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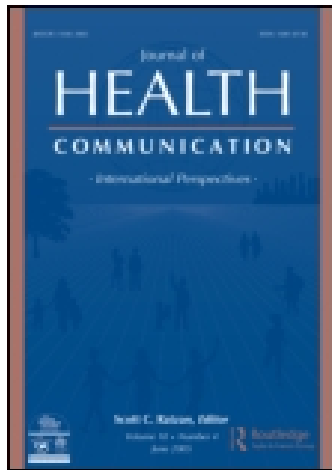
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Physician Review Websites: Effects of the Proportion and Position of Negative Reviews on Readers' Willingness to Choose the Doctor

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Health consumers are increasingly turning to physician review websites to research potential health care providers. This experiment examined how the proportion and position of negative reviews on such websites influence readers' willingness to choose the reviewed physician. A 5×2 (Proportion of Negative Reviews \times Position of Negative Reviews) factorial design was implemented, augmented with two standalone comparison groups. Five hundred participants were recruited through a crowdsourcing website and were randomly assigned to read a webpage screenshot corresponding to 1 of 12 experimental conditions. The participants then completed a questionnaire that assessed evaluations of and cognitive elaborations (thoughts) about the physician. The authors hypothesized that readers would be less willing to use a physician's services when reviews were predominantly negative and negative comments were positioned before positive comments. As hypothesized, an increase in the proportion of negative reviews led to a reduced willingness to use the physician's services. However, this effect was not moderated by the level of cognitive elaboration. A primacy effect was found for negative reviews such that readers were less willing to use the physician's services when negative reviews were presented before positive reviews, rather than after. Implications for future research are discussed.

The role of the patient in health care is undergoing a remarkable transition, driven by the health consumerism movement, in which patients are increasingly seeking empowerment and expressing a preference for active participation in their medical visits (Lorence, Park, & Fox, 2006). At the core of this movement is the view that patients should take greater responsibility for managing their own health care. One of the most important decisions a health consumer must make is the selection of a primary care physician.

When searching for a physician, people have traditionally relied on acquaintances, friends, and family to learn about prospective physicians before they make a choice (Harris, 2003). However, the Internet offers an additional source of information when searching for a physician (Harris, Buntin, & Robert Wood Johnson Foundation, 2008; Mostaghimi, Crotty, & Landon, 2010). Information about physicians is often provided by health care organizations and health insurance companies on their corporate websites (Reimann & Strech, 2010). The present study focuses on physician review sites (PRSs), examples of which include RateMDs (www.ratemd.com) and the Doctor Scorecard (www.drscorecard.com). In addition to providing basic

information about a physician, such as the physician's address, business hours, certifications, and graduate school training, PRSs provide a platform for patients to share their opinions of the physician with others.

In the United States, about one fifth of physicians have been rated on major PRSs, with many new physicians and reviews being added every year (Emmert, Sander, & Pisch, 2013; Gao, McCullough, Agarwal, & Jha, 2012). Although these sites vary in their format, patients are usually given the opportunity to evaluate the physician with rating scales or by posting their own narrative reviews, which have the potential to provide information about the quality of physicians (Segal et al., 2012). Reimann and Strech (2010) systematically analyzed the rating scales these sites present to people to evaluate their doctors. Thirteen dimensions of patients' experience and satisfaction were identified, such as the physician's professional competence, interpersonal style, and communication skills. Although patients can post anonymously and without fear of retribution from the physician (Segal, 2009), studies indicate that the majority of opinions penned have been positive (Ellimoottil, Hart, Greco, Quek, & Farooq, 2012; Kadry, Chu, Kadry, Gammas, & Macario, 2011; Lopez, Detz, Ratanawongsa, & Sarkar, 2012) and about one half of patients' reviews contain information intended to guide others' choice of medical care (Lagu, Hannon, Rothberg, & Lindenauer, 2010).

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Because of their descriptive nature, content analyses of PRSs cannot address the effects of reviews on readers' willingness to choose the physician for their personal care. We thus experimentally tested the effects of two very basic features of patient reviews on readers' evaluations of physician in this initial investigation: the proportion of reviews that negatively evaluate the focal physician and the position of these negative reviews in the series of reviews made about that physician. The role of cognitive elaboration was also examined using thought-listing procedures developed for studies guided by the Elaboration Likelihood Model (Petty & Cacioppo, 1986).

Influence of Online Comments on Readers' Perceptions

Improvements in technology have transformed the World Wide Web from a traditional one-way medium to a more interactive platform (Duffy & Thorson, 2009). One noticeable advance is that almost any Internet user can contribute content to many websites (Chakravarty, Liu, & Mazumdar, 2010; Walther & Jang, 2012). For example, the eBay (www.ebay.com) and Amazon (www.amazon.com) reputation systems allow a buyer to leave comments about the seller after a transaction. Likewise, the Rate My Professor (www.ratemyprofessors.com) website enables students to provide reviews of their instructors (Edwards, Edwards, Qing, & Wahl, 2007).

Empirical studies carried out in a variety of contexts have demonstrated that peer-generated comments have the potential to influence individuals' perceptions and behaviors. In their review of studies of eBay, Resnick, Zeckhauser, Swanson, and Lockwood (2006) found that buyers' positive feedback led to higher bidding prices and greater probability of sale, whereas negative feedback had the opposite effect. Edwards and colleagues (2007) tested the influence of online reviews on students' perceptions of instructors and course content. Students who read positive reviews about an instructor evaluated the instructor more positively and had stronger motivation to learn from the instructor than did those who read no reviews or negative reviews. Walther, DeAndrea, Kim, and Anthony (2010) found that supportive comments displayed with an antimarijuana public service announcement led to more favorable evaluations of the announcement, whereas derisive comments resulted in more negative evaluations.

Proportion of Negative Reviews

Patients' reviews about physicians are likely to be perceived as credible and informative to visitors of a PRS because they represent other patients' direct experiences. These online reviews are especially likely to address physicians' professional competence and medical professionalism. It is thus not surprising that studies conducted outside the health care context have shown that negative reviews tend to lead to negative evaluations (Edwards et al., 2007; Resnick et al., 2006; Walther et al., 2010). However, research published to date has been limited by a restricted variance in the proportion of positive or negative reviews. Past studies have

typically compared review sets that are predominantly positive to sets that are mostly negative, which does not allow for a precise understanding of the nature of the relation between review valence and perceptual outcomes. For example, in their study on students' perceptions of professors, Edwards and colleagues (2007) contrived two sets of reviews containing exclusively positive or negative evaluations on a professor. Walther and colleagues (2010) used a similar design to examine the effect of online comments on viewers' perception on antimarijuana public service announcements. This study attempts to address this limitation in past research by examining the effects of a wider range of proportions of positive and negative reviews in the context of PRSs. In line with past research (Edwards et al., 2007; Houser & Wooders, 2006; Lucking-Reiley, Bryan, Prasad, & Reeves, 2007; Walther et al., 2010), it was expected that as the proportion of negative reviews increases in a set of online reviews about a physician, willingness to choose the physician's services will decrease. We also argue, however, that this negative effect is not necessarily a linear function of the proportion of negative comments. Although no prior study has empirically addressed this issue with regard to PRSs, research on eBay rating system provides some insight into this matter.

As Livingston (2005) pointed out, the majority of previous research on the eBay rating system assumed that the relationship between bidding price (or sale probability) and the number of positive rating was linear or log linear, but this assumption might not be true. He speculated that bidding behavior is largely affected by the first few ratings. Later ratings beyond the first few, he argued, should have a much smaller effect on the bid amount, because once the bidders formed an impression of a seller's credibility, there is little room to alter the impression. As expected, Livingston's (2005) study found that the first few positive ratings on eBay sellers had a larger effect than did subsequent positive ratings. Given the inconsistency of findings in extant literature, we advanced two competing hypotheses:

- Hypothesis 1a: There will be a negative linear relationship between the proportion of negative reviews of a physician in a PRS and readers' willingness to use the physician's services.
- Hypothesis 1b: There will be a quadratic relationship between the proportion of negative reviews on a physician in a PRS and readers' willingness to use the physician's services such that each incremental increase in negative reviews will have a diminishing effect on willingness.

The hypothesized effect of the proportion of negative reviews on willingness to use the physician's services may differ as a function of the degree of issue-relevant thinking readers have when they process the PRS page for the physician. Methods for measuring such thinking (cognitive elaboration) have been developed for investigations informed by the Elaboration Likelihood Model, which contends that people tend to rely on one of two distinctive routes when

confronted with a message, the central route and the peripheral route (Petty & Cacioppo, 1986). The two routes differ in the nature and extent of cognitive elaboration, which is defined in the Elaboration Likelihood Model research tradition as the extent to which a person engages in issue-relevant thinking (Petty & Cacioppo, 1986). In the context of PRSs, the critical issue that readers consider is whether the physician would be a desirable provider of health care. Therefore, “issue-relevant thinking” in this context is composed of thoughts related to the physician. The central route is taken when the individual forms an opinion based on such issue-relevant thinking. People who approach high end of elaboration tend to involve the central route by carefully scrutinizing all available information before making a judgment (Petty & Cacioppo, 1984; Petty & Wegener, 1999). As Petty and Cacioppo (1984) emphasized in their work, when people have high elaboration, even a peripheral cue (e.g., source credibility) “does not serve as a simple acceptance or rejection cue, but may be considered along with all other available information in the subject’s attempt to evaluate the true merits of the arguments and position advocated” (p. 671). In contrast, when an individual is unable or unwilling to process a message through high elaboration, a decision may be formulated via the peripheral route. Readers who exhibit higher elaboration pertaining to the physician are likely to carefully analyze all available information, including the proportion of negative reviews. We thus proposed the following hypothesis.

Hypothesis 2: The detrimental effect of proportion of negative reviews on willingness to use the physician’s services will increase with the amount of physician-relevant thinking.

Position of Negative Reviews

Our second set of hypotheses pertains to the effects of the order in which positive and negative reviews are presented. We anticipated that the position of patient reviews on PRSs would influence readers’ willingness to use the physician’s services. There is an absence of research on this question with regard to PRSs, but order effects have been investigated extensively in persuasion and impression formation research, showing support for primacy and recency effect (Haugtvedt & Wegener, 1994; Hennessy, Fishbein, Curtis, & Barrett, 2007; Li, 2010; Rosnow, 1966).

A primacy effect is present when information presented first has a greater effect on people’s perceptions than subsequent information. For example, a person described as “intelligent, industrious, impulsive, critical, stubborn, envious” will likely be perceived more favorably than will a person described as “envious, stubborn, critical, impulsive, industrious, intelligent” (Ash, 1946). In contrast, a recency effect is present when information presented last has the greater effect. For example, an individual described as extroverted after being portrayed as an introverted person would be evaluated more extroverted (Luchins, 1958).

The findings on primacy and recency effect are mixed, leading researchers to try to identify the circumstances

under which each effect is most likely to occur (Horgath & Einhorn, 1992; Stewart, 1965). It appears that people tend to weigh earlier information more in their evaluations if their task is to provide a final judgment upon reading all the stimuli. On the other hand, if people respond to stimuli through a step-by-step procedure (e.g., providing evaluations immediately after reading each piece of information), the recency effect is more likely to be observed (Horgath & Einhorn, 1992; Luchins, 1958; Stewart, 1965). Given that the participants in the present study were asked to make a holistic judgment about the reviewed physician only after reviewing all comments, a primacy effect was predicted. In addition, people have usually been found to use early information as an anchor and to make insufficient judgments of information presented later in the sequence (Biswas, Biswas, & Chatterjee, 2009). Because of the scarcity of other information on the physician, the first comment is expected to become highly diagnostic and thus become a better indicator of the physician’s services than subsequent comments. We thus anticipated that reviews on PRSs would produce a primacy effect, with readers forming an impression about the physicians based principally on their initial few reviews. Thus, even when adjusting for the proportion of negative reviews in a set of reviews, we expected that readers would be less willing to use a doctor’s services when those negative reviews appear at the beginning of the reviews section, rather than at the end. Accordingly, we hypothesized the following:

Hypothesis 3: Readers’ willingness to use a physician’s services will be lower when negative reviews of the physician are presented before positive reviews, rather than after.

Method

Participants

A total of 666 members of the MTurk community who resided in the United States participated in the experiment, which was carried out online. Six screening criteria were employed. Specifically, respondents were dropped from the study if they (a) did not submit their data from a unique IP address, (b) spent less than 30 seconds reviewing the webpage,¹ (c) took less than 2 minutes reading and answering questions, (d) failed to complete the thought-listing task, (e) reported veridical suspicions about the objectives of the study, or (f) withdrew their data after being debriefed (an institutional board review requirement). A total of 166 cases (24.9%) that failed to meet one or more of the criteria were discarded, leaving exactly 500 cases for analysis.

Experimental Design

The experiment was conducted using Qualtrics Labs, Inc. software (version 12.018). A 5 (proportion of negative reviews: 17%, 33%, 50%, 67%, 83%) × 2 (position of negative reviews:

¹The amount of time spent with the webpage was covertly recorded to identify individuals who did not appear to have taken the study seriously.

Table 1. Counterbalanced experimental design based on a 2×5 factorial design with 2 additional standalone groups

Comment order ^b	Position: Negative reviews first ^a					Position: Negative reviews last ^a					Standalone groups	
	1	2	3	4	5	1	2	3	4	5	0 negative reviews	6 negative reviews
ABFCED	-+++++	--++++	---+++	----++	-----+	+++++-	++++-	+++-	+-	+-----	+++++	-----
BCADFE	-+++++	--++++	---+++	----++	-----+	+++++-	++++-	+++-	+-	+-----	+++++	-----
CDBEAF	-+++++	--++++	---+++	----++	-----+	+++++-	++++-	+++-	+-	+-----	+++++	-----
DECFBA	-+++++	--++++	---+++	----++	-----+	+++++-	++++-	+++-	+-	+-----	+++++	-----
EFDACB	-+++++	--++++	---+++	----++	-----+	+++++-	++++-	+++-	+-	+-----	+++++	-----
FAEBDC	-+++++	--++++	---+++	----++	-----+	+++++-	++++-	+++-	+-	+-----	+++++	-----

Note. The plus sign stands for a positive review, whereas the minus sign stands for a negative review. Thus, “+-----” indicates that the first two reviews were positive and the last four were negative.

^aNumber of negative reviews out of six.

^bReview order refers to the order of the six patient reviews, represented as A–F in the table. Reviews are described in Table 3. Orders are based on a balanced Latin square design as described in the text.

Table 2. Positive and negative versions of each review

Review	Positive version	Negative version
A	Dr. Bartlett is a very caring person. He always makes me feel comfortable and pays attention to what I say.	Dr. Bartlett is very uncaring person. He always makes me feel uncomfortable and doesn't pay attention to what I say.
B	Dr. Bartlett's very knowledgeable. He's open to discussion and is interested in what I think. 😊	Dr. Bartlett's not very knowledgeable. He's not open to discussion and isn't interested in what I think. ☹️
C	Amazing! Dr. Bartlett was soooo kind and caring. He took his time and answered my questions. He did not seem rushed. Dr. Bartlett was even on time for my appointment! My past doctors were always late.	Disappointing! Dr. Bartlett was soooo unkind and uncaring. He didn't take time to answer my questions. He seemed rushed. Dr. Bartlett was even late for my appointment! My past doctors were always punctual.
D	My experience with Dr. Bartlett has been a wonderful one. He has a lot of experience and many skills. He ordered the tests I needed without me having to ask. The meds he gave me helped me to feel better after a week.	My experience with this doctor has been a terrible one. He has little experience and few skills. He ordered the tests I needed, but only after I begged. The meds he gave me did not help me to feel better, even after a week.
E	Dr. Bartlett took the time to listen to me. He diagnosed my problem. He was willing to talk with me about different things we could do for my infection. He even spent time telling me a good joke (lol). One of the BEST doctors I've ever had!	Dr. Bartlett didn't take the time to listen to me. He misdiagnosed my problem. He was unwilling to talk with me about different things we could do for my infection. He even wasted time telling me a bad joke (col). One of the WORST doctors I've ever had!
F	Dr. Bartlett is an amazing person. He takes on only as many patients as he has time for and spends a lot of time with each of us. I have recommended him to friends.	Dr. Bartlett is an awful person. He takes on as many patients as he can get and spends very little time with each of us. I would not recommend him to friends.

negative reviews presented first vs. last) factorial design was used. The order of the six reviews was counterbalanced across the factorial design by using a balanced Latin square design in which each of the six reviews preceded and followed every other review once (Table 1). To examine a full range of proportion of negative reviews, two additional standalone comparison groups with only positive (i.e., 0% negative reviews) or only negative reviews (i.e., 100% negative reviews) on a physician were included. These are standalone conditions because it is not possible to assess the primacy effect for reviews that are all positive or all negative. Thus, this experiment consists of 12 experimental conditions defined by the factorial design plus the all-negative reviews and all-positive reviews conditions.

Participants were randomly assigned to one of the 12 experimental conditions and then asked to view a webpage of a (faux) PRS with six comments about a physician. Participants were instructed to go to a questionnaire on the next page once they felt they had a good understanding of the webpage and could answer questions about it.

Stimulus Materials

A total of 12 versions of a faux physician profile on a PRS webpage were created for this study, one for each experimental condition. Each page contained a review section with six reviews about a primary care physician, Dr. Alex Bartlett. Each of the six reviews had a negative and positive version, created by using the antonyms of a few key words. For example, a positive review was "Dr. Bartlett is a very caring person. He always makes me

feel comfortable and pays attention to what I say." The corresponding negative version was "Dr. Bartlett is a very uncaring person. He always makes me feel uncomfortable and doesn't pay attention to what I say." Efforts were made to keep constant the word length and reading levels of the two versions for each review, as noted in Table 2. Patient reviews were written in casual language and made occasional use of Internet abbreviations (e.g., "lol") and emoticons (e.g., 😊 and ☹️) to invite the inference among research participants that the reviews were authentic evaluations of a real physician by his real patients on an actual PRS.

To manipulate the proportion of negative reviews, the number of negative reviews out of the six reviews was varied from no negative reviews (0% negative) to six negative reviews (100% negative). The order of the reviews was manipulated to test the primacy effect for negative reviews. In the primacy condition, the negative reviews were displayed before the positive reviews. In the recency condition, the negative reviews were presented after the positive reviews. As previously noted, the two standalone groups were excluded from the manipulation of position because primacy cannot be studied in a set of exclusively positive or exclusively negative reviews. Patient reviews were the only manipulated feature of the PRS presented to respondents; the doctor's profile and all visual elements of the PRS were held constant. The doctor's profile provides basic information about the doctor, including the doctor's name (Dr. Alex Bartlett), gender (male), and specialty (family/general practitioner). Other background information such as phone number, graduate school, and year was blocked out in each condition.

Measures

Willingness to Use the Physician's Services

The respondent's willingness to use Dr. Bartlett's services was assessed with two items: "Let us suppose that you needed to find a new doctor. How willing would you be to choose this physician?" and "Suppose that a close member of your family asked you to find a new doctor for him or her. How willing would you be to recommend this doctor to your family member?" A 5-point scale was used for both items, which were highly correlated and thus averaged to create a composite score ($\alpha = .95$).

Issue-Relevant Thinking

Participants were then asked to list all the thoughts that they had while reading the website page (Cacioppo & Petty, 1981). Two independent coders unitized the written thoughts into units. A thought unit was defined as any statement that can stand alone as an independent idea, whether grammatically correct or not. On the basis of Krippendorff's (2004) alpha, unitizing was considered reliable ($\alpha = .91$). The unitized thoughts were then categorized into three groups: (a) *doctor thoughts*, which involved any thoughts about the physician (e.g., profile information and medical competence); (b) *review thoughts*, which pertained to the reviews, the reviewers, or the numerical ratings which were masked; and (c) *issue-irrelevant thoughts*, which contained other thoughts not included in the first two categories. Two coders independently categorized the units with satisfactory reliability (percentage agreement = .92, Krippendorff's $\alpha = .88$). Level of elaboration is usually assessed as the number of issue-relevant thoughts by the message recipient. Given that issue relevant thinking in this study was physician-relevant thinking, we operationalized this measure as the sum of *doctor thoughts* and *review thoughts*; issue-irrelevant thoughts were ignored.

Manipulation Check

To determine whether the manipulation of the position of the reviews was successful, participants were asked about whether they thought the most recent reviews (placed on the top of the list) were more positive, or negative than, or did not differ in valence from the older reviews found at the bottom.

Data Analysis

Data were analyzed using SPSS 21. Basic descriptive statistics were used to profile the sample. To test the first set of rivaling hypotheses with regard to the linear or curvilinearity relationship between the proportion of negative reviews and willingness to use the physician's services, a regression involving linear and quadratic terms of the independent variable was conducted. The second hypothesis was tested via regression analysis by examining the statistical significance of Proportion of Negative Reviews \times Issue-Relevant Thinking interaction term, with willingness to use the physician's services serving as the dependent measure. The primacy effect predicted in the third hypothesis was

Table 3. Demographic characteristics of the sample ($N = 500$)

Characteristic	<i>n</i>	%
Female	260	52.0
Race		
White	263	52.6
Asian	155	31.0
Black	28	5.6
Hispanic	11	2.2
Other	43	8.6
Age (years)		
18–29	211	42.2
30–39	149	29.8
40–49	75	15.0
50–59	41	8.2
60–69	21	4.2
≥ 70	3	0.6
Education		
High school graduate or less	50	10.0
Some college no degree	102	20.4
Two-year degree	41	8.2
Bachelor's degree	204	40.8
Graduate degree	103	20.6
Household income (US\$)		
Less than 20,000	140	28.0
20,000 to <40,000	152	30.4
40,000 to <60,000	77	15.4
60,000 to <80,000	55	11.0
80,000 to <100,000	24	4.8
100,000 and higher	34	6.8
Decline to answer	18	3.6

assessed with an independent samples *t* test, excluding the two standalone groups that were single-valenced.

Results

Preliminary Analyses

Four preliminary analyses were carried out prior to hypothesis testing. First, we examined the characteristics of the sample, which is profiled in Table 3. The sample was fairly equally balanced between men and women and predominantly White and Asian. Most respondents were under the age of 40 years, college educated, and had a modest income of less than US\$40,000/year. Second, a series of one-way analyses of variance showed that the six orders of the review set for counterbalancing purpose had no significant main effects on willingness to use the physician's services or physician-relevant thinking (all $ps > .38$). Therefore, the counterbalancing order of the review set was not included in our subsequent analyses. Third, we examined the success of the review position (order) manipulation. The manipulation was deemed successful, as 86% of participants were able to identify the valence of the reviews corresponding to the order for their experimental group. Fourth, we computed descriptive statistics for the primary study variables, which are described in Table 4.

Table 4. Descriptive statistics for main study variables

Variable	<i>M</i>	<i>SD</i>	Observed range	Theoretical range	Reliability
Evaluation of the physician	5.70	2.61	1–10	1–10	.99 ^a
Willingness to use physician's services	2.66	1.21	1–5	1–5	.95 ^a
Issue-relevant thinking	5.94	3.53	0–19	0–unrestricted	.88 ^b

^aCronbach's (1951) alpha reliability coefficient.

^bKrippendorff's (2004) alpha for classification reliability. Before classification, thought units were extracted with a unitizing reliability of .91.

Proportion of Negative Reviews

Hypothesis 1a predicted a negative linear relationship between the proportion of negative reviews and respondents' willingness to use the physician's services. In contrast, competing Hypothesis 1b predicted a quadratic relationship between the two variables. Specifically, each incremental increase in negative reviews was expected to have a diminishing effect on readers' willingness to use the physician's services. A significant linear relationship was found between the proportion of negative reviews and readers' willingness to use the physician's services, $b = -3.14$, $t(1) = -6.58$, $R^2 = .49$, $p < .001$. However, the quadratic relationship was not significant, $b = 0.29$, $t(1) = -0.63$, $R^2 = .00$, $p = .53$. Therefore, hypothesis 1a was supported; the relationship between proportion of negative comments and willingness to use the physician's services was linear.

The second hypothesis predicted that the detrimental effect of proportion of negative reviews on willingness to use the physician's services would be moderated by the amount of physician-relevant thinking. Although in the predicted direction, the interaction between proportion of negative reviews and the amount of physician-relevant thinking was not significant, $\Delta r^2 = .001$, $F(1, 496) = 1.28$, $p = .26$. Compared with participants who engaged in lower levels of physician-relevant thinking, those who engaged in higher levels of physician-relevant thinking were not found to be more influenced by the proportion of negative reviews as they evaluate the physician. The hypothesis was not supported.

Primacy Effect

Evidence of a primacy effect for negative reviews was observed. As predicted by the third hypothesis, respondents expressed less willingness to use the physician's services when negative reviews were presented first in the physician review section ($M = 2.53$, $SD = 1.11$) than last ($M = 2.75$, $SD = 1.18$), $t(415) = -1.95$, $p < .05$ (one-tailed), $r^2 = .01$, Cohen's $d = .19$.

Discussion

As participatory websites gain more popularity among consumers, communication researchers have given increased attention to the ways in which these websites influence online users. In particular, investigators have examined features of website content, such as numerical ratings (Lee & Jang, 2010), and characteristics of the websites, such as their design (Westerwick, 2013) and credibility (Willemsen,

Neijens, & Bronner, 2012). However, rarely has research focused on features of online reviews other than their valence. The present study represents the first effort that we know of to experimentally test two features of online reviews – the valence of the reviews and the relative positioning of positive and negative reviews. Findings of the current study support three general conclusions.

First, online reviews about the physician profiled in a PRS substantially influenced people's perceptions of the physician, with a set of reviews containing a higher proportion of negative reviews leading to a reduced willingness to use the physician's services. The experimental manipulation of the proportion of negative reviews accounted for 49% of the variance in willingness to use the physician's services. Negative reviews were found to affect readers' willingness to use the physician's services in a linear fashion. We cannot rule out the possibility that this linear relationship reflects the small number of reviews incorporated into the stimulus materials. As the total amount of review increases, a curvilinear relationship predicted by Livingston (2005) might be observed. This is a topic for future investigation.

Second, the expected moderating effect of elaboration on the relationship between the proportion of negative reviews and willingness to use the physician's services was not observed in this study. The nonsignificant result, however, was in the predicted direction such that the adverse effect of negative reviews on willingness to use the physician's services increased with respondents' degree of issue-relevant (i.e., physician-relevant) thinking. It is possible that people who thought more about the reviews might also have taken into account other factors (e.g., reviewer's credibility) to a larger degree, which could have interfered with the effect of reviews on willingness to choose the physician's services. Although elaboration in this study was treated as a moderator, it should be noted that elaboration levels could also be affected by various message and source factors. For example, reviews rated as helpful (e.g., a thumb up) by many users might stimulate more elaboration than reviews not marked as helpful by other users of the PRS.

Third, evidence for a primacy effect was found; compared with people who read positive reviews first, those who were exposed initially to the negative reviews were less inclined to want to use the physician's services. This finding indicates that readers of online reviews may be more influenced by initial reviews than subsequent ones. We caution that the effect sizes for this primacy effect were small and paled in comparison with the effect observed for the proportion of negative reviews. Specifically, review positioning accounted

for only one percent of the variance in willingness to select the physician. It is possible that multiple reading of reviews would reduce the primacy effect further by exposing the reader to the full range of patients' opinions of the focal doctor. We suspected that the primacy effect would be magnified for review sections containing more reviews. When confronted with many reviews that have been sorted by valence, the reader might pay less attention to later reviews, and thus be more influenced by earlier reviews.

This study has limitations that point to new directions for future research. First, participants were instructed to review the faux webpage for at least two minutes before moving on to the question sections. These instructions could have led participants to pay more attention to the reviews than they would under more natural circumstances. As a result, the level of elaboration found in this experimental study could have been inflated in our procedure. On the other hand, it is possible that a real patient in search of a new physician would process online reviews with an even greater degree of elaboration than the participants in this experiment. Future research should examine how people approach and reflect upon PRS sites, perhaps by surveying patients who have recently changed physicians after visiting such a website.

A second limitation is that the focal doctor described in this experiment was a primary care physician. Future studies should compare how PRSs are used by patients seeking a provider for his or her primary care versus a specialist physician. We speculated that patients may rely more on primary care physician referrals, not other patients' reviews, when seeking specialty care. Because seeing a specialist often requires a referral from the primary care physician, patients may have limited control over the specialists they see, and thus feel little compulsion to investigate these physicians. Even so, online reviews can serve as a meaningful way for patients to learn more about the referred specialists and facilitate (or impede) physician-patient interaction.

Third, while examining the effects of proportion of negative reviews, we held constant the total number of reviews to six. It is possible that the effect of the proportion of negative reviews may change with an increasing number of reviews. Consider a PRS page with two reviews, one positive and one negative. A reader of such a set of reviews may be inclined to attribute the negative review to a disgruntled patient and dismiss it. However, such a response is less likely for a set of 10 reviews in which 5 are negative. Likewise, 100% positive reviews would no doubt carry more weight when unanimity was represented over a large set of reviews rather than just a few.

Fourth, this study focuses exclusively on the effect of PRSs on the patient. Little work has been carried out to date on whether physicians even monitor what patients write about them on these sites (Azu, Lilley, & Kolli, 2012). Nor do we know whether the physicians who do read their patients' reviews would find the comments to be constructive and would modify their practice behaviors based on the feedback in these reviews (Jain, 2010). Also unknown is the extent to which physicians make efforts to manage the content on their online reviews by responding to bad

reviews, by complaining to PRS administrators about unfair reviews, or by encouraging their satisfied patients to go online and provide them with a positive review.

A fifth limitation is that this experiment examined the effects of two features of narrative reviews. Other PRS content features not investigated also have the potential to influence people's judgments of a physician. For example, we need to know more about how visitors to PRSs make sense of numerical ratings of physicians and are influenced by such quantitative evaluations; how they make use of profile information, such as the credibility of the university granting the physician's medical degree, the doctor's age and years of experience, and the doctor's sex; and how they integrate narrative and quantitative information about the reviewed physician to form a judgment.

Sixth, the manipulation of proportion of negative reviews in this study contained an inherent, natural confound. It is not possible to manipulate the valence of a narrative review without altering the language used. We put great effort into minimizing the change in content by using the antonyms of a few key words in positive and negative versions of reviews. This confound cannot be altogether eliminated in a narrative review. It would be possible, however, for researchers to manipulate numerical summaries of reviews (e.g., 98% of reviewers liked this doctor) independent of the content of the reviews shown to readers.

Last, the outcomes examined in this study were perceptual in nature, not behavioral. Although our assessment of willingness to use the physician's services bears some resemblance to standard measures of behavioral intention, participants had no reason to believe that the physician described in the PRS they reviewed was even available to them. They did not know, for example, if the physician practiced medicine in their town, accepted their health plans, was taking new patients, and so forth. Future research thus needs to investigate behavioral outcomes, perhaps by studying the physician-search strategies of patients changing their health plans. For example, the peculiar American tradition of fall season open enrollment, when many employees are given the opportunity to change insurance plans (and providers), offers an opportunity for such naturalistic studies.

Consumers are increasingly turning to the Internet to glean insights from others when buying products and seeking services. People seeking a night out on the town often turn to online movie reviews to see what movies their peers enjoyed. Diners do the same to discover restaurants that others would recommend. Online buyers frequently investigate other customers' experiences with a seller before placing an order with that merchant. In today's world, it only makes sense that patients would seek the opinions of other patients when trying to find a health care provider. This study offers insights into how such reviews affect patients' assessments of potential providers.

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