ZOEY CHEN and NICHOLAS H. LURIE*

Prior research shows that positive online reviews are less valued than negative reviews. The authors argue that this is due to differences in causal attributions for positive versus negative information such that positive reviews tend to be relatively more attributed to the reviewer (vs. product experience) than negative reviews. The presence of temporal contiguity cues, which indicate that review writing closely follows consumption, reduces the relative extent to which positive reviews are attributed to the reviewer and mitigates the negativity bias. An examination of 65,531 Yelp.com restaurant reviews shows that review value is negatively related to review valence but that this negative relationship is absent for reviews that contain temporal contiguity cues. A series of lab studies replicates these findings and suggests that temporal contiguity cues enhance the value of a positive review and increase the likelihood of choosing a product with a positive review by changing reader beliefs about the cause of the review.

Keywords: word of mouth, negativity bias, temporal contiguity, causal attributions

Temporal Contiguity and Negativity Bias in the Impact of Online Word of Mouth

Online product reviews are an important information source for consumers (Chevalier and Mayzlin 2006). Word-of-mouth (WOM) communication is highly trusted by online shoppers (Nielsen 2009), and more than 60% of consumers consult online reviews before making buying decisions (Razorfish 2008). Practitioners are interested in WOM communication because it affects, among other things, consumers' willingness to pay for products (Ba and Pavlou 2002; Houser and Wooders 2006) as well as product sales (Chevalier and Mayzlin 2006; Godes and Mayzlin 2004; Liu 2006).

However, not all WOM has similar effects on consumer behavior. Although positive reviews are more prevalent (Fowler and De Avila 2009), they have less of an impact than negative reviews on product sales (Basuroy, Chatter-

jee, and Ravid 2003; Chevalier and Mayzlin 2006) and product evaluations (Herr, Kardes, and Kim 1991; Mizerski 1982). Although the negativity bias (i.e., the discounting of positive information) is well documented (Baumeister et al. 2001; Rozin and Royzman 2001), there is limited study of its moderators. In particular, research has paid little attention to factors that reduce the negativity bias.

This article shows that the presence of words and phrases indicating temporal proximity between product consumption and review writing, which we refer to as temporal contiguity cues, mitigates the negativity bias by increasing the perceived value (i.e., perceptions of the helpfulness of information provided by others for learning or making a decision; Weiss, Lurie, and MacInnis 2008) of positive reviews. Building on the ideas that information receivers (1) make attributions about WOM communication (Grice 1975), (2) use these attributions to assess the value of provided information (Friestad and Wright 1994), and (3) may have more reasons to attribute positive (vs. negative) WOM to factors other than the product experience (Mizerski 1982), we propose that the presence of temporal contiguity cues may mitigate the negativity bias by reducing the extent to which consumers attribute positive WOM to the reviewer versus the product experience.

We theorize that, in the absence of temporal contiguity cues, attributions of reviews to the reviewer (vs. product

experience) are stronger for positive than negative reviews. A possible explanation is that people have more personal reasons to talk about positive than negative product experiences. For example, a reviewer might write a positive review to feel good about his or her choices or to signal competence to others. If review readers share these inferences, a negativity bias results, because reviews become less valuable as they become less attributed to the underlying product and more attributed to alternative causes (Mizerski 1982).

In the same way that temporal contiguity leads to inferences of causality for physical events (i.e., between the actions of objects; Michotte 1963; Shanks, Pearson, and Dickinson 1989), cues that indicate temporal contiguity between the product experience and review writing should strengthen reader attributions that the product experience is the proximate cause of the review. However, this effect should be stronger for positive than for negative reviews because there may be few reasons other than the product experience itself to communicate negative information (Mizerski 1982). In other words, the presence of temporal contiguity cues may mitigate the negativity bias by changing reader beliefs about the cause of positive information.

This article makes several contributions. First, we contribute to research on the negativity bias by identifying an important and previously unexplored moderator. Specifically, we find evidence that temporal contiguity cues mitigate the negativity bias even in an environment in which negative information is less frequent and thus potentially more diagnostic (Skowronski and Carlston 1989). In addition to providing results that are inconsistent with a frequency account of the negativity bias, our results are also at odds with related accounts proposing that positive information is less attributed to the underlying stimulus because social norms increase the prevalence of positive information (e.g., Mizerski 1982). Instead, our findings suggest that the negativity bias in WOM is driven by differences in the perceived strength of the connection between product experiences and the reporting of these experiences.

Second, our work contributes to research on causal judgment. Although the role of temporal contiguity in facilitating perceptions of physical causality is well explored (Michotte 1963; White 1988), its study in the social psychological domain is limited (Buehner and May 2003). This article extends the concept of temporal contiguity to the social domain by demonstrating that people rely on temporal contiguity when judging information provided by others.

Third, this research offers insights to managers who are concerned about the excessive impact of negative reviews (Miller 2009). Although many studies have documented the implications of online WOM (Godes and Mayzlin 2004; Tirunillai and Tellis 2012), only recently has research begun to examine the psychological processes underlying the creation and evaluation of WOM (Berger and Schwartz 2011; Cheema and Kaikati 2010; Wojnicki and Godes 2013). This research helps marketers take actions that augment the value of positive information.

THEORETICAL BACKGROUND

The Negativity Bias

The negativity bias refers to the phenomenon in which people value positive information less than negative infor-

mation (Baumeister et al. 2001; Rozin and Royzman 2001). Previous research has found the negativity bias in numerous settings. For example, relative to negative traits, positive traits are less heavily weighted in person perception (Fiske 1980), positive product attributes are perceived as less diagnostic of product quality (Herr, Kardes, and Kim 1991; Mizerski 1982; Wright 1974), and positive reviews have a weaker effect on purchase decisions (Basuroy, Chatterjee, and Ravid 2003; Chevalier and Mayzlin 2006).

There are evolutionary, frequency-as-information, and attribution-based frequency accounts for the negativity bias. Evolutionarily speaking, people are more likely to survive and thrive if they pay careful attention to negative information because negative events are more consequential than positive ones (Baumeister et al. 2001; Rozin and Royzman 2001; Taylor 1991). From a frequency-as-information perspective, negative information is more informative because it is rarer and indicates a change from more frequently experienced positive states (Fiske 1980; Peeters and Czapinski 1990). The frequency account is supported by research that shows a positivity bias in environments in which positive information is rarer (Rozin and Royzman 2001; Skowronski and Carlston 1989). The frequency-as-information account might explain the negativity bias in online WOM because online positive reviews outnumber negative reviews eight to one (Decker 2006; Greenleigh 2011); yet positive reviews are less influential (Basuroy, Chatterjee, and Ravid 2003; Chevalier and Mayzlin 2006).

A related explanation for the negativity bias comes from frequency-based attribution accounts. These accounts propose that positive information is less attributed to the underlying stimulus and is therefore less influential because social norms make positive information more prevalent. Specifically, social norms lead people to provide positive information about products (Kanouse and Hanson 1972; Mizerski 1982). Because of this, negative information is rarer; this relative rarity increases its influence (Jones, Gergen, and Jones 1963; Mizerski 1982; Thibaut and Riecken 1955). In contrast, we propose that consumer attributions about positive versus negative information are based on their naive theories about the sources of such information.

Review Valence and Attributions

Previous research shows that consumers make inferences about why product information is shared and use these inferences to judge the value of this information (Friestad and Wright 1994). When evaluating persuasive communication, consumers assess the extent to which the communication is due to personal versus situational causes (Folkes 1988). For example, readers could attribute a positive restaurant review either to the reviewer's tendency to be positive in general (Mizerski 1982) or to the food and service being genuinely good. Consumers find WOM that is more attributed to the underlying product experience than to the information provider to be more persuasive. A possible explanation for the negativity bias is that positive reviews are more attributed to the reviewer (vs. product experience) than negative reviews because there may be more personal reasons (e.g., the reviewer's motivation, traits, moods, attitudes; Gilbert and Malone 1995) for the reviewer to engage in positive WOM.

For example, people may communicate positive information to "look good" to themselves or others. Product pur-

chases are mostly discretionary, and consumers are largely responsible for their own consumption outcomes. Because people have control over which products to buy, positive information about product choices signals competence, whereas negative information signals ineptitude (Angelis et al. 2012; Wojnicki and Godes 2013).[1] Similarly, because receivers associate the content of the message with the messenger (Kamins, Folkes, and Perner 1997; Manis, Folkes, and Perner 1974), information providers prefer to be couriers of good news rather than bearers of bad news (Bond and Anderson 1987; Manis, Cornell, and Moore 1974; Tesser and Rosen 1975). Furthermore, adherence to social norms of positivity may encourage reviewers to provide more positive information (Mizerski 1982; Rozin and Royzman 2001), and striving to achieve or maintain positive mood may lead reviewers to reflect on positive events (Isen, Nygren, and Ashby 1988; Isen and Patrick 1983).

In summary, one possible explanation for the negativity bias is that consumers may have more personal reasons to provide positive than negative WOM and are likely to assume that others behave with the same insights and knowledge (Epley et al. 2004; Nickerson 1999). As a result, positive WOM is more attributed to the reviewer (vs. product experience) than negative WOM. Because WOM decreases in value as it becomes relatively more attributed to nonproduct causes (Mizerski 1982), this should lead to a negativity bias. However, factors that decrease attributions of positive reviews to the reviewer or increase attributions to the product experience should attenuate this negativity bias. We propose that the presence of temporal contiguity cues is one such factor.

Temporal Contiguity and Causal Attributions

Temporal contiguity, the degree to which events are close to each other in time, is the dominant perceptual cue humans use to establish causality between physical events (Bullock, Gelman, and Baillargeon 1982; Einhorn and Hogarth 1986; Heider and Simmel 1944; Kummer 1995; Michotte 1963). In the absence of temporal contiguity, perception of causality is greatly impaired (Buehner and May

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[1]Under certain circumstances, people judge negative evaluators to be more intelligent and discriminating (Amabile and Glazebrook 1982; Schlosser 2005). Yet there is little empirical evidence that people believe that others engage in negative WOM for self-enhancement purposes. In a pilot study, we asked people whether they think (1) they and (2) other people would post positive or negative reviews to make themselves look good. Respondents overwhelmingly (18 of 20) indicated they expected others to post positive reviews to self-enhance and that they (19 of 20) would post positive (rather than negative) reviews to make themselves look good to others.

2003; Einhorn and Hogarth 1986; Michotte 1963; Shanks, Pearson, and Dickinson 1989).

Although studies of temporal contiguity have concentrated on causal attributions for physical events, social attribution research has hypothesized—but, to our knowledge, not empirically tested—the idea that temporal contiguity matters when making causal inferences about human behavior. For example, Kelley's (1973, p. 109) covariation model of attribution rests on the assumption that "a close temporal relation [is] essential to a causal interpretation" and that "effects are ordinarily assumed to occur closely after their causes." The idea that people use temporal contiguity to make attributions about others' actions is also consistent with research suggesting that the development of causal knowledge and the processing of causal information are carried out by a single general system (Anderson 1995; Siegler 1991; Sperber, Premack, and Premack 1995). In the case of an online review, this indicates that readers will use causal knowledge about temporal contiguity gained in the physical domain to make attributions about the proximate cause of the review; in particular, the presence of temporal contiguity cues will causally connect the product experience to the review, facilitating perceptions that the review is driven by the product experience rather than the reviewer. If readers are more likely to attribute positive reviews than negative reviews to the reviewer, the effect of temporal contiguity on increasing attributions of reviews to the product experience (vs. reviewer) and increasing review value should be stronger for positive than for negative reviews.

This discussion suggests the following set of testable hypotheses:

H_1: The presence of temporal contiguity cues increases the perceived value of positive reviews to a greater extent than negative reviews.

H_2: In the absence of temporal contiguity cues, positive reviews are more attributed to the reviewer (vs. product experience) than are negative reviews.

H_3: The presence of temporal contiguity cues increases attributions of reviews to the product experience (vs. reviewer) to a greater extent for positive than negative reviews.

Figure 1 summarizes the theoretical model. Five studies examine the hypotheses and the proposed attribution mechanism. Studies 1 and 2a use reviews from Yelp.com ("Yelp" hereafter) and experimental data to investigate whether the presence of temporal contiguity cues increases the perceived value of positive reviews to a greater extent than negative reviews. Studies 2b and 3 test the proposed mechanism through which temporal contiguity affects review

Figure 1
THE RELATIONSHIP BETWEEN VALENCE, ATTRIBUTION, VALUE, AND TEMPORAL CONTIGUITY
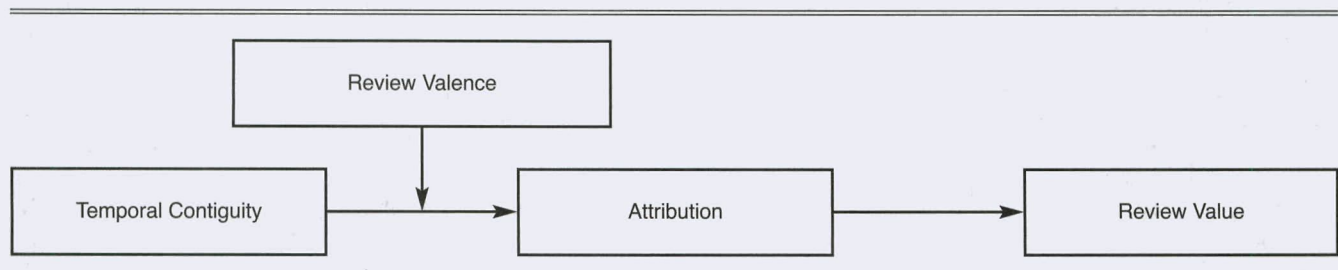
value. Study 4 examines whether the effects of temporal contiguity extend to choice.

STUDY 1: TEMPORAL CONTIGUITY CUES IN THE FIELD

Study 1 examines the influence of temporal contiguity cues on the perceived value of positive versus negative Yelp restaurant reviews. We chose this data source for two reasons. First, Yelp is one of the most popular service review sites on the web. With more than 50 million unique users (Kincaid 2011), Yelp is touted as being among the most socially oriented product review websites (Wang 2010). Yelp reviewers must register and create a profile that includes their location, name, hobbies, and interesting tidbits about themselves such as "Things I Love," "My Favorite Movie," and "My Last Meal on Earth." Reviewers have the option of uploading a photo to their profile; approximately 90% of the reviews in our sample are accompanied by a profile photo. Yelp encourages social interactions by allowing reviewers to "friend" one another and to send compliments with titles such as "You're Cool" and "Hot Stuff." Second, both consumer interest in restaurant reviews and merchant concerns about negative restaurant reviews are high (Keller and Fay 2006; Miller 2009). Thus, Yelp restaurant reviews offer a rich and important setting for us to examine the effects of temporal contiguity on the value of positive and negative online WOM.

Data

We extracted more than 65,000 Yelp reviews for the 19 or 20 most popular restaurants (in terms of number of reviews written) in five major cities (Atlanta, Chicago, Los Angeles, San Francisco, and New York; 98 restaurants total). The data consist of all available reviews for those restaurants as of June 17, 2010. We chose reviews from different cities to enhance generalizability and those from the most reviewed restaurants in each city because they tend to foster high levels of reader and reviewer involvement. For each review, we extracted the star rating (on a five-point scale, in which 5 is best), restaurant name, review text, review date, and the number of people who found the review to be useful. We also extracted the number of friends the reviewers had on Yelp, the number of reviews they had posted, whether they provided a profile photo, and whether they were a "Yelp Elite" (for a description of the characteristics of Yelp Elite reviewers, see "Reviewer-Specific Controls"). Appendix A shows a sample review illustrating the variables that we extracted.

Measures

We had a single dependent measure, value. We operationalized it as the number of "useful" votes a review received. In the following subsections, we describe our independent measures.

Review valence. We proxied review valence by the star rating (on a five-point scale, where 5 indicates a very positive experience) that accompanies the text of each review. The average review in our sample is positive (M = 3.98 of 5 stars); 10% of the reviews are negative (1 or 2 stars), 15% are neutral (3 stars), and 74% are positive (4 or 5 stars). The distribution of ratings in our sample is comparable to the distribution of star ratings across Yelp as a whole (Stoppel-

man 2009), suggesting that our data set is representative of Yelp reviews in general. The disproportionate number of positive reviews in our sample is also consistent with what researchers have found in other online platforms (Fowler and De Avila 2009).

Temporal cues. We identified two types of temporal cues. Temporal contiguity cues are words or phrases that indicate that the review was written on the day of product consumption (e.g., "today," "just got back"). We set this binary variable to 1 when a review contained such cues and 0 otherwise. To rule out the possibility that our results are driven by the presence of any temporal information in general, we created another variable, other temporal cues, which we coded as 1 if a review contained temporal information not captured by temporal contiguity cues (e.g., "last week," "Tuesday") and 0 otherwise. We categorized reviews with both types of temporal cues as temporally contiguous reviews.

Given the large number of reviews, hand coding of all temporal cues was infeasible. One author read 300 reviews and coded for the presence of temporal contiguity cues and other temporal cues. We extracted words and phrases used in temporal coding and inserted them into a text library (see Appendix B). We automated the coding process by using a computer program that checked reviews for library keywords. Using a separate sample of 500 hand-coded reviews, we found that the computer program correctly categorized more than 90% of reviews (intercoder reliability between machine and author coding was high: Cohen's $\kappa > .95$; Cohen 1960; Elliott and Woodward 2007).

Of the 65,531 reviews, 54,880 did not contain any temporal information. Of the remaining reviews, 2,448 contained temporal contiguity cues, and 8,203 contained only other temporal cues. It is important to note that the distribution of negative (star rating = 1 or 2), neutral (star rating = 3), and positive (star rating = 4 or 5) reviews was not significantly different in reviews written with temporal contiguity cues from those without these cues ($\chi^2(1) = 1.46$, $p = .49$; see Table 1). This reduces the possibility that the effects of temporal contiguity cues are driven by differences in their relative frequency in positive versus negative reviews.

Control Variables

To isolate the effects of review valence and the presence of temporal contiguity cues, we controlled for review- and reviewer-specific variables as well as restaurant-specific fixed effects. We briefly describe the control variables in the following subsections.

Review-specific controls. Review-specific controls were review age, calculated as the number of days between review posting and data collection (June 17, 2010), and review length. The average review in our sample is 142 words, and reviews written with temporal contiguity cues or other temporal cues are substantially longer (208 and 213 words, respectively).

Reviewer-specific controls. Reviewer-specific controls were the number of friends the reviewer has on Yelp, the number of reviews posted by the reviewer (log transformed to control for positive skew), whether the reviewer has a profile photo (1 = has photo, 0 otherwise), and whether the reviewer is a Yelp Elite member (1 = Yelp Elite, 0 otherwise; for descriptive statistics, see Table 1). Yelp Elite mem-

Table 1
YELP DATA DESCRIPTIVE STATISTICS

	Total	With Temporal Contiguity Cues	With Other Temporal Cues	With No Temporal Cues
N	65,531	2,448	8,203	54,880
Number of "Useful" votes	1.13	1.70	1.44	1.06
Valence (1–5 stars)	3.98	3.94	3.94	3.99
Review age (days)	391	359	386	394
Word count	142	208	213	128
Number of reviews	111	128	121	109
Number of friends	53	72	67	50
Photo (1 = profile photo present, 0 = not present)	.89	.90	.90	.88
Yelp Elite status (1 = Elite, 0 = not Elite)	.27	.33	.33	.26

bers are a subset of reviewers identified by Yelp on the basis of an application process in which reviewers must show that they are both passionate and knowledgeable about the businesses they review. Although this particular control may be imperfect, the number of reviews posted by the reviewer and their Yelp Elite status are likely to be indicators of reviewer expertise and review quality.

To examine the possibility that temporal contiguity cues are used to a greater extent by those who write more reviews and that our hypothesized effects are driven by differences in writers rather than by temporal contiguity cues, we used a median split to divide our data into two equal groups on the basis of the number of reviews posted. We found that those with more reviews were responsible for 52% of the reviews with temporal contiguity cues and those with fewer reviews were responsible for 48% of the reviews with temporal contiguity cues. Similarly, approximately 27% of the people in our sample are Yelp Elites and were responsible for 30% of the reviews with temporal contiguity cues. These findings limit the likelihood that our results are due to differences in reviewer expertise and ability.

Restaurant-specific effects. Our final control variable is restaurant-specific fixed effects. To control for these effects, we created 98 restaurant dummies.

Specification

Most reviews in our sample received few useful votes, and a small number received a large number of useful votes. Given that our dependent variable "value" is a count variable for which its variance exceeds its mean (M = 1.13, variance = 6.37, overdispersion = 2.06), we modeled review value using a negative binomial regression with robust standard errors (Greene 2008):

(1) $Value_{ijk} = \exp[\alpha_o + \beta_1(positive_j) + \beta_2(negative_j)$

$+ \beta_3(\text{temporal contiguity cues}_j)$

$+ \beta_4(\text{other temporal cues}_j)$

$+ \beta_5(positive_j \times \text{temporal contiguity cues}_j)$

$+ \beta_6(negative_j \times \text{temporal contiguity cues}_j)$

$+ \beta_7(positive_j \times \text{other temporal cues}_j)$

$+ \beta_8(negative_j \times \text{other temporal cues}_j)$

$+ \Omega'X_{ij} + \alpha_k + \varepsilon_{ijk}],$

where j indexes the review, i indexes the reviewer, k indexes the restaurant, X_{ij} is the vector of review- and reviewer-

specific controls, α_k represents restaurant dummies, and ε_{ijk} is the idiosyncratic error.

To directly test the hypothesis that temporal contiguity cues increase the value of positive reviews more than negative ones (H_1), we created indicator variables for positive reviews ($positive_j = 1$ if star rating = 4 or 5, 0 otherwise) and negative reviews ($negative_j = 1$ if star rating = 1 or 2, 0 otherwise) and tested whether the presence of temporal contiguity cues$_j$ had a stronger positive interaction with positive than with negative reviews (i.e., $\beta_5 > \beta_6$). Neutral reviews (star rating = 3) made up the baseline model, and coefficients can be directly interpreted with respect to neutral reviews (e.g., a significant positive β_2 means that negative reviews are more useful than neutral ones). To test our hypotheses, we rely on the Wald test (Greene 2008). To examine the possibility that any sort of temporal information, rather than temporal contiguity cues alone, increases the value of positive reviews more than negative ones, we tested whether other temporal cues$_j$ interacted with positive$_j$ (β_7) and negative$_j$ (β_8) reviews to affect review value.

Results

Table 1 displays the descriptive statistics, and Table 2 presents the results for the empirical models. In the absence of temporal contiguity cues, negative reviews were more valuable than neutral reviews ($\beta_2 = .52, p < .01$), whereas positive reviews were not significantly more valuable than neutral reviews ($\beta_1 = .03, p > .10$). Consistent with the negativity bias, a Wald test shows that negative reviews were more valuable than positive ones ($H_o: \beta_1 = \beta_2, \chi^2(1) = 513.55, p < .001$).

In support of H_1, the presence of temporal contiguity cues increased the value of positive reviews ($\beta_5 = .18, p < .05$) but not negative reviews ($\beta_6 = -.08, p > .10$). A Wald test confirms that temporal contiguity cues increased the value of positive reviews to a greater extent than negative ones ($H_o: \beta_5 = \beta_6, \chi^2(1) = 6.01, p = .01$). The presence of other temporal cues did not increase the value of positive reviews ($\beta_7 = -.05, p > .10$) and actually decreased the value of negative reviews ($\beta_8 = -.15, p < .05$), perhaps because this information interferes with the interpretation of negative ratings (Schlosser 2011). In other words, although knowing that a review is written on the day of consumption significantly increased the perceived value of a positive review, other temporal information about the reviewer's experience (e.g., "crowded on Tuesdays") did not. The main effects of temporal contiguity cues and other temporal cues were both insignificant.

Table 2

PERCEIVED VALUE OF YELP REVIEWS AS A FUNCTION OF REVIEW VALENCE AND PRESENCE OF TEMPORAL CONTIGUITY CUES

	Discrete Model		Continuous Model	
Variable	*Coefficient*	*SE*	*Coefficient*	*SE*
Temporal contiguity cues	−.06	.07	−.09	.14
Other temporal cues	−.02	.04	−.09	.08
Negative	.52**	.03		
Positive	.03	.02		
Positive × temporal contiguity cues	.18*	.08		
Negative × temporal contiguity cues	−.08	.12		
Positive × other temporal cues	−.05	.04		
Negative × other temporal cues	−.15*	.07		
Stars			−.11**	.01
Stars × temporal contiguity cues			.10**	.03
Stars × other temporal cues			.03	.02
Controls				
Review age	<.01**	<.01	<.01**	<.01
Friends	<.01**	<.01	<.01**	<.01
Log(reviews)	.17**	.01	.16**	.01
Photo (1 = profile photo present, 0 = not present)	.72**	.03	.71**	.03
Elite status (1 = Elite, 0 = not Elite)	.32**	.02	.32**	<.01
Word count	<.01**	<.01	<.01**	<.01
N = 65,531				
Pseudo R^2		.13		.13

*Significant at 5% level.
**Significant at 1% level.

We obtained consistent results when we modeled review valence as a continuous variable using the one- to five-star rating; more formally:

$$(2)\ \text{Value}_{ijk} = \exp[\alpha_o + \beta_1(\text{review valence}_j)$$

$$+ \beta_2(\text{temporal contiguity cues}_j)$$

$$+ \beta_3(\text{other temporal cues}_j)$$

$$+ \beta_4(\text{review valence}_j \times \text{temporal contiguity cues}_j)$$

$$+ \beta_5(\text{review valuence}_j \times \text{other temporal cues}_j)$$

$$+ \Omega'X_{ij} + \alpha_k + \varepsilon_{ijk}].$$

As with the preceding analysis, the results show that as reviews become more positive, they become less valuable ($\beta_1 = -.11, p < .01$). However, this negative relationship is mitigated in reviews written with temporal contiguity cues, as indicated by a significant positive interaction between temporal contiguity cues and review valence ($\beta_4 = .10, p < .01$). A Wald test reveals a lack of relationship between value and review valence in reviews written with temporal contiguity cues ($H_0: \beta_1 + \beta_4 = 0, \chi^2(1) = .04, p = .83$). In other words, there is no evidence of negativity bias in reviews that contain temporal contiguity cues. Consistent with the discrete model, treating valence as a continuous variable shows that the presence of temporal contiguity cues, but not other temporal cues, mitigates the negativity bias by increasing the value of positive reviews. The main effects of temporal contiguity cues and other temporal cues are insignificant.

According to our theory, an increase in the time noted between consumption and review writing should reduce the value of positive reviews. To test this, we created a variable to capture the number of days between consumption and review writing for reviews that referenced when consumption occurred. We coded this variable as 0 if the review contained temporal contiguity cues (e.g., "today," "just got back"; N = 2,448), as 1 if the review contained "yesterday" (N = 1,546) or "last night" (N = 1,072), as 5 if the review contained "last weekend" (N = 274; because Thursday, the midpoint of a Monday to Sunday week, is roughly 5 days after the previous weekend), and as 7 if the review contained "last week" (N = 133). We did not include reviews with a long delay (e.g., "last month," "last year") because they are outliers that may significantly affect the substantive results (Belsley, Kuh, and Welsch 1980). As we predicted, the value of positive reviews decreased as temporal delay increased ($\beta_{\text{positive delay}} = -.04, SE = .009, z = -4.90, p < .001$). The value of negative reviews was unaffected by temporal delay ($\beta_{\text{negative delay}} = -.07, SE = .11, z = -.65, p > .5$).

Discussion

The analysis of Yelp restaurant reviews shows that temporal contiguity cues increase the value of positive reviews and attenuate the negativity bias. In the absence of cues to temporal contiguity, people perceive negative reviews as more valuable than positive ones. However, in reviews written with temporal contiguity cues, we no longer observed this difference in valuation.

The Yelp data set, drawing on more than 65,000 reviews from five major cities, is appealing from an external validity standpoint. However, although we controlled for a range of factors that may affect review value, there is a possibility that our findings are driven by unobserved variables or selection issues. For example, it could be that consumers who read negative reviews are different from those who read positive reviews and that these two groups of consumers are differentially affected by temporal contiguity cues. In addition, the secondary data do not allow us to examine the proposed attribution account for the negativity bias and its mitigation by temporal contiguity. Specifically, we are not able to test whether positive reviews are rela-

tively more attributed to the reviewer than negative ones or whether the presence of temporal contiguity cues affects these relative attributions. Finally, it is not clear whether these effects carry over to purchase intentions.

To address these issues, we conducted four lab studies. In the first two, we test whether temporal contiguity and valence interact to affect review value (Study 2a) and attributions (Study 2b). We examine review value and review attributions separately to avoid measurement effects (Feldman and Lynch 1988). In the third lab study (Study 3), we measure both value and attributions to test for mediation. In a final lab study (Study 4), we examine how temporal contiguity affects choice.

STUDY 2A: TEMPORAL CONTIGUITY CUES AND REVIEW VALUE

Procedure

Study 2a examines whether the result that temporal contiguity cues increase the value of positive reviews more than negative reviews is replicated in a controlled setting. Seventy-three respondents (40 women) from an online panel participated for pay. Respondents were randomly assigned to one of four 2 (review valence: positive vs. negative) × 2 (temporal contiguity cues: present vs. absent) between-subjects conditions.

We developed the stimuli by randomly selecting a positive review from the Yelp data set with the same text length as the sample average. The selected review contained no temporal contiguity cues. To create the negative review, we replaced positive adjectives with negative ones. For example, we changed "food is inspired" to "food is uninspired." In the temporal contiguity cues present conditions, we inserted the words "just got back" and "tonight" into the reviews. We omitted these cues in the temporal contiguity cues absent conditions. In all four reviews, the restaurant was renamed "Joe's" to control for possible familiarity with the actual restaurant, and this name was displayed alongside the review.

Participants first read the review and then assessed review value. This was followed by a check for the valence manipulation. In addition, because perceived similarity between information senders and receivers can affect the perceived value of WOM communication (Feldman 1984), a possible alternative explanation for our finding is that readers think they are more similar to reviewers who communicate positive news immediately after the experience. Accordingly, we measured perceived similarity.

Measures

We measured review value on a nine-point scale adapted from Sen and Lerman (2007): "Assuming that you were thinking about going to Joe's in real life, how likely would you be to use this review in your decision making?" (1 = "very unlikely," and 9 = "very likely"). As a manipulation check, participants indicated how positive versus negative they perceived the review to be (1 = "very negative," and 9 = "very positive"). Finally, participants were asked how similar to the reviewer they believed themselves to be (1 = "very dissimilar," and 9 = "very similar").

Results

In support of H_1 and replicating the results of Study 1, there was a significant valence × temporal contiguity inter-action ($F(1, 69) = 6.03, p < .05$; see Figure 2). Planned contrasts show that for negative reviews, temporal contiguity had no significant effect on perceived value ($M_{neg\ cues} = 6.17$ vs. $M_{neg\ no\ cues} = 6.85$; $F(1, 69) = 1.09, p = .30$). For positive reviews, however, the presence of temporal contiguity cues significantly increased review value ($M_{pos\ cues} = 7.00$ vs. $M_{pos\ no\ cues} = 5.31$; $F(1, 69) = 5.69, p < .05$). A different set of planned contrasts show that, in the absence of temporal contiguity cues, participants regarded negative reviews as more valuable than positive reviews ($M_{neg\ no\ cues} = 6.85$ vs. $M_{pos\ no\ cues} = 5.31$; $F(1, 69) = 5.11, p < .05$). However, this negativity bias disappeared when temporal contiguity cues were provided ($M_{neg\ cues} = 6.17$ vs. $M_{pos\ cues} = 7.00$; $F(1, 69) = 1.47, p = .23$). Neither the presence of temporal contiguity cues nor review valence had a significant main effect on review value.

The manipulation of review valence was successful. Those in the negative review condition indicated that the review was more negative than those in the positive condition ($M_{neg} = 1.52$ vs. $M_{pos} = 8.92$; $F(1, 69) = 2,136.54, p < .01$). The main and interaction effects of the presence of temporal contiguity cues were not significant (Fs < 1). Perceived similarity to the reviewer was not affected by review valence, temporal contiguity cues, or their interaction (all Fs < 1).

Discussion

The results of Study 2a provide further evidence for H_1 by showing that the presence of temporal contiguity cues increases the perceived value of positive reviews to a greater extent than negative reviews. Study 2a also replicates the previous result that the presence of temporal contiguity cues

Figure 2
PERCEIVED VALUE AS A FUNCTION OF REVIEW VALENCE AND PRESENCE OF TEMPORAL CONTIGUITY CUES (STUDY 2A)
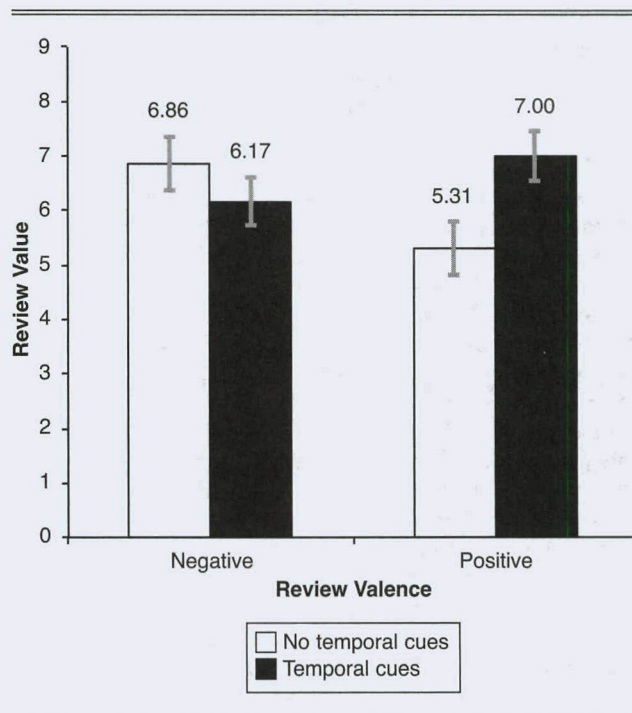
can remove the negativity bias. In other words, we replicated Study 1's results in a lab setting that controls for selection and unobserved variable issues that may be present in field data. Study 2b examines the proposed mechanism for these effects by measuring attributions of reviews to the reviewer (vs. product experience).

STUDY 2B: TEMPORAL CONTIGUITY CUES AND ATTRIBUTIONS

Study 2b tests whether, in the absence of temporal contiguity cues, consumers are more apt to attribute positive reviews to the reviewer (vs. product experience) than they are for negative reviews (H_2). Study 2b also examines whether the presence of temporal contiguity cues increases the degree to which readers attribute reviews to the product experience (vs. reviewer) to a greater extent for positive than for negative reviews (H_3).

Procedure

Sixty-nine respondents (42 women; all respondents differed from those who participated in Study 2a) from an online subject pool participated for pay. Stimuli were identical to Study 2a, and participants were randomly assigned to one of the four between-subjects conditions. Instead of rating reviews on value, participants were asked to make attributions about the cause of the review.

Measures

We assessed causal attributions using measures adapted from Frank and Gilovich (1989). We measured reviewer attribution by asking participants to indicate how large a role personal factors (e.g., the reviewer's personality, traits, character, personal style, attitudes, mood) played in the reviewer's decision to write the review (1 = "minimal role," and 9 = "maximal role"). We measured product attribution by asking participants to indicate how large a role the restaurant experience (e.g., food quality, service) played in the decision to write the review (1 = "minimal role," and 9 = "maximal role"). Drawing from Frank and Gilovich, we calculated a causal score by subtracting reviewer from product attributions such that higher scores indicated greater product (lesser reviewer) attributions.
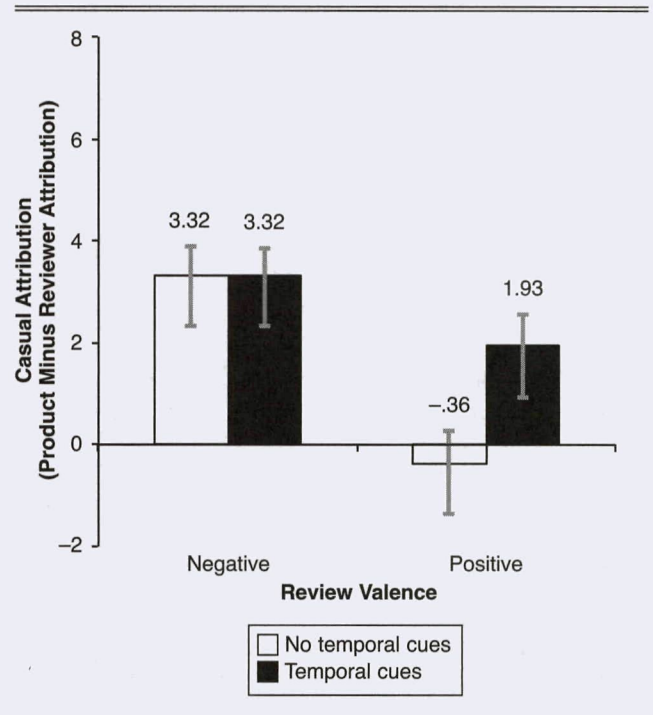
Results

In support of H_2, when temporal contiguity cues were absent, positive reviews were significantly more attributed to the reviewer (vs. product experience) than were negative reviews ($M_{pos\ no\ cues} = -.36$ vs. $M_{neg\ no\ cues} = 3.32$; $F(1, 65) = 12.04, p < .01$). When temporal contiguity cues were present, this difference in causal attributions was no longer statistically significant ($M_{pos\ cues} = 1.93$ vs. $M_{neg\ cues} = 3.32$; $F(1, 65) = 1.83, p > .10$).

In support of H_3, there was a significant interaction between review valence and temporal contiguity cues ($F(1, 65) = 4.71, p < .05$; see Figure 3). Planned comparisons show that the presence of temporal contiguity cues increased product (vs. reviewer) attributions to a greater extent for positive ($M_{pos\ cues} = 1.93$ vs. $M_{pos\ no\ cues} = -.36$; $F(1, 65) = 4.05, p < .05$) than for negative reviews ($M_{neg\ cues} = 3.32$ vs. $M_{neg\ no\ cues} = 3.32$; $F(1, 65) < 1$).

Overall, positive reviews were more attributed to the reviewer (vs. product experience) than were negative reviews ($M_{pos} = .79$ vs. $M_{neg} = 3.32$; $F(1, 65) = 7.65, p <$

Figure 3
CAUSAL ATTRIBUTION AS A FUNCTION OF REVIEW VALENCE AND PRESENCE OF TEMPORAL CONTIGUITY CUES (STUDY 2B)

.01). However, this main effect should be interpreted in light of the significant interaction between review valence and temporal contiguity cues. The main effect of temporal contiguity cues was not significant ($M_{cues} = 2.78$ vs. $M_{no\ cues} = 1.76$; $F(1, 65) = 2.41, p > .10$).

Discussion

The results of Study 2b suggest that temporal contiguity cues increase the value of positive reviews by increasing relative attributions to the product (vs. reviewer). When temporal contiguity cues are missing, positive reviews are relatively more attributed to the reviewer (vs. product experience) than are negative reviews. However, when temporal contiguity cues are present, differences in causal attributions for positive versus negative reviews are no longer significant.

Although our results show that temporal cues affect relative attributions to the product experience versus reviewer, one might wonder if this is due primarily to changes in reviewer or product attributions. To examine this, we analyzed reviewer and product attributions separately. The results revealed a significant interaction between valence and the presence of temporal contiguity cues on reviewer attributions ($F(1, 65) = 4.61, p < .05$). In the absence of temporal contiguity cues, positive reviews were significantly more attributed to the reviewer than negative reviews ($M_{pos\ no\ cues} = 7.08$ vs. $M_{neg\ no\ cues} = 3.95$; $F(1, 65) = 20.11, p < .001$). However, in the presence of temporal contiguity cues, this difference in reviewer attributions was no longer significant ($M_{pos\ cues} = 5.15$ vs. $M_{neg\ cues} = 4.10$; $F(1, 65) = 2.50, p = .12$). Specifically, the presence of temporal contiguity cues decreased reviewer attributions to a greater extent

for positive reviews ($M_{pos\ cues}$ = 5.15 vs. $M_{pos\ no\ cues}$ = 7.08; $F(1, 65)$ = 6.46, p = .01) than negative reviews ($M_{neg\ cues}$ = 4.10 vs. $M_{neg\ no\ cues}$ = 3.95, $F(1, 65)$ = .06, p = .81). Absolute attribution to the product was high (M_{all} = 7.28) and not significantly affected by review valence, the presence of temporal contiguity cues, or their interaction (all $Fs < 1$). These results show that temporal contiguity cues work primarily by changing reviewer rather than product attributions.

STUDY 3: THE MEDIATING ROLE OF ATTRIBUTIONS

Although we demonstrate that temporal contiguity cues increase the value of positive reviews (Study 2a) and decrease attributions to the reviewer (Study 2b), it is uncertain whether these two effects are related. We address this issue in Study 3 by testing whether causal attributions mediate the interactive effect of temporal contiguity and review valence on review value. In addition, we examine whether alternative processes explain our findings. Namely, we test whether perceptions of emotional expression, rashness, sincerity, politeness, and review freshness are significant mediators of our effect.

Moving away from the restaurant domain, we also test whether our findings replicate using cruise reviews. On average, people have more experience with restaurants than cruises. Whereas the average American goes out to eat several times a week, only 20% of Americans have ever been on a cruise (Cruise Lines International Association 2010). Furthermore, in comparison to dining experiences, cruise experiences involve greater amounts of time and money. Whereas people are free to leave a restaurant at any point, after the ship has left the dock, it is difficult to leave a cruise early. In summary, cruises differ from restaurants in several important ways, and replicating our effects in this domain would help generalize our findings.

Procedure

Ninety-eight people (46 women) from an online forum participated for pay. They were randomly assigned to read one of four 2 (review valence: positive vs. negative) × 2 (temporal contiguity cue: present vs. absent) cruise reviews. We modified the stimuli from an actual review from a popular cruise review website (cruisecritic.com). As in Study 2, we developed stimuli by first choosing a positive review and then creating a negative review by replacing positive adjectives with their negative counterparts. We manipulated temporal contiguity by inserting the phrase "Just got back from the cruise" into the review. We used a fictional name ("Magic Sail") to avoid issues of familiarity. As in Study 2, participants first read a review and then assessed review value. They then provided ratings of causal attributions and other potential mediators. Finally, they rated review valence as a manipulation check.

Measures

Review value. We measured review value with the same nine-point scale used in Study 2a. On this scale, higher scores indicate greater value.

Causal attributions. To show that our observed findings are not due to the transformation of the raw causal scores (i.e., subtracting reviewer from product attributions), we used a bipolar scale trading off product and reviewer attributions. We again adapted the measures used by Frank and Gilovich (1989) and asked participants how important per-

sonal factors versus cruise characteristics (e.g., quality, food, amenities) were in causing the reviewer to write the review (1 = "personal characteristics are most important," and 9 = "cruise characteristics are most important"). As in Study 2b, higher scores mean higher product (vs. reviewer) attributions.

Other potential mediators. To rule out alternative processes that could potentially explain our findings, we measured reviews on politeness (1 = "not at all polite," and 9 = "very polite"), sincerity (1 = "not at all sincere," and 9 = "very sincere"), rashness (1 = "not at all rash," and 9 = "very rash"), emotional expression (1 = "not at all emotional," and 9 = "very emotional"), and freshness (i.e., "How long ago was this review written?" [1 = "a long time ago," and 9 = "pretty recently"]).

Manipulation checks. As a valence manipulation check, participants rated how positive versus negative they found the review to be (1 = "very negative," and 9 = "very positive"). We also asked them to indicate "How long after having the cruise experience did the reviewer write this review?" (1 = "immediately after," and 9 = "after a long time") to observe whether the presence of temporal contiguity cues affects perception of delay between the product experience and review writing.

Results

Perceived value. In further support of H_1, there was a significant interaction between review valence and temporal contiguity ($F(1, 94)$ = 4.34, $p < .05$). Planned comparisons show that the presence of a temporal contiguity cue increased the perceived value of positive ($M_{pos\ cue}$ = 8.08 vs. $M_{pos\ no\ cue}$ = 7.36; $F(1, 94)$ = 5.33, $p < .05$) but not negative reviews ($M_{neg\ cue}$ = 8.08 vs. $M_{neg\ no\ cue}$ = 8.29; $F < 1$). In the absence of a temporal contiguity cue, negative reviews were regarded as more valuable than positive reviews ($M_{neg\ no\ cue}$ = 8.29 vs. $M_{pos\ no\ cue}$ = 7.36; $F(1, 94)$ = 8.73, $p < .01$). However, in the presence of a temporal contiguity cue, this difference was not present ($M_{neg\ cue}$ = 8.08 vs. $M_{pos\ cue}$ = 8.08; $F < 1$).

There was no main effect of temporal contiguity on review value ($F(1, 94)$ = 1.32, p = .25). There was a significant main effect of valence on review value, in which negative reviews were more valuable than positive ones (M_{neg} = 8.19 vs. M_{pos} = 7.72; $F(1, 94)$ = 4.40, $p < .05$), but this result should be interpreted in light of the significant interaction between review valence and temporal contiguity.

Causal attributions. Again in support of H_2, in the absence of a temporal contiguity cue, positive reviews were significantly more attributed to the reviewer (vs. product) than were negative reviews ($M_{pos\ no\ cue}$ = 5.84 vs. $M_{neg\ no\ cue}$ = 7.33; $F(1, 94)$ = 7.58, $p < .01$). In the presence of a temporal contiguity cue, this difference no longer existed ($M_{pos\ cue}$ = 7.20 vs. $M_{neg\ cue}$ = 7.00; $F(1, 94)$ = .14, $p > .50$). In further support of H_3, there was a significant interaction between valence and temporal contiguity ($F(1, 94)$ = 4.87, $p < .05$). For negative reviews, the presence of a temporal contiguity cue did not significantly affect causal attributions ($M_{neg\ cue}$ = 7.00 vs. $M_{neg\ no\ cue}$ = 7.33; $F < 1$). For positive reviews, however, the presence of a temporal contiguity cue significantly increased the extent to which readers attributed the review to the product experience (vs. reviewer; $M_{pos\ cue}$ = 7.20 vs. $M_{pos\ no\ cue}$ = 5.84; $F(1, 94)$ = 6.42, $p < .05$). The main effect of temporal contiguity on attribution was not

significant ($M_{cue} = 7.10$ vs. $M_{no\ cue} = 6.57$; $F(1, 94) = 1.79$, $p > .10$). Although participants attributed positive reviews to the reviewer (vs. product experience) marginally more than negative reviews ($M_{pos} = 6.52$ vs. $M_{neg} = 7.17$; $F(1, 94) = 2.84$, $p < .10$), this result should be interpreted with respect to the significant interaction between valence and temporal contiguity.

To test whether causal attributions mediate review value, we conducted a moderated mediation analysis with temporal contiguity as the independent variable ($0 = $ no cue, $1 = $ with cue), valence as the moderator ($0 = $ negative, $1 = $ positive), causal attributions as the mediator, and review value as the dependent variable (Model 7, Hayes 2012). We used bootstrapping to generate a 95% confidence interval (CI) around the indirect effect of attributions, in which successful mediation occurs if the CI does not contain zero (Preacher, Rucker, and Hayes 2007; Zhao et al. 2010).

Again, the effect of temporal contiguity on causal attributions was moderated by valence ($\beta = 1.69$, $SE = .77$, $t(94) = 2.21$, $p < .05$). For negative reviews, the presence of a temporal contiguity cue did not significantly affect relative attributions ($\beta = -.33$, $SE = .55$, $t(94) = -.71$, $p = .54$). For positive reviews, however, the presence of a temporal cue increased attributions to the product (vs. reviewer; $\beta = 1.36$, $SE = .54$, $t(94) = 2.53$, $p < .05$), which in turn positively affected review value ($\beta = .30$, $SE = .04$, $t(94) = 5.61$, $p < .001$). Conditional indirect effects show that, for negative reviews, the presence of a temporal contiguity cue failed to increase review value because it had little effect on relative attributions (95% CIs: $-.49$ to $.27$). For positive reviews, however, temporal contiguity increased review value by changing causal attributions (95% CIs: $.14$ to $.81$).

Other potential mediators. In addition to testing causal attributions, we also tested the moderated mediating effects of reviewer politeness, sincerity, rashness, emotional expression, and review freshness to determine whether these alternative processes could explain our results. Following Zhao et al.'s (2010) recommendations, we tested these potential mediators simultaneously alongside causal attributions. Aside from causal attributions, none of these measures successfully mediated our observed finding because CIs generated around politeness, sincerity, rashness, emotional expression, and freshness all include zero.[2] (For full mediation results, see the Web Appendix at www.marketingpower.com/jmr_webappendix.)

Manipulation checks. Participants viewed positive reviews as significantly more positive than negative reviews ($M_{pos} = 8.72$ vs. $M_{neg} = 1.42$; $F(1, 94) = 1,988.74$, $p < .001$), and perceived valence was unaffected by temporal contiguity and its interaction with valence ($Fs < 1$). Those in the temporal contiguity cue present conditions believed that the review was written more immediately after the cruise experience than those in the no temporal contiguity cue conditions ($M_{cue} = 2.53$ vs. $M_{no\ cue} = 3.55$; $F(1, 94) = 11.68$, $p = .001$). There was neither a main effect of valence nor an interaction between valence and temporal contiguity ($Fs < 1$). This finding shows that the presence of a temporal conti-

guity cue increases the perceived temporal proximity between the product experience and the review.

Ancillary study and analyses. A possibility is that the effects of temporal contiguity on review value are driven by increased perceptions of information freshness rather than the extent to which positive reviews are attributed to the product experience versus the reviewer. That is, temporal contiguity cues make readers think that the review reflects a more recent consumption experience and is therefore more valuable. To examine this possibility, we ran a 2 (review valence: positive vs. negative) $\times$ 2 (temporal contiguity cue: present vs. absent) $\times$ 2 (temporal delay vs. information freshness) between-subjects study with 230 members of an online panel. Participants were randomly shown one of the four reviews used in the main study and then either presented with a measure assessing temporal contiguity ("How long after the cruise experience did the reviewer write the review?" [$1 = $ "immediately after," and $9 = $ "after a long time"]) or a measure assessing information freshness ("How long ago did the cruise experience occur?" [$1 = $ "a very long time ago," and $9 = $ "pretty recent"]). Counter to an information freshness explanation, separate analyses of each measure show that the presence of a temporal contiguity cue reduced perceptions of temporal delay between consumption and review writing ($M_{cue} = 2.79$ vs. $M_{no\ cue} = 3.47$; $F(1, 114) = 4.81$, $p = .03$) but did not significantly affect perceptions of information freshness ($M_{cue} = 7.26$ vs. $M_{no\ cue} = 7.10$; $F(1, 108) = .22$). No other effects were significant.

Discussion

The results of Study 3 show the potential process through which temporal contiguity cues mitigate the negativity bias in online reviews. Specifically, the presence of a temporal contiguity cue may increase the value of positive reviews by increasing the extent to which readers attribute positive reviews to product versus reviewer characteristics. For negative reviews, however, temporal contiguity does not significantly affect reader attributions or review value.

STUDY 4: EFFECTS ON CHOICE

Study 4 examines whether temporal contiguity cues also affect choice. Positive reviews persuade people to choose the reviewed product, whereas negative reviews persuade people to *not* choose the product. If temporal contiguity cues augment the value of positive reviews more than negative ones, they should have a stronger effect on increasing the choice of positively reviewed products than on decreasing the choice of negatively reviewed products.

Procedure

One hundred eighty people (89 women) from an online panel participated in the study for pay and were asked to imagine they were picking a restaurant for dinner. They were randomly assigned to one of four 2 (review valence: positive vs. negative) $\times$ 2 (temporal contiguity cues: present vs. absent) between-subjects conditions. In each condition, participants were shown one of the four reviews used in Studies 2a and 2b for "Joe's Restaurant" (the target restaurant) and a neutral review for "Mike's Restaurant" (which was identical in all conditions). Participants were asked which restaurant they preferred and, to increase the external validity of the study (Dhar 1997), were given the option of

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[2]Although valence and temporal contiguity interacted to affect politeness and sincerity, politeness and sincerity did not significantly affect review value ($\beta_{polite} = .002$, $SE = .05$, $p = .97$; $\beta_{sincerity} = .13$, $SE = .08$, $p > .10$), thus nullifying mediation.

choosing "neither restaurant." We predicted that the presence of temporal contiguity cues in a positive review would increase choice of the target restaurant more than their presence in a negative review would decrease choice of the target restaurant.

Results

We analyzed the choice data with two partial chi-squares, one for positive reviews and one for negative reviews. (The presence of perfect prediction in our data rendered the logit inadequate [Albert and Anderson 1984].) The results (see Table 3) reveal that when the review of the target restaurant was negative, the presence of temporal contiguity cues did not significantly affect choice of the target restaurant (without cues = 4.5% vs. with cues = 11.6%; Fisher's exact test: $p = .27$). However, consistent with our prediction, when the review of the target restaurant was positive, the presence of temporal contiguity cues significantly increased the choice of the target restaurant (without cues = 85.7% vs. with cues = 100%; Fisher's exact test: $p = .01$).

Discussion

The results of Study 4 show that the effects of temporal contiguity cues extend to choice. As with review value, temporal contiguity cues have a stronger effect on choice when they are present in positive than in negative reviews. In this case, the presence of temporal contiguity cues in a positive review increased choice of the reviewed product to 100%, but their presence in a negative review did not similarly decrease choice likelihood.

GENERAL DISCUSSION

This research shows that temporal contiguity cues mitigate the negativity bias in online reviews. One possible mechanism is that temporal contiguity cues reduce the extent to which consumers attribute positive reviews to the reviewer versus the product experience. In the absence of temporal contiguity cues, consumers are relatively more likely to attribute positive reviews to the reviewer (vs. product experience) than negative reviews. By connecting the review to the product experience, the presence of temporal contiguity cues enhances the value and influence of positive reviews. In other words, temporal contiguity cues reduce the negativity bias by shifting consumer beliefs about the cause of positive reviews. The presence of temporal contiguity cues in negative reviews has limited effects on causal attributions, perceptions of value, or choice. One explanation is that there may be fewer personal reasons to communicate negative information.

In an analysis of restaurant reviews from Yelp (Study 1), we demonstrate that in the absence of temporal contiguity cues, reviews become less valuable as they become more positive. However, when temporal contiguity cues are present, we no longer observe this negativity bias. Furthermore, we show that temporal contiguity cues attenuate the negativity bias by increasing the value of positive reviews rather than by reducing the value of negative reviews. Study 2a replicates these results in a controlled setting in which selection and unobserved variables issues are unlikely to affect outcomes.

In subsequent lab experiments, we find support for the proposed attribution mechanism. In Study 2b, when temporal contiguity cues are missing, consumers attribute positive reviews more than negative reviews to the reviewer (vs. product experience). However, when temporal contiguity cues are present, differences in causal attributions for positive and negative reviews are no longer significant. Study 3 uses a different context, replicates the findings of Studies 1 and 2a–b, and shows that these effects are mediated by attributions about review causes. Study 3 also rules out other potential mediators and alternative explanations for the effect. Study 4 shows that these results extend to choice. The presence of temporal contiguity cues in positive reviews increases the likelihood that a product is chosen for consumption but does not significantly affect the influence of negative reviews on choice.

Contributions

We propose an attribution account of the negativity bias in online WOM based on consumers' naive beliefs about the extent to which reviews reflect the writer's product experience. Our account deviates from frequency accounts for the negativity bias, which posit that positive information is less valued because it is more common than negative information; our account also deviates from frequency-based attribution accounts of the negativity bias, which propose that people make different attributions as a result of the relative frequency of positive versus negative information. Rather, we propose that temporal contiguity cues mitigate the negativity bias by changing reader inferences about the source of WOM.

Despite early suggestions that temporal contiguity matters for attributions about human behavior (Kelley 1973), there has been little empirical investigation of these ideas. This research shows that temporal contiguity affects causal attributions in social as well as physical domains. Although temporal contiguity cues are a small percentage of review text, they have strong effects on the value and influence of reviews in lab and real world settings.

Table 3

PPERCENTAGE CHOOSING EACH OR NEITHER RESTAURANT AS A FUNCTION OF VALENCE AND PRESENCE OF TEMPORAL CONTIGUITY CUES

| Valence | Temporal Contiguity Cues | Target (Joe's) | Not Target (Mike's + Neither) | Not Target Breakdown | |
				Mike's	Neither
Negative	Absent	4.5%	95.5%	45.5%	50.0%
	Present	11.6%	88.4%	51.2%	37.2%
Positive	Absent	85.7%	14.3%	4.8%	9.5%
	Present	100.0%	0%	0%	0%

This work also has implications for marketers who are worried about the excessive impact of negative reviews. Although business owners can respond to negative reviews in hopes of thwarting their impact, such maneuvers may exacerbate the situation (Wehrum 2009). However, with the knowledge that temporal contiguity cues increase the usefulness of positive but not negative reviews, marketers can encourage consumers to review products immediately after consumption and to explicitly communicate the recency of these experiences in their reviews (e.g., "If you liked your experience, please review us on Yelp and say you were here today!").

In addition, we contribute methodologically by showing how hand coding of psychological constructs can be reliably combined with automatic processes to extract meaningful variables from large amounts of text data. Behavioral researchers can provide valuable insights into real-world WOM behavior by manually coding secondary text (e.g., Moore 2012; Schlosser 2011), but the labor intensiveness of hand coding limits its application to relatively small data sets. Although automatic coding is common in computer science and increasing in the fields of psychology (e.g., Niederhoffer and Pennebaker 2009) and marketing (e.g., Tirunillai and Tellis 2012), there have been few attempts to manually develop context-specific dictionaries and apply automatic processes for large-scale coding. Using a novel coding scheme, we automated and validated the coding of temporal information. This enabled us to use all the reviews in our data set, providing assurance that our findings are not due to fortuitous sampling.

More generally, this article contributes to a better understanding of the psychological processes through which online WOM affects consumer behavior. Although research has shown that WOM affects firm and product performance (Godes and Mayzlin 2004; Tirunillai and Tellis 2012), little is known about why certain types of WOM communication are more impactful than others. This article adds to recent work exploring the psychological underpinnings of WOM communication (Berger and Schwartz 2011; Cheema and Kaikati 2010) by examining how consumers' naive theories about WOM affect its value.

Limitations and Directions for Further Research

Although our approach is consistent with prior research demarcating person versus nonperson causes of actions (Frank and Gilovich 1989), and we eliminated several alternative mediators, additional research could further explore the mechanisms behind these effects. For example, readers may attribute positive reviews to the writers' self-enhancement or social desirability motives, but the presence of temporal contiguity cues may change these attributions. Temporal contiguity cues may also convey greater excitement on the part of the reviewer, signaling readers to pay more attention to positive information. A more detailed exploration of the mechanism through which these effects occur is likely to enrich understanding of the psychological processes that affect the impact of WOM. More generally, there is an opportunity to examine how cues to temporal contiguity affect causal reasoning in social settings.

Further research could also examine contexts in which negative reviews are attributed more to the reviewer and are therefore less influential than positive reviews. For example, this may occur when a negative review is written by a reviewer who is known to write negative reviews consistently. Another such situation involves negative reviews that are written by a known competitor or someone loyal to a competing brand. It would be worthwhile to determine whether the presence of temporal contiguity cues could overcome these attributions. Other research could explore moderators that affect the extent to which people attribute positive versus negative WOM to the reviewer. As consumers grow ever more reliant on reports about others' product experiences to form their own preferences, it is increasingly important to understand the factors that affect the value of these reports.

Appendix A
SAMPLE YELP REVIEW

Appendix B
TEXT DICTIONARY FOR TEMPORAL CODING OF YELP REVIEWS

	Keywords
Temporal contiguity cues	Today, this morning, just got back, tonight
Other temporal cues	Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday, yesterday, last night, last week, weekend, weekday, last month, last year

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