion words to affect audience selection?

RQ4 How does the negativity of thumbnail images interact with the mention of cancer or other diseases to affect audience selection?

Position Bias and Selective Exposure

Information on the Internet is often ordered in a single- or multi-column design. The rank-order presentation of online content typically reflects its importance, relevance, or popularity, as evaluated by human editors (i.e., journalistic cues), computer algorithms, or other users. The presentation order constitutes a key context feature of online health information that can affect audience selection (Knobloch-Westerwick, 2015). Research has shown that people tend to exhibit a *position bias*, clicking information located higher on a webpage more frequently than content lower on the page. The position bias effect is well documented in the literature on click-through behaviors in web search results (e.g., Joachims et al., 2007; Pan et al., 2007). However, despite its importance, few studies have examined the role of position bias in selective exposure to health information in a naturalistic setting. In sum, we test the following:

H6 Headlines placed higher in an e-mail newsletter will be more frequently selected than those displayed lower in the newsletter.

Methods

Overview

We used data from part of a population-based field experiment in which participants received a monthly e-mail health newsletter, the *Penn Health Digest*, for one year. The unit of analysis is the *headline* listed in the e-mail newsletters. Using clickstream data, we measured how many times each headline had been clicked (i.e., selection count) by the study participants. Textual and visual features of headlines were content-analyzed using human and computerized coding methods. A negative binomial generalized estimating equation (GEE) model (Hilbe, 2011) was fitted to the headline-level data to examine the hypotheses and research questions.

Data and Sample

The newsletter articles covered a wide range of health topics that would be relevant to participants aged 50–70 years (e.g., cancer prevention and screening, healthy lifestyles, etc.). All articles were written by a professional health news writer, and their content was reviewed and approved by medical/health professionals. The newsletter was created to have similar content and design to other popular online health newsletters (e.g., the *Harvard Health Letter*). Each e-mail newsletter featured ten headlines. A headline consisted of a thumbnail image and a title with teaser copy (see Figure 1). Headlines were displayed in a one-column list, from top to bottom. Participants received the e-mail newsletter in a natural setting (i.e., their regular e-mail inbox), and could freely (a) *open* it and (b) *click* any headline. When participants clicked a specific headline, they were taken to a website where they could read the full article. Their headline choice was unobtrusively recorded.

Of 12 monthly newsletters sent to participants over the course of a year, the last nine newsletters included a “News Quiz,” whereas the first three newsletters did not. To address this inconsistency, we only included the comparable headline data from the last nine newsletters. We also excluded the “News Quiz” headlines from our analyses because they defined a constant condition of competition for attracting audience selection for other headlines presented. In sum, we focused on the remaining nine headlines competing with each other for audience selection.

For each month’s newsletter, there were four versions of headline lists that correspond to the four between-participants conditions of the abovementioned field experiment varying in their cancer-related behavioral focus: (a) fruit and vegetable consumption, (b) exercise, (c) colorectal screening, and (d) mammography. In the experiment, participants were randomly assigned to one of the four versions of e-mail newsletters before the first month’s newsletter was sent. Once randomly assigned to a specific version, they received the same version over nine months (for further details about the design and procedure of the experiment, see Hornik et al., 2012). For each monthly newsletter, all four versions shared six *general* headlines covering a wide range of health topics, but each version also had three *version-specific* headlines that addressed the health behaviors of its focus (e.g., exercise). In one month’s newsletter, for example, all four versions included an article titled “Taking drugs to stop bone loss? Read this” (i.e., *general* headline), while the following articles were specific to each version: “Are beans the secret to weight loss?” (*fruit and vegetable consumption*), “Should you exercise if you have asthma?” (*exercise*), “Lower your risk of colorectal cancer” (*colorectal screening*), and “What’s your risk of developing breast cancer?” (*mammography*).

The ordering of the headlines was fixed for all participants in a given month; in each version of the newsletter, the *general* and *version-specific* headlines appeared in the same position. For example, in one month, *version-specific* headlines would appear in the 1st, 3rd, and 4th positions across all the four versions of newsletters for that month, and the *general* headlines would appear in the 2nd, 5th, 6th, 7th, 8th, and 9th positions. In total, there were 36 headline lists (9 months × 4 versions per each month), and in each list, nine headlines competed for selection. Thus, the final sample consisted of 324 headlines (9 headlines per each of the 36 lists). However, it should be noted that the sample did not consist of entirely independent headlines. As mentioned earlier, there were six identical *general* headlines in four versions of e-mail newsletters that were sent each month ($n = 6 \times 9$ months = 54). In one month, there was another headline that was identical across the four versions ($n = 1$). Taken together, there were 159 unique headlines, where 55 of them were observed four times and the other 104 were observed once[1]: $(55 \times 4) + 104 = 324$ (see the Analysis section for our statistical treatment of the repeated observations).

A total of 15,824 newsletter subscribers were recruited from an online respondent panel maintained by Survey Sampling International. Of the total participants, 4,260 selected at least one headline during the nine-month period. Seventy-one point one percent of the

[1]The 104 headlines consist of the following: (3 version-specific headlines × 4 versions × 8 months) + (2 version-specific headlines × 4 versions × 1 month).

participants were female; age ranged from 50 to 70 years (*M* = 60; *SD* = 5); 5.0% were African American, 88.3% were White, and 6.7% were some other ethnicity. Of all the participants, about 49.9% earned a bachelor's degree or higher. The study was approved by the institutional review board of the University of Pennsylvania.

Measures

Selection count—We tracked which specific headline the participants clicked on first among the set of nine headlines shown in each e-mail newsletter; clicking a headline enabled them to read the accompanying full article on the newsletter's website. Only first-click data were recorded in this setting and analyzed throughout this study. Their click-through behaviors in the e-mail interface were automatically logged and stored in the newsletter's database maintained on a server at the Annenberg School for Communication at the University of Pennsylvania. Using the clickstream data, we counted the number of clicks on each headline in the e-mail newsletters. The 324 headlines invited a total of 15,055 clicks. Since this selection count was obtained from an environment in which participants clicked a headline of their first choice out of nine headlines listed in an e-mail newsletter, it captures the participants' selective exposure behaviors at an aggregate level, with the headline as the unit of analysis. The selection count (i.e., the number of clicks) ranged from 1 to 223, with a mean of 46.47 (*SD* = 44.52) showing a highly positively skewed distribution, which is typically the case for count data (Long, 1997).

Content features—Unlike the selection count on which the 324 headlines have individual records, the variations in the content features of the headlines do not represent completely independent observations: the headlines are composed of 159 unique ones with 55 of them repeatedly shown in the four versions of each month's e-mail newsletter. We nonetheless report the textual and visual features of the 324-headline sample here because it is these variations that we used for the data analysis (with statistical methods addressing the clustering issue; see the Analysis section). Descriptive statistics of the content features of the 159 unique headlines are presented in Appendix A.

Textual features: Two trained research assistants, blind to the research questions and hypotheses, coded intrinsic features of headline texts (i.e., titles with teaser copy). Thumbnail images were not shown to coders during this process. The two coders judged if headline texts (a) contained efficacy-signaling information (Moriarty & Stryker, 2008), that is, if they signaled a means or response action to achieve a specified health goal (e.g., *researchers have identified 5 ways for you to prevent colorectal cancer*); (b) contained one or more verbs in the imperative form (e.g., *Boost your veggie intake*); (c) indicated one or more professional sources of information (e.g., *expert*, *doctor*, *CDC*); (d) mentioned cancer (e.g., *cancer*, *breast cancer*); and (e) mentioned specific non-cancer diseases or bad health conditions (e.g., *Alzheimer's disease*). Inter-coder reliability was tested using 28 headline texts that were not part of the final sample of the current study but that were drawn from the same headline population of the e-mail newsletters of the abovementioned larger research project. Krippendorff's alphas for these five binary-choice items ranged from .89 to 1.00 with a mean of .95. After reliability was achieved, each coder coded a random half of headline texts. About 39.8% of the headlines contained efficacy-signaling information, 35.8% used imperative mood (23.8% presented efficacy information with imperative mood), 26.5% indicated one or more professional information-sources, 10.5% mentioned cancer, and 46.0% mentioned non-cancer diseases (or bad health conditions) only.

We also conducted a computer-assisted content analysis of the headline texts using LIWC 2007 (Pennebaker, Booth, & Francis, 2007). LIWC 2007's dictionary classifies approximately 4,500 words and word stems in about 80 psychologically meaningful categories (see Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007; Tausczik & Pennebaker, 2010 for details about the reliability and validity of the LIWC 2007 lexicon). The LIWC 2007 dictionary covered words in the headline texts reasonably well, with an average coverage rate of 84.3% (*SD* = 9.8%). When a given LIWC-measured variable (e.g., the number of negative emotion words) showed a positively skewed distribution, we categorized it into two or more groups.

The number of negative emotion words (e.g., *bad*, *danger**, *fear* − words with a star superscript indicate word stems), which ranged from 0 to 5, had a positively skewed distribution, with a mean of 0.83 (*SD* = 1.07). Thus, we recoded the variable into four categories: 0 (50.9%), 1 (26.5%), 2 (14.8%), and 3–5 (7.7%). Control variables were also measured using LIWC 2007: word count (*M* = 18.50, *SD* = 4.01), number of words with seven or more letters (an indicator of writing complexity; *M* = 4.55, *SD* = 2.27), question marks (present = 31.8%), second person pronouns (present = 38.0%), quantifier words (e.g., *less*, *many*; present = 34.0%), number of positive emotion words (e.g., *good*, *great*; 0 = 46.0%, 1 = 28.4%, 2 = 16.4%, 3 or 4 = 9.3%), insight words (e.g., *find**, *think*; present = 34.0%), tentative words (e.g., *may*, *possib**; present = 30.9%), and inhibition words (e.g., *prevent**, *protect**; present = 30.9%).

Visual features: Four research assistants, unaware of the nature of the study, rated the perceived emotional valence of all thumbnail images used in the analysis. Associated headline texts were not shown to the raters, and the ordering of the images was randomized for each rater. The raters indicated how *positive/negative* a given image made them feel on a 9-point scale ranging from *not at all positive/negative* (= 1) to *extremely positive/negative* (= 9). Their evaluations were consistent with each other, with Cronbach's alpha = .84 for the "positive" feeling and alpha = .82 for the "negative" feeling. The responses from the four raters were averaged to create positive- and negative-feeling scores. Further examination indicated that the two items were strongly negatively correlated ($r = -.84$). Thus, they were averaged, after reverse-scoring the positive-feeling score, to form a single scale of rated emotional valence of images, *M* = 5.38, *SD* = 2.17, ranging from *extremely positive* (= 1) to *extremely negative* (= 9).

Two research assistants, unaware of the research questions and hypotheses, coded a random half of the intrinsic features of thumbnail images. First, the two coders judged if thumbnail images contained (a) a human face, (b) human body or body parts, (c) concrete objects such as aspirin and cherries, (d) numbers, (e) letters, (f) symbols, (g) one or more bright colors, and (h) whether 50% or more of the image was composed of bright colors. At this stage, they were unable to see the associated headline texts. As with the human coding of the textual features, inter-coder reliability was assessed using thumbnail images of headlines drawn from the full set of the e-mail newsletters other than those constituting the final sample of the present study (n = 22). Krippendorff's alphas for the binary-choice items ranged from .77 to 1.00 with an average reliability of .94. Second, once the two coders completed the above set of coding tasks, they judged if a given image was directly linked to an associated headline text (i.e., at this stage of coding, they could see both images and texts). To be directly linked, the image needed to correspond to a specific word in the text. For example, the title "Detect Alzheimer's Early Warning Signs" is accompanied by an image with the word Alzheimer's in it (see Figure 1). Krippendorff's alpha for this binary-choice item, based on 18 headlines (i.e., thumbnail images and associated texts), was .89.

We constructed three control variables based on the content analysis of the thumbnail images: (a) types of image objects, (b) color brightness, and (c) image-text link. About 16.0% of the images contained one or more human faces; 23.8% contained a body or body parts; 30.2% included one or more numbers, letters, or symbols only (i.e., no human face or body part); and 29.9% included concrete objects only. About 56.5% of the images were made up of at least 50% bright color(s), while 43.5% were made up of less than 50% bright color(s) or no bright color(s). About 53.7% of the thumbnail images were directly linked to the associated headline texts.

Context features—The position of the headline in the list ranged from first to ninth. Headlines' publication month was included as a control variable.

Analysis

We used a negative binomial GEE model to identify how content and contextual features of headlines affect audience selection. First, we estimated a negative binomial model rather than a Poisson model because the distribution of our dependent variable, headline selection count, is overdispersed (Hilbe, 2011; Long, 1997). A boundary likelihood ratio test indicated evidence of overdispersion for the selection count, suggesting that the negative binomial model fits the data significantly better than the Poisson model: χ^2 (1) = 3,021.63, $p < .001$, overdispersion parameter (α) = .30, 95% CI [.25, .38], for the model without interaction terms; χ^2 (1) = 2,585.63, $p < .001$, α = .27, 95% CI [.22, .34], for the model with interaction terms. Second, as noted earlier, some of the headlines were repeatedly presented across the four versions of each month's newsletter (i.e., between-participants groups of the field experiment from which the current data were obtained). To address the clustered nature of our data (i.e., dependence among the observations), we estimated a negative binomial GEE model with robust sandwich-based standard errors and an exchangeable correlation structure for the clusters (Hilbe, 2011; Liang & Zeger, 1986). We also included the headline version as a covariate. Third, it should also be noted that the 324 headlines cannot be directly compared to each other in terms of their selection count per se because there is variation in the total number of clicks *among the 36 lists* e-mailed to participants over the nine-month period (i.e., the total number of participants who clicked a headline in a given list; ranging from 315 to 581, M = 448.11, SD = 74.05, n = 36 lists). For example, suppose that a headline P shown in a list X was clicked 40 times, while another headline Q in a list Y was clicked 50 times. Suppose further that all nine headlines in the list X invited a total of 400 clicks, while those in the list Y received 500 clicks. Then, the observed numbers of clicks on headlines P and Q (i.e., 40 vs. 50) are not appropriate indicators to compare the performance (or success) of these two headlines in attracting audience clicks because P simply had less opportunity to be clicked than Q (i.e., 400 vs. 500); instead, the comparison should be made between "40 clicks out of 400" (P) and "50 clicks out of 500" (Q). We therefore incorporated the natural log of the headline list-level total click count into our negative binomial GEE model estimation as an "offset" variable (Hilbe, 2011; Long, 1997) to examine headline selection count while adjusting for the frequency with which the event of clicking a headline could have happened.

Results

Table 1 presents the results of our negative binomial GEE models (Model 1: without interaction terms; Model 2: with interaction terms). Inconsistent with H1, efficacy-signaling information had no significant independent effect on selection count (Model 1). The use of imperative mood was also unrelated to selection count (RQ1; Model 1).

The impact of efficacy-signaling information was moderated by the use of imperative mood (RQ2; Model 2). As shown in the left panel of Figure 2, efficacy-signaling information had no significant impact on selection count when headlines did not use imperative mood, incidence rate ratio (IRR) = 0.93, 95% CI [0.69, 1.25]. When coupled with imperative mood, however, headlines presenting efficacy-signaling information triggered about 1.6 times more clicks than headlines without such information, IRR = 1.59, 95% CI [1.12, 2.26]. Or, equivalently, utilizing verbs in the imperative mood without presenting efficacy-signaling information backfired. The mention of professional sources of information in headlines did not affect the number of clicks, rejecting H2 (Model 2).

The number of negative emotion words was significantly associated with selection count (H3; Model 2) but, unexpectedly, showed a curvilinear relationship (an "inverted-U" pattern), χ^2 (3) = 10.65, $p < .05$. As illustrated in the right panel of Figure 2, headlines that used one negative emotion word invited about 43% more clicks than those without such word, IRR = 1.43, 95% CI [1.12, 1.83]. There were about 34% fewer selections on headlines that presented three to five negative emotion words than those using one such word, IRR = 0.66, 95% CI [0.48, 0.92]. Headlines that did not include negative emotion words were not significantly different from those with two or those with three to five such words. Mentioning cancer or other diseases was unrelated to selection count (Model 1), χ^2 (2) = 3.41, $p = .18$. Thus, H4 was rejected.

The results revealed a significant independent effect of the negativity of thumbnail images on selection count (Model 1), providing support for H5. Headlines presenting more negative thumbnail images were more frequently chosen than those with less negative ones, such that each one-unit increase in the image-negativity scale was associated with about 7% increase in selection count, IRR = 1.07, 95% CI [1.01, 1.13].

The image-negativity effect was significantly moderated by whether headlines mentioned cancer, non-cancer diseases, or none of the above (RQ4; Model 2), χ^2 (2) = 6.22, $p < .05$. As the left panel of Figure 3 demonstrates, negativity of thumbnail images was unrelated to selection count when there was no mention of cancer or other diseases in headlines, IRR = 0.98, 95% CI [0.89, 1.07], but it was significantly positively associated with the number of clicks when the headlines mentioned cancer, IRR = 1.15, 95% CI [1.03, 1.29] or other diseases, IRR = 1.09, 95% CI [1.01, 1.17]. Equivalently, the significant interaction effect indicated that mentioning cancer – or other diseases to a lesser extent – was associated with a significant decrease in selection count when associated headline thumbnail images were in the range of neutral to extremely positive. The opposite pattern, though not statistically significant, emerged when the images were highly negative. The interaction effect between image-negativity and the number of negative emotion words was not statistically significant (RQ3), χ^2 (3) = 3.97, p = .26.

Consistent with H6, we found a significant position effect (Model 2), χ^2 (8) = 351.86, p < .001. As shown in the right panel of Figure 3, headlines appearing in the first and second position of the headline lists were clicked more frequently than other headlines.

Some of the control variables were found to be significantly associated with selection count (Model 2). Headlines that used quantifier words prompted about 26% more clicks than those with no such words, IRR = 1.26, 95% CI [1.03, 1.54]. The version of headline lists had a significant effect on selection count, χ^2 (3) = 11.74, p < .01. Headlines of the *mammography* version invited more clicks than those in the *fruit and vegetable consumption* version, IRR = 1.23, 95% CI [1.09, 1.39], or those in the *colorectal screening* version, IRR = 1.15, 95% CI [1.02, 1.30]. The type of thumbnail image object was also significantly related to selection count, χ^2 (3) = 8.85, p < .05. Headlines with images of concrete objects (e.g., aspirin and cherries) triggered more clicks than those with symbols, letters, or numbers, IRR = 1.35, 95% CI [1.05, 1.74], and those with human body or body parts, IRR = 1.44, 95% CI [1.10, 1.90]. The number of clicks for headlines that contained images of human face(s) did not significantly differ from the other three categories.

Robustness Check

We conducted two ancillary analyses to ensure that our results are robust to (a) the sample of study participants whose selection behaviors were aggregated to obtain the number of clicks for the newsletter headlines, and (b) the way the LIWC 2007-measured variables were incorporated into the model. First, as described earlier, the 324 headlines received 15,055 clicks from 4,260 study participants. That is, the total number of clicks exceeded that of study participants. This is due to the aforementioned design of a larger research project from which the current data were collected where participants were randomly assigned to receive one of the four versions of e-mail newsletters (i.e., *exercise*, etc.) over nine months. All in all, the number of clicks was greater than that of participants because some participants made their headline choice in two or more months' e-mail newsletters during the period of nine months.[2]

[2]Of the 4,260 participants who performed the headline selection behavior at least once during the nine-month period, about 6.2% did it every month (i.e., nine times), 6.6% did it eight times, 6.7% did it seven times, 8.6% did it six times, 8.5% did it five times, 8.1% did it four times, 12.5% did it three times, 16.5% did it twice, and 26.3% did it only once.

This clustering of participants may threaten the external validity of our results. Ignoring the clustered observations might have led us to over-represent selective exposure behaviors of particular participants who – for any reason – clicked headlines in more months' e-mail newsletters than others over the nine-month study period. To assess the sensitivity of our results to the clustering issue, we estimated a negative binomial GEE model using clickstream data from 1,120 participants who made their headline choice in only one month during the study period (i.e., no repeated observations on the same participants). Our results remained virtually unchanged when analyzing the data from this alternative sample of independent participants.

Second, we categorized some LIWC-measured variables due to their positively skewed distributions (e.g., number of negative emotion words). However, categorization of continuous variables might produce biased estimates of true effects (MacCallum, Zhang, Preacher, & Rucker, 2002). We therefore tested a negative binomial GEE model using the original continuous version of the LIWC variables. The results from this analysis were almost identical to those reported above. Considering these consistent results, we opted to report the results based on the categorized LIWC variables, primarily to facilitate interpretation.

Discussion

The analysis of aggregate selection behaviors (i.e., clickstream data) provides evidence for message-related drivers of selective exposure. The results suggest that content and context features of headlines have a significant impact on audience selection in the context of the choice between articles of an online health newsletter in a naturalistic setting.

Our findings shed light on the role of efficacy information in audience health content selection. The inclusion of efficacy-signaling information in headlines by itself did not have an advantage in attracting audience selection. Rather, efficacy-signaling information invited more frequent selections when it was delivered with imperative mood, which underscores the joint role of content and format (or executional) features of health messages in audience selection. This finding is partially consistent with the informational utility model of selective exposure (Knobloch-Westerwick, 2015), suggesting a potentially important boundary condition for the effectiveness of efficacy information in fostering selective exposure to health messages: the use of imperative wording as a message format feature. However, our data do not speak to psychological mechanisms through which the imperative voice enhances the effectiveness of efficacy information in prompting audience selections. Future research might need to examine how the synergistic interaction effect emerges, focusing on the role of imperative mood in boosting the credibility or utility of efficacy information (Ng & Bradac, 1993). It is also worth noting that recent research has revealed the significant interaction effect between the use of efficacy information (content feature) and exemplification (format feature) in health messages on selective exposure (Hastall & Knobloch-Westerwick, 2013b; Knobloch-Westerwick & Sarge, 2015). Thus, an important next step is to replicate and extend the current and previous findings regarding message format features that moderate the efficacy-information effects.

In any case, if replicable, this study's finding also has significant practical implications for health message design. Health newsletter articles sometimes contain a verb in the imperative form in their headlines to highlight suggestions and recommendations. The present finding suggests that using the imperative mood as a means of delivering efficacy-signaling information in headlines would be an effective messaging strategy to attract audience selective exposure. With respect to this conclusion, it should be emphasized that this study operationalized the construct of the imperative mood as the presence of verb(s) in the imperative form (i.e., grammatical/syntactic definition). Newsletter writers and editors might not want to create health messages with highly forceful, intense, controlling, or dogmatic language because such freedom-threatening messages are likely to trigger psychological reactance and reduce persuasive impact (e.g., Bessarabova, Fink, & Turner, 2013; Dillard & Shen, 2005; Rains, 2013).

Our results showed that headlines that explicitly indicated expert information sources did not differ in the number of audience selections from those without such sources. Taken together with previous research, the present finding suggests that mentioning expert sources of health information in a newsletter article's headline does not necessarily increase the likelihood of inviting audience selection for further consumption (i.e., full text), although it affects persuasive outcomes (e.g., Hu & Sundar, 2010; O'Keefe, 1998) and triggers a longer exposure time (e.g., Knobloch-Westerwick et al., 2013). It should also be noted that our finding was obtained in the context of audience selection among a set of headlines, whereas previous studies tended to examine the effectiveness of entire messages in terms of the amount of time audience spent consuming the messages. More research is warranted to test how the source expertise of online health messages shapes recipients' selective exposure, focusing on whether and how it differentially affects the (a) likelihood of selection of and (b) time spent with the messages.

We found *nonlinear* negativity bias effects generated by textual and visual components of newsletter headlines, which can contribute to our understanding of the role of negativity in shaping audience message selection (Knobloch-Westerwick, 2015). First, the number of negative emotion words was significantly associated with the number of clicks, with the relationship showing an inverted-U shape. Regarding the result, one might wonder if words related to discrete negative emotions (Lazarus, 1991) have differential effects on selective exposure. To address this issue, we conducted an ancillary analysis using anxiety-, anger-, and sadness-related words (measured by LIWC 2007) as three separate predictors. The analysis suggests that the observed negativity bias effect is not driven by the use of words related to a particular negative emotion(s) but by the use of a combination of those negative emotion words. In sum, the study finding suggests that there is a threshold in the number of negative emotion words in a headline that determines optimum effectiveness in attracting audience selection (cf. Kim et al., 2013). However, it should be noted that this study focused on the negativity bias effect in terms of emotion-related words used in headlines but did not measure audience emotional responses produced by those words. Future research will thus need to examine what psychological mechanism underlies the observed effect of expressed emotional negativity.

Second, the results also revealed a nonlinear negativity bias effect produced by a between-modality interaction of the emotional negativity of thumbnail images (visual) and the mention of cancer or other diseases (textual) in headlines. While there was an overall positive association between negativity of thumbnail images and selection count, the relationship was only statistically significant when the images were presented with words about cancer or other diseases. The interaction effect between the image-negativity and the number of negative emotion words was not significant. Taken together, the findings suggest that the image-elicited negativity bias is stronger when the headline text induces negative feelings by mentioning cancer or other diseases but not by using negative emotion words. Future work will need to examine why this differential effect emerges (e.g., if it is because the mention of cancer/diseases and the use of negative emotion words generate different intensity or kind of negative feelings). It is also worth noting that when associated thumbnail images were emotionally positive or neutral, participants tended to avoid headlines presenting cancer-related information and those mentioning other diseases to a lesser extent (cf. Kim et al., 2013; Miles, Voorwinden, Chapman, & Wardle, 2008). Given that a significant proportion of health messages reference disease, it will be important to investigate this finding further.

Our results demonstrate that headline position, a context feature, is an important driver of selective exposure. Perhaps unsurprisingly, headlines placed in a higher position in the list were more likely to be selected, a result that is consistent with previous findings in the context of selective exposure to web search engine results (Joachims et al., 2007; Pan et al., 2007). More specifically, on average, more than half (56%) of the total number of clicks were made on the top two headlines. Thus, it is recommended that important online health information should be physically located near the top of web pages and/or lists. From a theoretical perspective, the strong ordering effect poses intriguing questions about its psychological mechanism (Knobloch-Westerwick, 2015). First, the position of each headline (order) might signal that the article is more important or popular than other articles, although there was no explicit indication of importance or popularity. People may have a shared perception about the relationship between the order and the importance (or popularity) on the basis of their experience of using the Internet. Second, the mechanism may have to do with an attentional bias toward certain positions in a webpage. Eye-tracking studies have revealed that people rarely look at web links (and teaser copy) that are positioned lower in web search results, even when they are more relevant than links placed higher (e.g., Guan & Cutrell, 2007). Future studies can advance this line of research by examining how the observed headline-ordering effect operates especially when an importance or popularity indicator is absent. In addition, the strong headline-position effect observed in this study calls for further investigation of how content features predict editorial decisions about health message placement on a real-world e-mail newsletter or webpage (e.g., editorial cue to news importance; Knobloch-Westerwick, 2015). This line of future research, together with the current study finding on the position effect, might demonstrate a bigger picture of how content features drive selective exposure in a real-world setting.

In sum, the present study identified message-level factors that drive audience selection of newsletter articles (headlines), using clickstream data obtained from part of a large-scale online field experiment. We observed a population sample's selection behaviors in a naturalistic context and examined the behavioral data in relation to content and context features of headlines while controlling for other potential confounders. The bottom line to headline writers in terms of controllable factors are as follows: To prompt audience selection of a story, position the story early in the visual field of the audience, provide efficacy information but in conjunction with imperative voice, use a moderate number of negative emotion words, present negative images along with words about cancer or other diseases, use quantifier words such as "many," and show images of concrete objects such as pills and fruits rather than other types of objects such as symbols and human body. While there are likely other factors that trigger audience selection, the present data show that each of these factors will increase the probability of selection.

Our study has some limitations. First, the participants in the study were adults aged 50 to 70 years, so the results may not necessarily generalize to younger populations. Second, although we included a set of control variables, our independent variables were not randomly assigned treatments. Therefore, we cannot conclusively rule out the possibility that the observed associations between headline features and selection count are explained by unmeasured third variables such as content controversiality and novelty (Knobloch-Westerwick, 2015). Third, we used study participants' headline choice as an indicator of selective exposure. However, selective exposure could be operationalized differently, such as the amount of time spent reading an article's full text (Hastall & Knobloch-Westerwick, 2013a; Knobloch-Westerwick, 2015). Finally, we focused exclusively on message-related features as drivers of selective exposure. While our results suggest that the observed effects of content and context features of newsletter headlines on audience selection operate in general at the aggregate message-population level, a more microscopic examination of the role of individual differences and their interactions with message-related factors in shaping selective exposure awaits further study. For example, future research might examine whether people with poor health status are more likely to choose to read headlines presenting efficacy-signaling information than those with good health status.

Despite these limitations, the present study contributes to our understanding of selective exposure by identifying message-level drivers of audience content selection behaviors observed in a naturalistic setting. It is our hope that future research will experimentally investigate how individual-level and message-level factors jointly influence information selection.

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Appendix A. Descriptive Statistics: Content Features of Unique Headlines (N = 159)

Content Features	Distribution
Efficacy-Signaling Information	Presented (43.4%)
Imperative Mood	Used (39.0%)
Professional Source	Mentioned (27.7%)
# of Negative Emotion Words	0 (52.8%), 1 (23.9%), 2 (15.1%), 3 to 5 (8.2%)
Negativity of Thumbnail Images	$M = 5.18$, $SD = 2.12$
Mention of Cancer or Other Diseases	Cancer (17.6%), Other Diseases (37.1%), None (45.3%)
Word Count	$M = 18.69$, $SD = 4.12$
Number of Words with >6 Letters	$M = 4.48$, $SD = 2.18$
Question Marks	Used (30.8%)
Second Person Pronouns	Used (43.4%)
Quantifier Words	Used (37.1%)
# of Positive Emotion Words	0 (46.5%), 1 (31.4%), 2 (16.4%), 3 or 4 (5.7%)
Insight Words	Used (35.2%)
Tentative Words	Used (34.6%)
Inhibition Words	Used (28.9%)
Brightness of Thumbnail Images	Made up of at least 50% bright color[s] 58.5%
Image-Text Link	Directly matched (49.1%)
Type of Image Object	Human face[s] (13.8%), body [parts] (20.1%), number/letter/symbol (37.1%), concrete object[s] (28.9%)

Note. Headlines with efficacy information *and* imperative mood: 27.7%.

References

Arm Yourself for Good Health. NIH News in Health. 2008. Retrieved from http://newsinhealth.nih.gov/2008/August/index.htm

Atkin, CK. Instrumental utilities and information seeking. In: Clarke, P., editor. New models for mass communication research. Beverly Hills, CA: Sage; 1973. p. 205-242.

Bandura A. Health promotion by social cognitive means. Health Education and Behavior. 2004; 31:143–164. DOI: 10.1177/1090198104263660 [PubMed: 15090118]

Bessarabova E, Fink EL, Turner M. Reactance, restoration, and cognitive structure: Comparative statics. Human Communication Research. 2013; 39:339–364. DOI: 10.1111/hcre.12007

Cappella JN, Kim HS, Albarracín D. Selection and transmission processes for information in the emerging media environment: Psychological motives and message characteristics. Media Psychology. 2014; Advance online publication. doi: 10.1080/15213269.2014.941112

Dillard JP, Shen L. On the nature of reactance and its role in persuasive health communication. Communication Monographs. 2005; 72:144–168. DOI: 10.1080/03637750500111815

Eastin MS. Credibility assessments of online health information: The effects of source expertise and knowledge of content. Journal of Computer-Mediated Communication. 2001; 6doi: 10.1111/j.1083-6101.2001.tb00126.x

Garrett RK. Politically motivated reinforcement seeking: Reframing the selective exposure debate. Journal of Communication. 2009; 59:676–699. DOI: 10.1111/j.1460-2466.2009.01452.x

Guan Z, Cutrell E. An eye tracking study of the effect of target rank on web search. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. 2007; :417–420. DOI: 10.1145/1240624.1240691

Hart W, Albarracín D, Eagly AH, Brechan I, Lindberg MJ, Merrill L. Feeling validated versus being correct: A meta-analysis of selective exposure to information. Psychological Bulletin. 2009; 135:555–588. DOI: 10.1037/a0015701 [PubMed: 19586162]

Hastall, MR. Informational utility as determinant of media choices. In: Hartmann, T., editor. Media choice: A theoretical and empirical review. New York, NY: Routledge; 2009. p. 149-166.

Hastall MR, Knobloch-Westerwick S. Caught in the act: Measuring selective exposure to experimental online stimuli. Communication Methods and Measures. 2013a; 7:94–105. DOI: 10.1080/19312458.2012.761190

Hastall MR, Knobloch-Westerwick S. Severity, efficacy, and evidence type as determinants of health message exposure. Health Communication. 2013b; 28:378–388. DOI: 10.1080/10410236.2012.690175 [PubMed: 22809248]

Hilbe, JM. Negative binomial regression. 2nd. New York, NY: Cambridge University Press; 2011.

Hornik RC. Exposure: Theory and evidence about all the ways it matters. Social Marketing Quarterly. 2002; 8:31–37. DOI: 10.1080/15245000214135

Hornik, RC., Mello, S., Forquer, H., Tan, ASL., Johnson, M., Rusko, J., Schwartz, JS. Results from a randomized controlled trial testing the effects of routine health information exposure on cancer prevention and screening behaviors. Paper presented at the 98th Annual Convention of the National Communication Association; Orlando, FL. 2012 Nov.

Hornik RC, Parvanta S, Mello S, Freres D, Kelly B, Schwartz JS. Effects of scanning (routine health information exposure) on cancer screening and prevention behaviors in the general population. Journal of Health Communication. 2013; 18:1422–1435. DOI: 10.1080/10810730.2013.798381 [PubMed: 24083417]

Hu Y, Sundar SS. Effects of online health sources on credibility and behavioral intentions. Communication Research. 2010; 37:105–132. DOI: 10.1177/0093650209351512

Iyengar S, Hahn KS. Red media, blue media: Evidence of ideological selectivity in media use. Journal of Communication. 2009; 59:19–39. DOI: 10.1111/j.1460-2466.2008.01402.x

Joachims T, Granka L, Pan B, Hembrooke H, Radlinski F, Gay G. Evaluating the accuracy of implicit feedback from clicks and query reformulations in web search. ACM Transactions on Information Systems. 2007; 25:1–27. DOI: 10.1145/1229179.1229181

Kim HS. Attracting views and going viral: How message features and news-sharing channels affect health news diffusion. Journal of Communication. 2015; 65:512–534. DOI: 10.1111/jcom.12160 [PubMed: 26441472]

Kim HS, Lee S, Cappella JN, Vera L, Emery S. Content characteristics driving the diffusion of antismoking messages: Implications for cancer prevention in the emerging public communication environment. Journal of the National Cancer Institute Monographs. 2013; 2013:182–187. DOI: 10.1093/jncimonographs/lgt018 [PubMed: 24395989]

Knobloch S. Mood adjustment via mass communication. Journal of Communication. 2003; 53:233–250. DOI: 10.1111/j.1460-2466.2003.tb02588.x

Knobloch S, Dillmann Carpentier F, Zillmann D. Effects of salience dimensions of information utility on selective exposure to online news. Journalism & Mass Communication Quarterly. 2003; 80:91–108. DOI: 10.1177/107769900308000107

Knobloch S, Hastall MR, Zillmann D, Callison C. Imagery effects on the selective reading of Internet newsmagazines. Communication Research. 2003; 30:3–29. DOI: 10.1177/0093650202239023

Knobloch-Westerwick, S. Informational utility. In: Donsbach, W., editor. International encyclopedia of communication. Malden, MA: Blackwell; 2008. p. 2273-2276.

Knobloch-Westerwick, S. Communication Research. 2014. The selective exposure self- and affect-management (SESAM) model: Applications in the realms of race, politics, and health. Advance online publication

Knobloch-Westerwick, S. Choice and preference in media use: Advances in selective exposure theory and research. New York, NY: Routledge; 2015.

Knobloch-Westerwick S, Dillmann Carpentier F, Blumhoff A. Selective exposure effects for positive and negative news: Testing the robustness of the informational utility model. Journalism & Mass Communication Quarterly. 2005; 82:181–195. DOI: 10.1177/107769900508200112

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Knobloch-Westerwick S, Johnson BK, Westerwick A. To your health: Self-regulation of health behavior through selective exposure to online health messages. Journal of Communication. 2013; 63:807–829. DOI: 10.1111/jcom.12055

Knobloch-Westerwick S, Sarge MA. Impacts of exemplification and efficacy as characteristics of an online weight-loss message on selective exposure and subsequent weight-loss behavior. Communication Research. 2015; 42:547–568. DOI: 10.1177/0093650213478440

Lazarsfeld, PF., Berelson, BR., Gaudet, H. The people's choice: How the voter makes up his mind in a presidential campaign. 3rd. New York, NY: Columbia University Press; 1968.

Lazarus, RS. Emotion and adaptation. New York, NY: Oxford University Press; 1991.

Liang KY, Zeger SL. Longitudinal data analysis using generalized linear models. Biometrika. 1986; 73:13–22. DOI: 10.1093/biomet/73.1.13

Long, JS. Regression models for categorical and limited dependent variables. Thousand Oaks, CA: Sage; 1997.

MacCallum RC, Zhang S, Preacher KJ, Rucker DD. On the practice of dichotomization of quantitative variables. Psychological Methods. 2002; 7:19–40. DOI: 10.1037//1082-989x.7.1.19 [PubMed: 11928888]

Miles A, Voorwinden S, Chapman S, Wardle J. Psychologic predictors of cancer information avoidance among older adults: The role of cancer fear and fatalism. Cancer Epidemiology, Biomarkers and Prevention. 2008; 17:1872–1879. DOI: 10.1158/1055-9965.EPI-08-0074

Millar MG, Millar K. Negative affective consequences of thinking about disease detection behaviors. Health Psychology. 1995; 14:141–146. DOI: 10.1037/0278-6133.14.2.141 [PubMed: 7789349]

Moriarty CM, Stryker JE. Prevention and screening efficacy messages in newspaper accounts of cancer. Health Education Research. 2008; 23:487–498. DOI: 10.1093/her/cyl163 [PubMed: 17289658]

Napoli, PM. Audience evolution: New technologies and the transformation of media audiences. New York, NY: Columbia University Press; 2011.

Ng, SH., Bradac, JJ. Power in language: Verbal communication and social influence. Thousand Oaks, CA: Sage; 1993.

O'Keefe DJ. Justification explicitness and persuasive effect: A meta-analytic review of the effects of varying support articulation in persuasive messages. Argumentation and Advocacy. 1998; 35:61–75.

Pan B, Hembrooke H, Joachims T, Lorigo L, Gay G, Granka L. In Google we trust: Users' decisions on rank, position, and relevance. Journal of Computer-Mediated Communication. 2007; 12:801–823. DOI: 10.1111/j.1083-6101.2007.00351.x

Pennebaker, JW., Booth, RJ., Francis, ME. Linguistic Inquiry and Word Count: LIWC. Austin, TX: LIWC.net; 2007.

Pennebaker, JW., Chung, CK., Ireland, ME., Gonzales, A., Booth, RJ. The development and psychometric properties of LIWC2007. Austin, TX: LIWC.net; 2007.

Rains SA. The nature of psychological reactance revisited: A meta-analytic review. Human Communication Research. 2013; 39:47–73. DOI: 10.1111/j.1468-2958.2012.01443.x

Rozin P, Royzman EB. Negativity bias, negativity dominance, and contagion. Personality and Social Psychology Review. 2001; 5:296–320. DOI: 10.1207/s15327957pspr0504_2

Slater MD. Reinforcing spirals: The mutual influence of media selectivity and media effects and their impact on individual behavior and social identity. Communication Theory. 2007; 17:281–303. DOI: 10.1111/j.1468-2885.2007.00296.x

Sperber, D. Explaining culture: A naturalistic approach. Malden, MA: Blackwell; 1996.

Stroud, NJ. Niche news: The politics of news choice. New York, NY: Oxford University Press; 2011.

Sunstein, CR. Republic.com 2.0. Princeton, NJ: Princeton University Press; 2007.

Tausczik YR, Pennebaker JW. The psychological meaning of words: LIWC and computerized text analysis methods. Journal of Language and Social Psychology. 2010; 29:24–54. DOI: 10.1177/0261927x09351676

Witte K, Allen M. A meta-analysis of fear appeals: Implications for effective public health campaigns. Health Education and Behavior. 2000; 27:591–615. DOI: 10.1177/109019810002700506 [PubMed: 11009129]

Zillmann D. Mood management through communication choices. American Behavioral Scientist. 1988; 31:327–340. DOI: 10.1177/000276488031003005

Zillmann, D., Bryant, J. Selective-exposure phenomena. In: Zillmann, D., Bryant, J., editors. Selective exposure to communication. Hillsdale, NJ: Lawrence Erlbaum; 1985. p. 1-10.

Zillmann D, Chen L, Knobloch S, Callison C. Effects of lead framing on selective exposure to Internet news reports. Communication Research. 2004; 31:58–81. DOI: 10.1177/0093650203260201

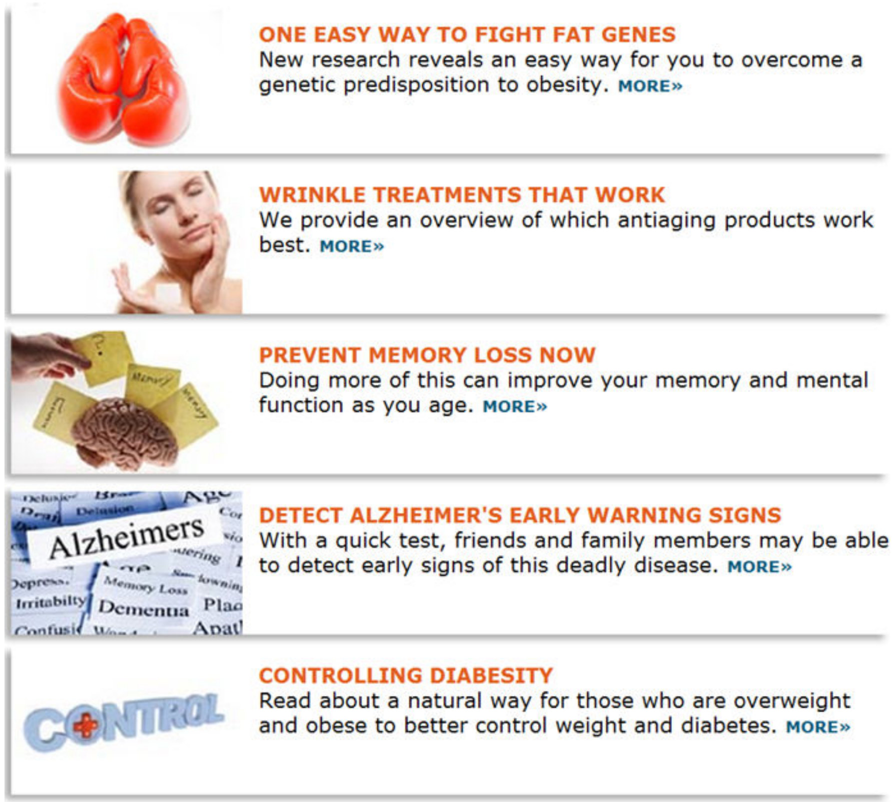

Figure 1.

A screenshot of the newsletter. Only the first five headlines are shown here.

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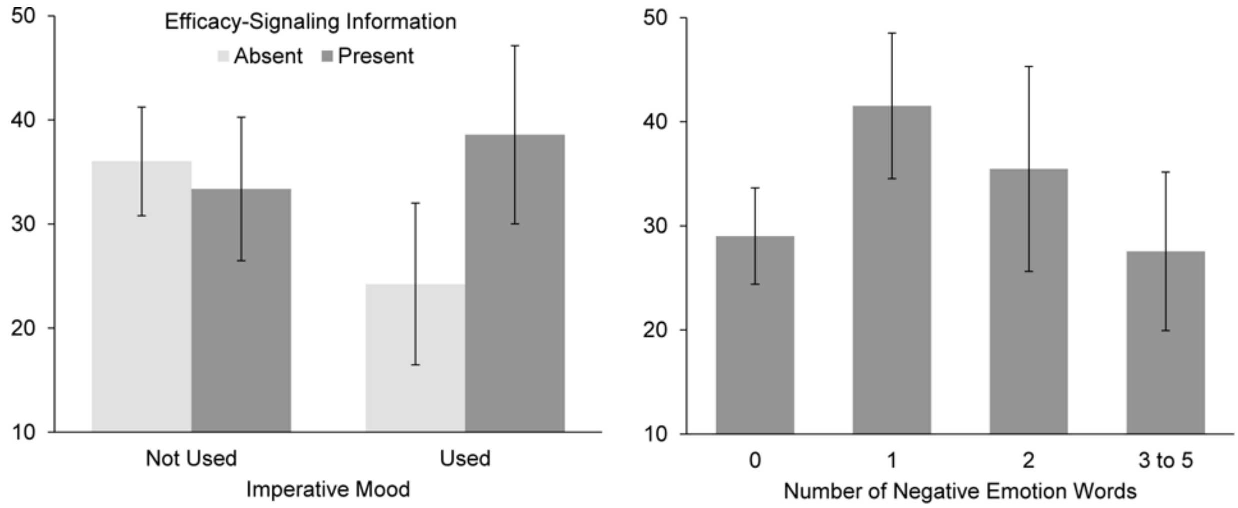

Figure 2.
Interaction effect between the presence of efficacy-signaling information and the use of the imperative mood on selection count (Left). Effect of the number of negative emotion words on selection count (Right). Values in Y-axis are predicted selection frequencies that are adjusted for other predictors. Error bars represent 95% confidence intervals.

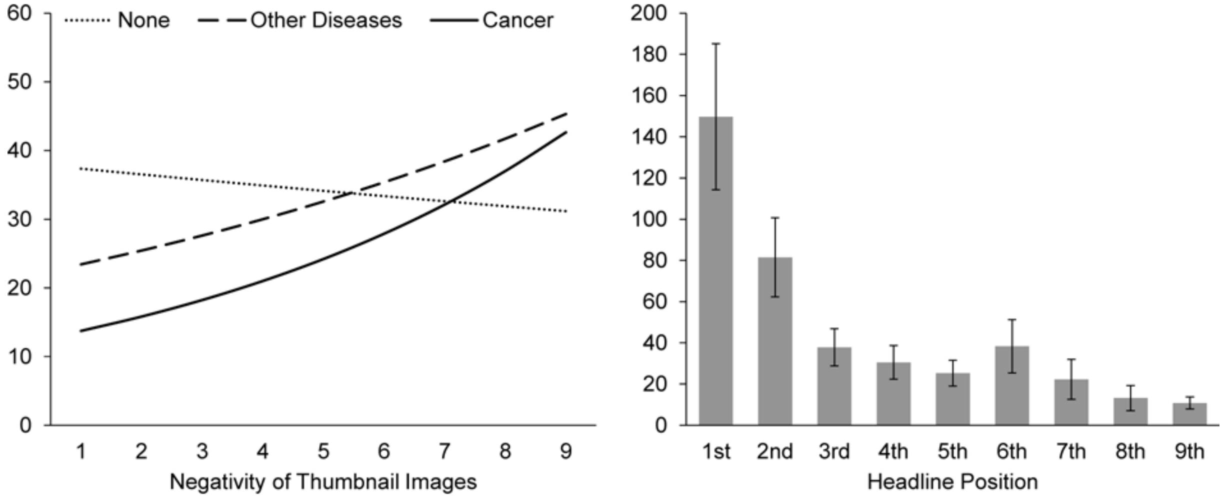

Figure 3.

Interaction effect between the negativity of thumbnail images and the mention of cancer or other diseases on selection count (Left). Effect of headline position on selection count (Right). Values in Y-axis are predicted selection frequencies that are adjusted for other predictors. Error bars represent 95% confidence intervals.

Table 1

Negative Binomial GEE Models of Headline Selection Count

	Model 1	Model 2
Efficacy-Signaling Information Presented	1.21 [0.97, 1.52]	0.93 [0.69, 1.25]
Imperative Mood Used	0.95 [0.78, 1.16]	0.67* [0.48, 0.94]
Efficacy × Imperative Mood		1.72* [1.11, 2.65]
Professional Source Mentioned	0.95 [0.74, 1.23]	1.02 [0.80, 1.32]
Number of Negative Emotion Words		
1 vs. 0	1.27+ [0.98, 1.63]	1.43** [1.12, 1.83]
2 vs. 0	1.13 [0.83, 1.55]	1.22 [0.90, 1.66]
3 to 5 vs. 0	1.01 [0.73, 1.40]	0.95 [0.70, 1.30]
Negativity of Thumbnail Images	1.07* [1.01, 1.13]	0.98 [0.89, 1.07]
Cancer or Other Diseases Mentioned		
Non-Cancer Diseases Mentioned vs. None	0.95 [0.76, 1.19]	0.99 [0.79, 1.24]
Cancer Mentioned vs. None	0.76+ [0.57, 1.02]	0.75+ [0.57, 1.01]
Image-Negativity × Cancer/Diseases Mentioned		
Image-Negativity × Non-Cancer Diseases		1.11+ [0.99, 1.24]
Image-Negativity × Cancer		1.18* [1.02, 1.36]
Headline Position		
2nd vs. 1st	0.49*** [0.34, 0.70]	0.54*** [0.38, 0.78]
3rd vs. 1st	0.25*** [0.17, 0.35]	0.25*** [0.18, 0.36]
4th vs. 1st	0.18*** [0.13, 0.26]	0.20*** [0.14, 0.29]
5th vs. 1st	0.17*** [0.13, 0.24]	0.17*** [0.13, 0.23]
6th vs. 1st	0.27*** [0.17, 0.43]	0.26*** [0.17, 0.39]
7th vs. 1st	0.15*** [0.09, 0.27]	0.15*** [0.09, 0.25]
8th vs. 1st	0.09*** [0.05, 0.14]	0.09*** [0.05, 0.15]
9th vs. 1st	0.07*** [0.05, 0.10]	0.07*** [0.05, 0.10]
Model 2 vs. Model 1		χ^2 (3) = 11.95**

Note. N = 324. Cell entries are incidence rate ratios with 95% confidence intervals in brackets. The Huber-White (sandwich) method was used to estimate robust standard errors. An exchangeable correlation structure was assumed in the model. Negativity of Thumbnail Images was mean-centered before entry (Model 2). The following control variables were included in the model but not shown here for brevity: headline month, version of headline list, number of positive emotion words, word count, number of words with 7 or more letters, question marks (binary), second person pronouns (binary), quantifier words (binary), insight words (binary), tentative words (binary), inhibition words (binary), type of image object, color brightness (binary), image-text link (binary). A full table is available upon request from the authors.

+ $p < .07$,

* $p < .05$,

** $p < .01$,

*** $p < .001$.