



The emotional review–reward effect: how do reviews increase impulsivity?

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Abstract

A growing reliance on customer reviews prompts firms to develop strategies to encourage customers to post online reviews of their products. However, little research investigates the behavioral consequences of writing a review. The act of sharing personal opinions through reviews is a rewarding experience and makes customers feel socially connected. With an application of reverse alliesthesia theory, the current study predicts that such rewarding experiences drive online reviewers to seek other rewards, such as impulsive buying. Three lab-based and two field studies demonstrate such an emotional review–reward effect: sharing emotional information in the public realm of customer reviews, rather than forming similar opinions privately, drives participants to make more impulsive buying decisions.

Keywords Reverse alliesthesia · Impulsivity · Reward · Online reviews

Reviews and online feedback from consumers represent pivotal influences on customer purchase decisions (Adjei et al. 2010; Weber Shandwick 2013), so companies actively recruit consumers to post online reviews and share their opinions and experiences with their peers. These efforts have been successful; on Yelp.com alone, an average of 26,380 reviews appear per minute (Stampler 2014). Nevertheless, extant research on the features of reviews (e.g., length, content, and rating) has focused almost entirely on how reviews influence *other* customers (e.g., Berger et al. 2010; Kronrod

and Danziger 2013; Ludwig et al. 2013) and what leads people to write reviews (Moe and Schweidel 2012). Considering the incredible number of reviews written daily, managers also must understand the behavioral and consumption consequences of writing a review for the *reviewer*. Is a reviewer likely to make unplanned purchases after writing a review? Does using emotionally laden language have any distinct effect on the reviewer? How can retailers interact with reviewers, either before or after they write their reviews, to increase conversion rates?

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Among the many motivations that drive customers to write reviews, the very act of sharing opinions with others is central (Berger and Milkman 2012). This act of sharing can provide a gratifying experience that is rewarding in and of itself, because it makes people feel positively about themselves and socially connected with like-minded peers (Nielson 2012; *The New York Times* 2011). Such gratifying experiences in turn may cause consumers to engage in impulse buying, because they trigger a reward drive (Tamir and Mitchell 2012; Wadhwa et al. 2008). Thus, if retailers can understand such behavioral consequences of writing reviews, they would be better prepared to leverage their reviewers' positive sense of gratification and potentially increase their revenues.

To establish these predictions, we draw on two key theoretical concepts: reverse alliesthesia and social sharing. Reverse alliesthesia suggests that encounters with rewarding stimuli create a reward drive state, which heightens the person's desire for instant gratification (i.e., impulsivity; Wadhwa et al. 2008). For humans, one such reward is the act of sharing information about oneself (Baumeister and Leary 1995; Cavanaugh 2014; Tamir et al. 2015). In fact, we extend prior research on reverse alliesthesia by showing that reward drive states can be primed by social as well as physiological rewards.

Subsequently, the type of writing style used in reviews can be conducive to triggering reward-seeking behaviors. Reviews published in a public realm often adopt an affective tone whereby consumers form private opinions about the products they purchase, but we argue that the emotional, public expression of these opinions drives reward-seeking behaviors, because emotional expressions invoke social rewards that strengthen connections with others (Berger and Milkman 2012; Gable and Reis 2010; Ludwig et al. 2013). This prediction also accords with accumulating evidence that acutely rewarding stimuli—such as sexual images, food and beverages, or opportunities for distinctiveness—increase impulsive behavior (Berger and Shiv 2011; Kim and Zauberma 2013; Van den Bergh et al. 2008; Wadhwa et al. 2008).

Our work aims to make three substantive contributions. First, it contributes to growing literature on online reviews. Substantial research focuses on customers' responses to reviews; we present the first insights into the behavioral consequences of sharing a review for the *reviewer*. With three experimental studies and two field studies, we demonstrate that when reviews are shared in an emotional manner, regardless of their valence, impulsivity increases. This has implications for how managers elicit online reviews from consumers to maximize future revenue.

Second, we extend current reverse alliesthesia theory by specifying which writing style in reviews is most conducive to triggering impulsive behaviors. The affective tone and emotional expressions that tend to mark reviews in a public realm can provide an array of social rewards that strengthen a sense of connectedness with others (Berger and Milkman 2012;

Gable and Reis 2010; Ludwig et al. 2013). We specify that writing customer reviews constitutes a contributing force to impulsive behavior, whereas previous research has only examined how physiological rewards might cue reverse alliesthesia. This important contribution addresses a gap, in which social contexts have remained largely unexplored in relation to the theory of reverse alliesthesia.

Third, the current research has implications for studies of impulsivity and self-control. We show that social sharing online, even in an asynchronous context, is a rewarding experience that prompts impulsivity. Furthermore, we demonstrate that, to reduce the likelihood of acting impulsively, a reward drive state can be satiated through exposure to an ancillary reward. Previous research notes how rewards such as money or hedonic products (e.g., candy bars) might quench this reward drive; in practice, though, it is difficult for firms to integrate such strategies into a review writing context, because they would have to compensate each reviewer after he or she submits a review, which could create negative perceptions (Streitfeld 2012). Instead, we suggest praise is any attractive, cost-effective alternative with rewarding characteristics that are well established (Henderlong and Lepper 2002). Accordingly, we demonstrate that social sharing through reviews is rewarding, and we offer the practical insight that the use of praise can mitigate the relationship between review writing and impulsive behavior.

Theoretical development

We begin by reviewing literature on online reviews, reverse alliesthesia, social sharing, and impulsivity, to delineate how these bodies of knowledge relate to writing reviews and to establish a foundation for our proposed *emotional reward–review effect*. Namely, we predict that people feel rewarded for sharing emotional information about themselves, in the form of a review, which leads to an increase in their impulsivity, because activation of the reward center makes them more sensitive to rewards in the immediate environment. Furthermore, we argue that this effect is independent of the valence (positive/negative) of the review.

eWOM and online reviews

Word-of-mouth (WOM) communications between customers are critical (Allsop et al. 2007; Duhan et al. 1997). WOM refers to an “informal, person-to-person communication ... regarding a brand, a product, an organization or a service” (Harrison-Walker 2001, p. 63). Such communications generally are perceived as more trustworthy and relevant than traditional advertising (Bickart and Schindler 2001), and positive WOM improves existing customers' service quality perceptions (Schumann et al. 2010). Not only do customers find WOM recommendations highly credible, but the rate of

WOM surrounding a product often serves as a measure of advertising effectiveness (Plummer 2007).

With the growth of the Internet, WOM has taken on a new, more powerful form, electronic word of mouth, or eWOM, including social media marketing, online reviews, forums, buzz, guerilla marketing, and viral marketing (Kelly 2007; Kozinets et al. 2010; Ordenes et al. 2017). Whereas traditional WOM communications are limited by the size of the person's social network, eWOM removes these barriers and facilitates communication among potentially billions of customers, at an astonishing speed. To give a sense of scope, on [Yelp.com](#) alone, 440 online product reviews, a common form of eWOM, are posted every *second* on average (Stampler 2014). Furthermore, nearly 70% of U.S. consumers read online product reviews before making a purchase (Chatterjee 2001; Senecal and Nantel 2004). Thus, not only are online reviews proliferous, but they also have wide consumer reach. In turn, eWOM accurately predicts consumer behaviors such as television ratings (Godes and Mayzlin 2004), video game sales (Zhu and Zhang 2010), stock market index returns (Das and Chen 2007; Tirunillai and Tellis 2012), and product demand (Ghose et al. 2012).

In Table 1, we summarize and code key articles in the eWOM literature related to the variables of interest: (a) if reviewers were the focus of the study, (b) if the researchers studied the effects of valence and (c) intensity (i.e., arousal) of affect, (d) if the researchers examined possible underlying reward mechanisms, and (e) if the researchers contrasted the experimental condition with private opinions. As Table 1 illustrates, while there is a substantial amount of research that describes how customers respond to *others'* reviews (e.g., Berger and Milkman 2012; Chevalier and Mayzlin 2006; He and Bond 2015), a clear understanding of the behavioral consequences for reviewers themselves is lacking, with a *very* limited set of studies examining effects on reviewers themselves (cf. Alexandrov et al. 2013; Brown et al. 2005; Hu et al. 2009; Moe and Schweidel 2012).

Examining the limited amount of research that has been done on reviewers, we see that while all of the studies include an examination of the effects of affect valence, none of the papers, to our knowledge, has examined the effects of the intensity of affect independent of valence. Similarly, no researchers have examined the potential underlying mechanisms, such as praise, that drive these effects. Finally, among the few papers that study reviewers, none have contrasted these posted reviews versus a control group of individuals that form an opinion about a product but don't share that opinion as a review; this represents a critical shortcoming, as comparing to other shared reviews is an improper control group to assess the effects of *sharing* reviews.

Thus, this research fills four important gaps in the eWOM literature: it explores (1) how writing reviews affects reviewers themselves, (2) the influence of affect intensity of reviews on the review writers, (3) possible reward

mechanisms, and (4) how these effects compare to forming an opinion privately but not sharing it as a review.

As stated previously, most research on eWOM and online reviews focuses on the characteristics of reviews that are deemed helpful by other customers, such as the length of the review, review ratings, review valence, and reviewer credibility (Baek et al. 2012; Chevalier and Mayzlin 2006; Pan and Zhang 2011). For example, reviews are viewed as more credible when they are more complex and balanced (Jensen et al. 2013). Beyond such characteristics, researchers have explored the types of reviews that consumers choose to share. Of importance to our research is the finding that consumers tend to write reviews only if they have had a polarizing experience with the product (which implies an underreporting bias). Whereas consumer evaluations follow a normal distribution, online reviews reveal a J-shaped distribution, characterized by extreme positive and negative reviews and a positive skew (Chevalier and Mayzlin 2006; Eliashberg and Shugan 1997; Hu, Pavlou, and Zhang 2007; Liu 2006; Moe and Schweidel 2012). That is, consumers appear more motivated to write reviews if they have had a particularly good or bad experience with a product. As we will discuss, sharing information about oneself is emotionally rewarding (Tamir and Mitchell 2012; Tamir et al. 2015), and people tend to better remember affect-laden events (e.g., wedding, death of a loved one; Bower 1981), so we predict that sharing information with stronger emotions, regardless of valence, is even more rewarding and produces stronger review–reward effects, including those on consumer behavior and impulsivity.

Whetting the appetite: Drive states, rewards, and reverse alliesthesia

We conceptualize rewards as positive outcomes that motivate behavior. These compelling forces direct attention, drive motivation, and prompt active “hungering” of the reward (Berger and Shiv 2011). Reward mechanisms often are based on physiological drives and spur action: people are hungry (physiological drive), so they eat (reward); they are thirsty (physiological drive), so they drink (reward) (Wadhwa et al. 2008). The pleasure derived from a stimulus, or *alliesthesia*, relates directly to the strength of the associated drive state (Cabanac 1979; Rolls et al. 1983). In simple terms, the thirstier a person is, the better a drink of water tastes.

Nevertheless, alliesthesia cannot explain all consumer behaviors. Imagine shopping at Costco on a Sunday afternoon, where an employee offers you a food sample. Common intuition and alliesthesia research suggest that providing this food sample should reduce consumers' hunger (drive state) and lead to fewer sales of other food products, due to decreased reward motivation. Instead, as the widespread use of product sampling suggests (Wadhwa et al. 2008), such offerings can enhance the drive state by activating but not satiating the reward center of the brain. In other words, when a person receives a small reward,

Table 1 Online reviews and eWOM literature summary

Authors	Key findings	Stimuli and sample size	Studied reviewers	Studied valence	Studied affect intensity	Tested reward mechanism	Contrasted private opinions
Alexandrov, Lilly, & Babakus (2013)	Self-enhancement drives positive word-of-mouth needs, whereas self-affirmation drives negative word of mouth	Responses from 394 potential reviewers	✓	✓	✗	✗	✗
Berger & Milkman (2012)	High arousal emotional content (e.g., awe, anger, anxiety) increases virality, as does low arousal positive content	6,956 NYT articles	✗	✓	✓	✗	✗
Berger, Sorensen, & Rasmussen (2010)	Negative reviews increase sales of low awareness books	244 hardcover fiction titles reviewed by the New York Times	✗	✓	✗	✗	✗
Brown et al. (2005)	Satisfaction, commitment, and identification are predictors of positive word of mouth	397 word-of-mouth intentions and 147 word-of-mouth behaviors	✓	✓	✗	✗	✗
Chevalier & Mayzlin (2006)	Positive changes in overall reviews increase sales; one-star reviews disproportionately affect readers; customers read full reviews, and review length matters	Most recent 500 reviews each for 6,405 books on Amazon.com and BN.com	✗	✓	✗	✗	✗
Chintagunta et al. (2010)	Positively valenced movie reviews within a designated market area affect box office sales more than the volume of reviews	3,766 reviews of 148 movies	✗	✓	✗	✗	✗
He & Bond (2015)	Negative effects of review dispersion (inconsistency) are greater for taste-similar products (e.g., desk lamps) than for taste-dissimilar products (e.g., music)	768 participants	✗	✓	✗	✗	✗
Ho-Dac et al. (2013)	Brand equity moderates the effects of eWOM. Online reviews affect sales for weak and moderate brands, but not for strong brands.	5,005 Amazon reviews of Blu-ray & DVD players	✗	✓	✗	✗	✗
Hu, Pavlou, & Zhang (2009)	Identifies the "underreporting bias"; the distribution of reviews is a J-shaped distribution, because only customers with highly polarized attitudes take the time to write reviews	4,250,619 Amazon reviews	✓	✓	✗	✗	✗
Jensen et al. (2013)	Reviewers are viewed as more credible when they write complex, balanced reviews without intense emotion words	435 digital camera reviews	✗	✓	✓	✗	✗
Ludwig et al. (2013)	Positive affectivity in reviews has diminishing returns on raising conversion rates; negative affectivity has a linear monotonic relationship with decreasing conversion rates	18,682 Amazon customer reviews from 591 books	✗	✓	✓	✗	✗
Moe & Schweidel (2012)	People are more likely to post reviews when their postpurchase evaluation is polarized (very positive or negative); less frequent reviewers tend to be more positive and display bandwagon behavior, "expert" reviewers attempt to differentiate with more negative reviews	10,460 product ratings of 1,811 products from 4,974 reviewers	✓	✓	✗	✗	✗
Mudambi & Schuff (2010)	Extreme valenced reviews are rated as more helpful for search than for experience goods; longer reviews are judged more helpful for all products, but especially search products	1,587 reviews of 6 products from Amazon.com reviewers	✗	✓	✗	✗	✗
Ordenes et al. (2017)	Posts with highly activated positive emotions increase overall sentiment strength	45,883 Customer Reviews;	✗	✓	✓	✗	✗

such as a product sample or writing a review, it essentially “whets the appetite” by intensifying the original drive state. This amplification of motivation prompts the consumer to indulge in additional consumption behaviors, which Wadhwa et al. (2008) call *reverse alliesthesia*, as it transposes the traditional relationship between drive state and reward.

Three characteristics of rewards can facilitate reverse alliesthesia (Berger and Shiv 2011). First, they go beyond the initial consumption cue and spill over to motivation to

consume in a broader array of domains. For example, sampling a delicious beverage increases people’s desire to consume more of the drink but also intensifies their preferences for other, unrelated, but also rewarding, consumer products (Wadhwa et al. 2008). In turn, consumers exhibit more impulsive choices and preferences (Li 2008), because their exposure to the rewarding stimuli heightens their preferences for smaller, immediate rewards instead of larger, delayed rewards (Kim and Zauberaman 2013; Van den Bergh et al. 2008), as well as

for appetitive options (e.g., movie tickets) over nonappetitive options (e.g., bookstore coupons; Li 2008). Second, the reward drive that triggers impulsive behaviors can be satiated by subsequent rewards, regardless of whether they are related to the initial reward domain or not. Receiving money after sampling a delicious beverage diminishes the urge to seek out other rewards (Wadhwa et al. 2008). Third, recent research suggests that the brain fails to distinguish different types of rewards; instead, rewards (e.g., food, money, sex) act as a common neural currency that activates the same regions of the brain. Because the brain cannot discriminate, this activation increases attention to and desire for any rewards in the immediate environment (Berridge and Robinson 1998).

Although reverse alliesthesia is an important construct for understanding impulsive consumer behavior, this emerging research area has only been studied with physiological reward cues thus far. Wadhwa et al. (2008) demonstrate that gustatory cues, such as food samples, increase drive states, as do pleasant olfactory cues (e.g., Febreze). Van den Bergh et al. (2008) extend the research to sexual cues, demonstrating that exposure to “hot stimuli” (e.g., bikinis in ads) leads people to choose an immediate, smaller reward over a larger reward paid later. To the best of our knowledge, no researchers have investigated reverse alliesthesia beyond physiological drive states. The studies we report herein accordingly constitute important contributions to extant literature, by offering the first tests of reverse alliesthesia with social (i.e., non-physiological) cues. Specifically, we consider reverse alliesthesia in the context of social sharing, with the argument that sharing emotional information is a rewarding experience. Therefore, we expect a reverse alliesthesia effect, in which social sharing causes the reward center of the brain to be activated, leading to increased desire for immediate rewards, just as physiological cues such as hunger, thirst, and sex might do.

Cross-domain spillover: from sharing emotional information to impulsive behaviors

Expressing emotions through writing provides a variety of benefits for well-being. Most research investigates these effects with diary studies, with the assumption that the benefits of emotional expression emerge even without an audience (Radcliffe et al. 2007). But humans place a high value on social interactions (Baumeister and Leary 1995; Cavanaugh 2014; Toubia and Stephen 2013), so sharing information with others can represent a gratifying experience, especially in online contexts where the information is shared with many people. Although the social interactions that occur through online reviews are asynchronous (i.e., reviewers and readers do not have direct, real-time interactions and can comment over time), they may still function as a form of social sharing that is rewarding to reviewers.

According to Tamir et al. (2015), people will forgo money to share information with others, particularly emotional information, even if doing so neither improves their reputation (i.e., self-enhancement) nor benefits the recipient (i.e., altruism). Regions of the brain that are associated with motivation and reward are activated when people share information (Tamir and Mitchell 2012; Tamir et al. 2015). However, the type of information that is shared may determine the extent to which the sharing experience is rewarding; people find sharing personal opinions and emotional experiences more inherently valuable than sharing facts (Tamir and Mitchell 2012).

In online reviews, customers tend to share either rational or emotional information. The former includes evaluative, factual content, shared mainly for self-enhancement purposes. Emotional information instead features expressions of personal feelings and opinions (Berger and Milkman 2012; Derlega et al. 1993), usually shared to build social bonds, though emotional information also can help people regulate their emotions and make sense of their experiences (Peters and Kashima 2007; Rime 2009).

We argue that when writing reviews, similar effects to real-time social sharing emerge. People find sharing emotional information about themselves to be rewarding, but sharing rational information (facts) is less so. To understand the effects of emotion on review writers, it is necessary to contrast the effects of forming emotional opinions about a product *in private* (no social context) with the effects of sharing emotional opinions *in a social setting* (i.e., online), to control properly for the unique influence of the social environment and social sharing that takes place within it, beyond the effects of emotional expressions.

As we have noted, despite being asynchronous, emotional (vs. rational) online reviews constitute a form of social sharing, in that reviewers know their opinions will be read by others. Thus, they should receive social rewards if they share emotional information in their online reviews but not if they form similar opinions privately without sharing them. In line with reverse alliesthesia theory, these rewards may trigger a reward drive for the reviewer that causes impulsive behaviors, like physiological cues (Wadhwa et al. 2008).

Alternatively, people might share reviews to build up their social status, instead of social connections. Status refers to a reputation for achievement and a high quality of work (Hall et al. 2005), which constitutes another socially rewarding experience that could trigger reverse alliesthesia. However, in this case, a differential prediction would emerge. When people gain status and power, they become less likely to use emotion in their communications (Hall et al. 2005). If the effects of review writing were based on a need for status, the strongest effects would emerge when people share rational, as opposed to emotional, reviews.

Reverse alliesthesia causes impulsivity

Impulsivity has been found to have widespread effects on consumer behavior. Coca-Cola's CEO recently estimated that more than 70% of Coke sales are directly attributable to impulse purchases (Karmali 2007). Similarly, 75% of U.S. adults report having recently made an impulse purchase (Hellmich 2014), and Dittmar (2005) estimates that up to 10% of adults are chronic compulsive shoppers. Impulsivity has been linked to credit card debt, reduced savings rates, guilt, remorse, strained social relationships, and even bankruptcy (Baumeister 2002; Bearden and Haws 2012; Vohs and Schmeichel 2007; Yoon and Kim 2016). Moreover, increased use of the Internet heightens impulsivity (Sun and Wu 2011), further emphasizing the need to understand the effects of review writing on impulsive consumer behavior.

Baumeister (2002, p. 670) conceptualizes impulsive behavior as "behavior that is not regulated and that results from an unplanned, spontaneous impulse." He then defines impulsive purchasing or shopping as giving in to a sudden urge to purchase a product, without carefully reflecting on the effects on the person's long-term goals, plans, or ideals. Increased impulsivity generally is tied to a lack of self-control (Baumeister 2002), resulting from either a personality trait (Bearden and Haws 2012; Van den Bergh et al. 2008) or ego depletion (Lisjak and Lee 2014).

The effects and strength of impulsivity also are highly sensitive to social and psychological (emotion) cues. In the social context, people tend to be more impulsive when they shop with peers, particularly if the group is cohesive (Luo 2005), or if they are not engaged in social or romantic relationships (Sinha and Wang 2013). Such social effects on impulsivity in turn are moderated by a susceptibility to normative influences (Rook and Fisher 1995). Taken together, this research suggests that consumer behavior may become more impulsive when social cues are evoked by sharing a review.

Yet research is unclear about the role of emotion. Some studies show that increased positive affect leads to more impulse purchases (Beatty and Ferrell 1998), whereas other studies find that negative affect can encourage consumers to make impulse purchases, to regulate their emotions (Bennett 2009; Silvera et al. 2008). Still others argue that negative emotions such as sadness cue feelings of loss that reduce impulsivity (Salemo et al. 2014). These conflicting findings may reflect the reliance on the valence of emotion alone to predict impulsive behavior, whereas we predict that the intensity of the emotions might drive these effects, instead of (just) their valence.

We also seek to address the surprising research gap related to how the intensity of emotions shared affects impulsivity. That is, we already have argued that sharing emotional information in reviews is a form of social sharing that most people find rewarding. Due to reverse alliesthesia, this small reward does not satiate the reward center but instead whets the appetite, causing

consumers to become more sensitive to the rewards in their immediate environment. We conceptualize this heightened sensitivity as a form of impulsivity (Ramanathan and Menon 2006). Taken together, then, we test the following propositions:

- P1: People engage in impulsive behaviors when they share emotional reviews but not when they form similar opinions privately.
- P2: These effects are independent of the valence of the review.

Current research

To explore these propositions, we conduct a series of five empirical studies. With the prediction that the effects of reverse alliesthesia spill over to multiple domains, we test our effects across different measures of impulsivity and thereby achieve greater external validity, while also confirming the robustness of results. Study 1 establishes the basic emotional review–reward effect: sharing emotional reviews increases people's preference for appetitive products. Study 2 replicates and extends this research by adding a control condition to examine how people write reviews when they receive no instructions and by examining impulsivity with intertemporal monetary reward choices. In Study 3 we test the emotional review–reward effect among differently valenced products and demonstrate that it is based on the intensity of emotion expressed, as opposed to its valence. In this study, we also use a third measure of impulsivity (willingness to pay) to demonstrate its wide-ranging effects. Next, in Study 4, as a strong test of the underlying mechanism, we check whether, after an initial reward, a subsequent reward cue (i.e., praise) mitigates the emotional review–reward effect. Finally, Study 5 establishes the ecological validity of the emotional review–reward effect with field research and real-world products. As a fourth measure of impulsivity, we examine the percentage of total purchases that were unplanned for a period of two weeks following the posting of a review.

Study 1: public sharing leads to appetitive preferences

The act of writing a review is an inherently social phenomenon, because the reviewer expects others will read it. Although people often form opinions about products, they do not always post those opinions online. To understand the behavioral effects of *sharing* emotional information with others, we compare public reviews with a condition in which participants form private opinions but do not post or share their reviews. We also consider the two types of information, namely, personal opinions and experiences (emotional) versus that which is based on fact (rational). With Study 1, we seek to

demonstrate that sharing information does not necessarily result in more impulsive behaviors; instead, the emotional review–reward effect arises only if emotional information gets shared. Thus, we randomly assigned participants in Study 1 to write an emotional or rational review (i.e., control).

To measure impulsive behaviors, we assessed choice between an appetitive and a nonappetitive product. This measure commonly serves to assess impulsivity by examining the trade-off between the short-term rewards provided by appetitive products (e.g., cake, flavor) and long-term rewards afforded by nonappetitive products (e.g., salad, health). Those who select the former due to a sudden unplanned urge to gratify themselves immediately are engaging in impulsive acts (Sengupta and Zhou 2007; Wilcox and Stephen 2013). Choice between a hedonic/vice product and a utilitarian/virtue product is a common measure of impulsivity in the literature, and includes: a choice between a \$25 gift certificate for school supplies or a movie (Wilcox et al. 2011), a side dish of French fries or salad as a lunch side dish (Wilcox et al. 2009), chocolate chip cookies or granola bar for a snack (Wilcox and Stephen 2013), and a luxury or non-luxury clothing item (Khan and Dhar 2006).

Several studies show that the amount a reviewer writes also relates to engagement (Baek et al. 2012) and that length of the review is an important factor that affects the utility of reviews (Chevalier and Mayzlin 2006; Mudambi and Schuff 2010). Therefore, we control for the effects of review length by entering word count as a covariate; it did not change the pattern of results.

Method

Ninety-six participants from an online panel (66% female; age 18–69 years; mean = 36 years) participated in this experiment and were randomly assigned to a 2 (audience: sharing vs. private) \times 2 (review type: emotional vs. rational) between-subjects design. Two participants (2% of sample) were removed from the study: one because she took excessive time on the writing task survey (likely started something and left off to do something else), and another because she did not take the writing task seriously (simply wrote down a single, indecipherable word). Thus, 94 entries entered the analysis; when we performed the analysis with the two excluded participants, the pattern of results did not change.

Participants watched a short video documentary on the life of Albert Einstein that presented a slideshow of pictures and a neutral voiceover, reciting a timeline of facts associated with his life. Next, participants were asked to write a review of the documentary, according to instructions that varied between subjects. That is, some participants were asked to write a personal review based on how the documentary made them feel (emotional condition), while others had to write an objective review based on their opinion of the quality of the documentary (e.g., storyline, editing; control [rational] condition). Other participants were informed that their review would be shared with

members of a film academy (sharing condition), whereas some were told that no one, not even the experimenters, would read it (private opinion condition).¹ The private opinion condition enables us to control for the engagement confounds that might arise from one group writing and the other not and also ensure that participants formed opinions of the product. That is, this condition represents the effects when a person forms opinion about a product but does not share them publicly.

After writing the review, participants were informed that they would move on to an unrelated decision-making study. They were asked to imagine that they had to choose between a chocolate chip cookie (appetitive item) and a granola bar (nonappetitive item; Wilcox and Stephen 2013). The word count of each review served as a covariate to control for the effort devoted to writing the review.

Results

Pretest A pretest with 90 participants from Amazon’s Mechanical Turk (MTurk), randomly assigned to a 2 (audience: sharing vs. private) \times 2 (review type: emotional vs. rational) between-subjects design, confirmed the believability of the manipulations, revealing no differences between the sharing and private opinion conditions ($M_{\text{private}} = 4.47$, $M_{\text{sharing}} = 5.00$; $t(88) = -1.27$; $p = .207$) nor the emotional and rational manipulations ($M_{\text{rational}} = 4.82$, $M_{\text{emotional}} = 4.60$; $t(88) = .53$; $p = .597$).

Manipulation checks To test whether the information manipulations worked as intended, participants answered two questions. Those in the emotional (vs. rational) condition reported lower scores in response to “I wrote down an objective review of the movie clip” ($M_{\text{emotional}} = 4.70$; $M_{\text{rational}} = 6.02$; $t(92) = 3.83$; $p < .001$, $r = .37$) and higher scores for “I wrote down my personal feelings and attitudes towards the movie clip” ($M_{\text{emotional}} = 6.14$; $M_{\text{rational}} = 3.76$; $t(92) = -6.03$; $p < .001$, $r = .53$). They also completed two items to indicate whether they thought others would read their review. Participants in the shared (vs. private) opinion condition reported higher scores on the statement “I felt like I was sharing it with other people” ($M_{\text{sharing}} = 5.57$; $M_{\text{private}} = 4.91$; $t(92) =$

¹ The audience and review type manipulation were: We would like you to write down your objective [personal] assessment of the short video biography on the space below. Comment about the quality of the sound, the editing, the length, and the content. As you write, do not let your personal feelings or opinions influence your factual assessment of the video. [Comment about how the film made you feel and what thoughts went through your head as you watched the clip. As you write, let your personal feelings and opinions guide your personal assessment of the video.] This will help you reflect on your experience, which is required for the next task. No one, not even the experimenters, will see what you have written. [Your review of the video will be shared with members of the film academy at our university. This will help them understand the importance of composition on various types films.] Please spend at least 3 min to write the assessment. After this time, you will be able to proceed to the next page.

-1.84; $p = .069$, $r = .19$) and lower scores for “I felt that it would not be seen by others” ($M_{\text{sharing}} = 2.72$; $M_{\text{private}} = 4.19$; $t(92) = 3.49$; $p = .001$, $r = .34$).

Two coders independently rated each review for both the intensity of emotion (*very rational–very emotional*) and the overall valence of the review (star rating: 1–5). Consistent with the self-report manipulation checks, participants in the emotional condition wrote with more intense emotions ($M_{\text{emotional}} = 2.67$, $M_{\text{rational}} = 1.49$; $t(92) = 5.23$, $p < .001$, $r = .48$), and emotional reviews were slightly more positive than rational reviews ($M_{\text{emotional}} = 3.39$; $M_{\text{rational}} = 2.96$; $t(92) = 1.89$, $p = .062$, $r = .19$).

Choice In the logistic regression to test the predictions, the dependent variable was choice; audience, review type, and their interaction were independent predictors; and word count and valence of review were covariates. The main effect of audience was not significant ($\beta = -.44$, $p = .492$), but the effect of review type was ($\beta = -1.29$, $p = .042$), such that participants in the emotional condition were more likely to choose the granola bar. This main effect indicates that forming an emotional opinion about a product in and of itself does not increase impulsivity. Neither word count ($\beta = -.002$, $p = .18$) nor valence of review were significant ($\beta = .085$, $p = .68$), indicating the effects are independent of the valence of the review. The review type by audience interaction was significant ($\beta = 1.81$, $p = .038$; Fig. 1); to explore this key interaction, we examined the effect of the audience on those who wrote rationally or emotionally. People who shared emotional information with a public audience (vs. private opinions) were significantly more likely to engage in impulsive behaviors by selecting the appetitive product (cookie; $z = 2.25$, $p = .024$). Participants who shared rational information were not more likely to engage in impulsive behaviors than those who only wrote down their rational opinions but did not share them ($z = -.68$, $p = .494$).

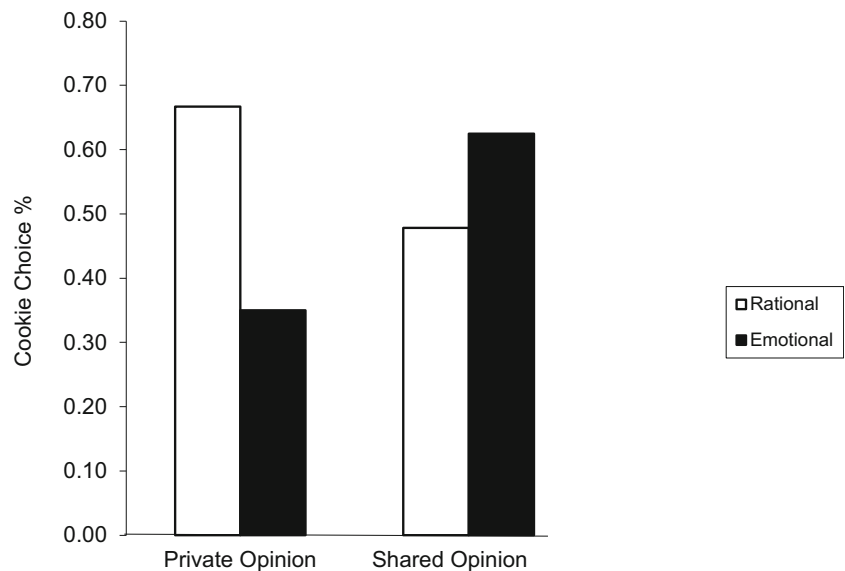
Discussion

Study 1 provides evidence of the emotional review–reward effect. Publicly sharing emotional information through customer reviews leads participants to engage in impulsive behaviors, in the form of preferring appetitive over nonappetitive options. This finding indicates the presence of reverse alliesthesia, because sharing emotional reviews appears to trigger a reward drive state that leads to impulsive choices. In Study 2, we include a control condition that does not limit the participants to writing in any particular manner.

Study 2: people naturally write emotional reviews

Retailers rarely instruct customers to provide reviews in any specific manner (e.g., write emotionally or rationally). Therefore, to address real-world, conventional writing styles, Study 2 includes a control condition without any specific writing instructions, which enables us to compare participants’ impulsive behaviors according to different scenarios. Study 2 also uses a different measure of impulsivity. That is, the appetitive choices in Study 1 represent impulsivity because they force a trade-off between immediate gratification and long-term benefits (Li 2008; Wilcox and Stephen 2013); similar trade-offs exist when people must make intertemporal rewards choices, such as between immediate or delayed gratification in the form of monetary rewards (Li 2008; Dhar and Wertenbroch 2012; Dittmar and Bond 2010; Van den Bergh et al. 2008). In Study 2 we thus asked participants to make a series of eight choices between smaller/sooner or larger/later rewards, which then serve as a measure of impulsivity (e.g., \$10 tomorrow vs. \$12 in 25 days; \$67 tomorrow vs. \$85 in 70 days).

Fig. 1 Study 1: effects of audience and review type on appetitive choice (cookie)



Method

The 174 participants from an online panel (55% female; age 18–70 years; mean = 35 years) were randomly assigned to a 2 (audience: sharing vs. private) \times 3 (review type: emotional vs. rational vs. control) between-subjects design. Five (3%) participants were removed: two due to excessive time taken to complete parts of the experiment (i.e., video or writing task), one due to an inability to write in English, one due to failure to take the writing task seriously (simply writing one word), and one due to guessing the purpose of the experiment. Thus, 169 respondents remained for the analysis, and a test that included the excluded participants did not change the pattern of results.

Participants viewed a short video documentary on the life of Genghis Khan, with features like those of the documentary in Study 1. After viewing the video, participants wrote their reviews, and the manipulations were like those in Study 1, except that participants in the control group only received instructions to write a review, without any details about style or content. After the writing task, participants made eight choices between smaller/sooner and larger/later monetary rewards (see Table 2). We summed the choices, so higher values indicate increased preference for smaller/sooner rewards (Li 2008). If people decide to obtain immediate gratification by selecting the smaller reward sooner, they are making an impulsive choice (Van den Bergh et al. 2008).

Results

Manipulation checks Similar to Study 1, participants responded to two items to check the review writing style manipulation. Those in the emotional (vs. rational) condition reported lower scores on “I wrote down an objective review of the movie clip” ($M_{\text{rational}} = 6.23$, $M_{\text{emotional}} = 5.15$; $t(106) = 3.89$, $p < .001$, $r = .35$) and higher scores on “I wrote down my personal feelings and attitudes towards the movie clip” ($M_{\text{rational}} = 2.92$, $M_{\text{emotional}} = 5.96$; $t(106) = -9.15$, $p < .001$, $r = .66$). Participants in the control condition did not respond to these statements. All participants completed two audience manipulation checks. Participants in the shared opinion condition reported higher scores on “I felt like I was sharing it with

other people” ($M_{\text{sharing}} = 5.66$; $M_{\text{private}} = 4.96$; $t(167) = -2.45$; $p = .015$, $r = .19$) and lower scores on “I felt that it would not be seen by others” ($M_{\text{sharing}} = 2.48$; $M_{\text{private}} = 3.94$; $t(167) = 4.77$; $p < .001$, $r = .35$).

Reward choices A two-way analysis of variance (ANOVA) included audience (sharing vs. private) and review type (rational vs. emotional vs. control) as independent variables and the summed choice of smaller/sooner rewards as a dependent variable, with word count and valence of review (star rating) as a covariate to control for engagement in the writing task. No main effects were identified for either audience ($F(1,161) = 1.72$; $p = .191$) or review type ($F(2,161) = .51$; $p = .600$), word count was marginally significant ($F(1,161) = 3.67$; $p = .057$, $r = .15$), and review valence was nonsignificant ($F(1,161) = .756$; $p = .386$). We also found a significant two-way interaction between audience and review type ($F(2,161) = 3.54$; $p = .031$; Fig. 2). In turn, we undertook a statistical comparison of the effects for participants who were asked to share information (emotional, rational, or control) versus those for people instructed to form similar opinions that would not be shared publicly. The participants who shared emotional information were more likely to engage in impulsive behaviors than were participants who did not publicly share their emotional opinions ($M_{\text{private}} = 4.10$, $M_{\text{sharing}} = 5.35$; $F(1,161) = 4.10$; $p = .044$, $r = .16$). In contrast, among participants who shared rational information, they were less likely to engage in impulsive behaviors than those who held their rational opinions privately ($M_{\text{private}} = 5.42$, $M_{\text{sharing}} = 4.64$; $F(1,161) = 1.98$; $p = .16$). Similar to the emotional review condition, when participants were not instructed about how to write the review (control condition), they were more likely to engage in impulsive behaviors if they shared rather than held the formed opinions privately ($M_{\text{private}} = 4.71$, $M_{\text{sharing}} = 5.54$; $F(1,161) = 2.35$; $p = .064$ one-tailed, $r = .12$). We found no significant differences between the control and emotional conditions for the privately held ($F(1,161) = 1.11$; $p = .29$) or publicly shared ($F(1,161) = .11$; $p = .74$) conditions. However, marginally significant differences arose between the control and rational conditions in both private ($F(1,161) = 1.84$; $p = .088$ one-tailed, $r = .11$) and shared ($F(1,161) = 2.52$; $p = .057$ one-tailed, $r = .12$) settings. Therefore, when reviewers receive no prompt about how to write a review, they naturally tend to share emotional content.

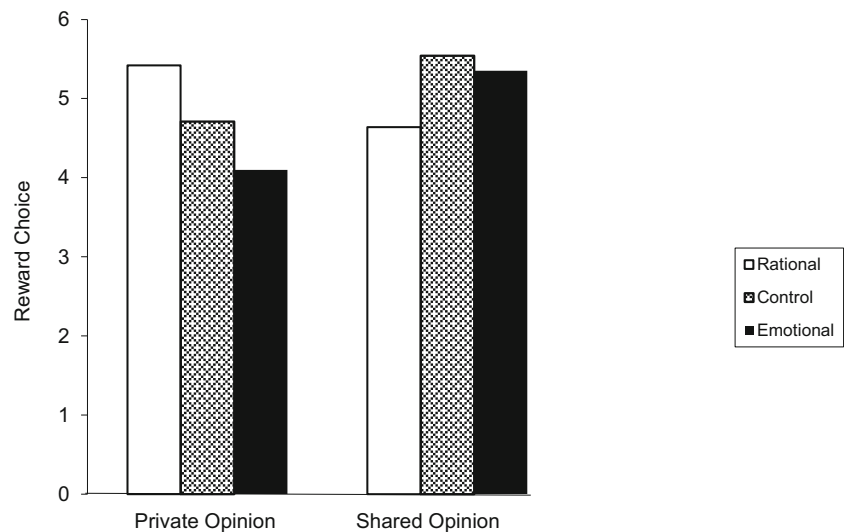
Discussion

These findings are in line with Study 1; we affirm the evidence of the emotional review–reward effect. When participants publicly share emotional information, regardless of valence, they are more likely to make impulsive choices than if they form similar opinions privately and do not share them. Participants in the control condition exhibited similarly impulsive choices as those in the emotional condition, whereas those in the rational condition did

Table 2 Studies 2 and 4: intertemporal choice between monetary rewards scale (Li 2008)

Choice
1. \$10 tomorrow vs. \$12 in 25 days
2. \$67 tomorrow vs. \$85 in 70 days
3. \$34 tomorrow vs. \$35 in 43 days
4. \$48 tomorrow vs. \$55 in 45 days
5. \$40 tomorrow vs. \$70 in 20 days
6. \$16 tomorrow vs. \$30 in 35 days
7. \$30 tomorrow vs. \$35 in 20 days
8. \$15 tomorrow vs. \$35 in 10 days

Fig. 2 Study 2: effects of audience and review type on reward choice



not. Participants may naturally be more expressive and inclined to share emotionally laden content in reviews, and this tendency might explain why they mimicked, even if to a lesser extent, the behavior of participants who were assigned to write emotionally.

Absent a retailer's explicit directions for how to write a review, consumers thus may be likely to write in an emotional manner and be subject to increased impulsivity due to the emotional review–reward effect. The vast number of reviews online implies that this finding might be cause for concern; many reviewers appear vulnerable to impulsive behaviors. However, the valence of the product review might influence the extent to which people provide emotional information; with Study 3, we seek to rule out the possibility that the effects might be constrained to positive reviews. If the interaction between the audience and review types remains significant even when we control for the star rating of the reviewed product (valence), the emotional review–reward effect is primarily activated by the *intensity* of shared emotions, not the *valence* of the emotions shared.

Study 3: it's about the review, not the product

Online retailers ask customers to review many different types of products, some of which may induce more positive or negative emotions than others. Therefore, we seek to determine whether the emotional review–reward effect generalizes across multiple product types and valences, such as different types of movie previews (neutral vs. entertaining). Previous literature indicates that participants are more likely to share their experiences of entertaining products; furthermore, companies actively work to reduce the effects of negative brand publicity (Berger and Schwartz 2011; Pullig et al. 2006). In line with our previous studies, we demonstrate the generalizability of the emotional review–reward effect by examining its

effects on a different measure of impulsivity, namely, participants' willingness to pay (WTP) (May and Irmak 2014; Vohs and Faber 2007). Willingness to pay is a commonly used metric of impulsivity, in that higher levels imply a greater urge to own the product and increased product valuations (Vohs and Faber 2007).

Method

The 256 participants from an online panel (56% female; age 19–71 years; mean = 36 years) entered the 2 (review type: rational vs. emotional) × 2 (audience: sharing vs. private) × 2 (movie clip: neutral vs. entertaining) between-subjects design. Eight participants (3%) were removed from the study because they took excessive time writing their reviews, leaving 248 usable entries. An analysis that included these participants did not change the pattern of results.

The participants were assigned randomly to one of eight groups and viewed a neutral clip, which featured the video documentary of Albert Einstein from Study 1, or an entertaining trailer of *Grabbers*, a U.K. monster movie. They then were asked to write a rational (emotional) review about the clip, which would (would not) be read by others. Next, participants indicated the amount of money (in dollars) that they would be willing to pay for the movie clip. On a separate page, they provided a star rating, which served as a covariate in the analysis to control for product preferences. Similar to previous studies, the number of words in the review also functioned as a covariate.

Results

Manipulation checks Similar to the previous studies, participants answered questions to indicate they type of review they wrote, and those in the rational (vs. emotional) manipulation

reported higher scores on “I wrote down an objective review of the movie clip” ($M_{\text{rational}} = 6.02$, $M_{\text{emotional}} = 5.15$; $t(246) = -4.67$, $p < .001$, $r = .29$) and lower scores on “I wrote down my personal feelings and attitudes towards the movie clip” ($M_{\text{rational}} = 3.47$, $M_{\text{emotional}} = 5.88$; $t(246) = 10.51$, $p < .001$, $r = .56$). For the audience manipulation check, participants in the sharing (vs. private) condition reported higher scores on “I felt like I was sharing it with other people” ($M_{\text{sharing}} = 5.27$, $M_{\text{private}} = 4.63$; $t(246) = 2.69$, $p = .008$, $r = .17$) and lower scores on “I felt that it would not be seen by others” ($M_{\text{sharing}} = 2.94$, $M_{\text{private}} = 4.18$; $t(246) = -4.81$, $p < .001$, $r = .29$).

Willingness to pay A three-way ANOVA was tested with audience (private vs. sharing), review type (rational vs. emotional), and movie clip (entertaining vs. neutral) as independent variables and WTP as the dependent variable; word count and review valence (star rating) functioned as covariates to control for involvement and review valence effects. As predicted, we found no significant three-way interaction ($F(1, 238) = .14$; $p = .71$). The main effects of audience ($F(1, 238) = .18$; $p = .675$) and review type ($F(1, 238) = .08$; $p = .78$) were not significant either, though the main effect of the type of movie was ($F(1, 238) = 11.37$; $p < .001$, $r = .21$). Both covariates, review valence ($F(1, 238) = 172.98$; $p < .001$, $r = .65$) and word count ($F(1, 238) = 8.82$; $p = .003$, $r = .19$), exhibited significant impacts on WTP. Among the two-way interactions, we found a significant interaction between audience and review type ($F(1, 238) = 6.99$; $p = .009$, $r = .17$) (Fig. 3). Planned contrasts revealed that participants who shared emotional information (vs. forming a private emotional opinion) were willing to pay significantly more for the film clip ($M_{\text{sharing}} = 6.01$; $M_{\text{private}} = 4.52$; $F(1, 238) = 5.24$; $p < .05$, $r = 0.15$);

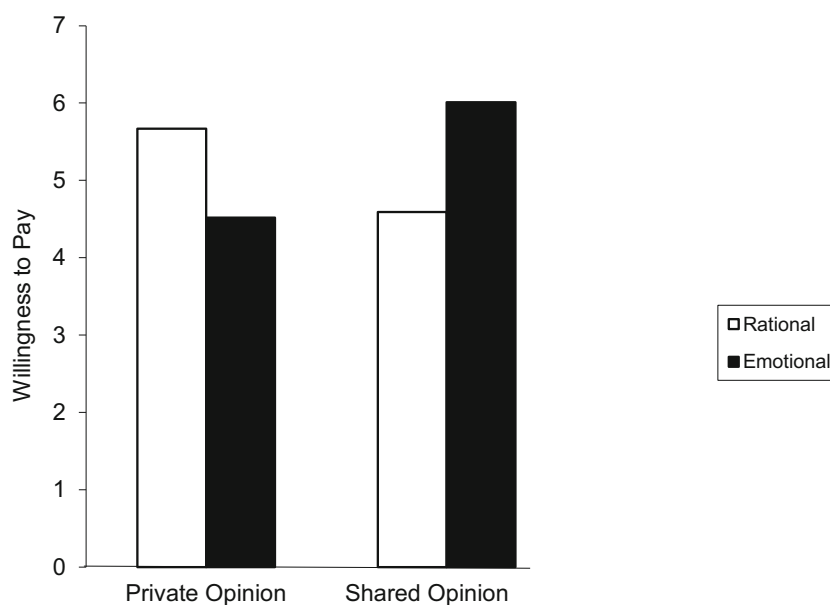
conversely, sharing rational reviews had no effect on WTP ($M_{\text{sharing}} = 4.59$; $M_{\text{private}} = 5.67$; $F(1, 238) = 2.26$; $p = .13$).

Discussion

With Study 3 we sought to extend the findings from Studies 1 and 2 by gaining insights into whether the emotional review–reward effect holds when participants write about more (vs. less) entertaining products. The results support the wider applicability of this effect and suggest that posting an emotional review can lead to impulsive behaviors, *regardless* of the type or valence (positive vs. negative) of the product being reviewed or its quality. Furthermore, the interaction remained significant even after we controlled for star rating (valence), indicating the emotional review–reward effect stems from the *intensity* of a communicated emotional review, not the valence of the product evaluation (e.g., high vs. low star rating).

The combined results of Studies 1–3 provide strong support for the proposed emotional review–reward effect. Yet these results could be “artificial,” in the sense that all three studies rely on controlled lab settings. It is critical to understand the effects as they arise in realistic market scenarios (Milberg et al. 2010). To check whether these effects emerge in ecologically valid settings, we conducted two studies with Amazon data. In Study 4, we test the underlying mechanism with a prospective study in which participants must post reviews on Amazon for a product they have previously purchased. In Study 5, we conduct a retrospective field study with previously posted [Amazon.com](https://www.amazon.com) reviews and then subsequent purchase data to test whether the reviewers increase their impulsive spending after they share more emotionally laden reviews.

Fig. 3 Study 3: effects of audience and review type on willingness to pay



Study 4: praise satiates the emotional review–reward effect

In Study 4, a prospective field study, we test the effect of exposure to praise (i.e., false feedback) on impulsive choices, to determine whether praise can satiate the reward drive created by sharing emotional reviews. This strong test of the mechanism underlying the emotional review–reward effect acknowledges that if the effects observed in our previous studies are due to reverse alliesthesia, providing an ancillary reward should mitigate the effects (Wadhwa et al. 2008). If instead people post emotional reviews as a form of altruism, praise should either strengthen the effect or have no influence. Previous research indicates that social praise promotes altruistic behavior (Andreoni 1990; Ellingsen and Johannesson 2008; Mills and Grusec 1989); thus, if consumers are praised and altruism is the mechanism, participants receiving praise and writing emotional reviews that will be shared should exhibit the strongest effects. Thus, we propose:

P3: Providing an ancillary reward (e.g., praise) mitigates the impulsivity effects of writing emotional reviews.

After writing reviews, most reviewers are redirected to a confirmation page on which the firm acknowledges that a review has been posted. We believe such a page has the potential to mitigate the impulsive drive brought about by writing reviews, because they represent a form of praise for reviewers. Thus, investigating the role of praise can produce important practical insights for retailers.

Method

Two hundred forty-seven participants from an online panel (65% women; age 19–76 years; mean = 35 years) participated in a 2 (audience: sharing vs. private) \times 2 (review type: emotional vs. rational) \times 2 (praise: no praise vs. praise) between-subjects design. Five (2%) respondents were removed for various reasons: one participant indicated an inability to write in the English, three participants in the sharing condition indicated that they did not post their reviews on [Amazon.com](https://www.amazon.com), and one participant identified as an Amazon vine member, leaving 242 participants in the analysis. The pattern of the results remained unchanged with their inclusion.

These participants, after being invited to participate in this experiment, next answered a screening question, regarding whether they had made a purchase on [Amazon.com](https://www.amazon.com) in the past six months. If not, the participants were immediately redirected to the end of the questionnaire. Participants who had made a purchase logged in to their [Amazon.com](https://www.amazon.com) accounts, at which point they were redirected to a page that featured products they had purchased but not reviewed. They had to select a product from the page that they had purchased

in the past six months and write a review of this product. They were randomly assigned to write a rational or emotional review and assigned to the private or shared opinion condition. These instructions were adapted from Study 1. Participants assigned to the sharing condition learned that they would share the review on [Amazon.com](https://www.amazon.com) and received instructions on how to do so. Those in the private condition instead were informed that we were developing an algorithm to evaluate messages in reviews, so no one would read the reviews that they had written.

After writing the review, participants were randomly assigned to either a praise or no praise condition. In the former, an anagram task prompted praise about their ability to find the correct number of solutions, beyond the norm (Hicks et al. 1969). Those in the no praise condition did not participate in this task. Similar to Study 2, participants then made eight monetary choices between a smaller/sooner or larger/ later reward, which we summed such that higher values indicated smaller/sooner choices. Word count again functions as a covariate, to control for engagement.

Results

Manipulation checks Similar to Studies 1–3, participants in the emotional (vs. rational) condition reported higher scores in response to the item, “I wrote down my personal feelings and attitudes towards the product” ($M_{\text{emotional}} = 6.27$; $M_{\text{rational}} = 5.20$; $t(239) = -6.52$; $p < .001$, $r = .39$) and lower scores to “I wrote down an objective review of the product” ($M_{\text{emotional}} = 5.27$; $M_{\text{rational}} = 5.51$; $t(239) = 1.44$; $p = .077$ one-tailed, $r = .09$). Moreover, participants in the sharing (vs. private) manipulation reported lower scores in response to the statement “I felt that it would not be seen by others” ($M_{\text{sharing}} = 2.40$, $M_{\text{private}} = 3.15$; $t(240) = 3.51$, $p = .001$, $r = .22$). Participants answered a slider question that asked them to indicate the extent to which they believed they shared information with others, anchored from 1 to 100 (1 = did not share information; 100 = shared information). With this question, participants in the sharing (vs. private) condition reported significantly higher values, to the extent that they felt they were sharing information ($M_{\text{sharing}} = 85.50$, $M_{\text{private}} = 76.81$; $t(240) = -3.34$, $p = .001$, $r = .21$). Participants in the praise condition completed a similar slider question, reflecting the feedback they received from the anagram task. A one-sample t-test revealed that these participants found the praise significantly more rewarding than the midpoint of the scale (50; $M = 70.72$; $t(120) = 9.35$; $p < .001$, $r = .52$), indicating a successful false feedback manipulation.

Reward choice A three-way ANOVA was conducted with the summed choice of smaller/sooner rewards as the dependent variable and word count and review valence (star rating) as covariates. We identified no significant main effects for praise

($F(1,232) = .210$; $p = .647$), audience ($F(1,232) = .310$; $p = .578$), or review type ($F(1,232) = 1.84$; $p = .176$). Word count covariate was marginally significant ($F(1,232) = 3.33$; $p = .070$, $r = .12$), but review valence did not have an effect ($F(1,232) = 3.33$; $p = .070$). None of the two-way interactions were significant: audience and review type ($F(1,232) = .593$; $p = .442$), praise and audience ($F(1,232) = 1.88$; $p = .171$), or praise and review type ($F(1,232) = .024$; $p = .878$). A significant three-way interaction arose though ($F(1,232) = 3.65$; $p = .057$, $r = .12$).

According to planned contrasts, participants assigned to the no-praise condition displayed results similar to those from Study 1 (Fig. 4). We found a significant two-way interaction between audience and review type ($F(1,232) = 3.86$; $p = .051$, $r = .13$), in which participants who shared emotional information with a public audience revealed more impulsive behaviors than those who expressed this information in private ($M_{\text{sharing}} = 4.23$, $M_{\text{private}} = 3.38$; $F(1,232) = 3.28$, $p = .07$, $r = .12$). Participants who expressed rational information in private displayed no statistically significant difference in impulsive behaviors than rational reviewers who shared the information with others, though it was in the direction expected ($M_{\text{sharing}} = 3.07$, $M_{\text{private}} = 3.63$; $F(1,232) = .92$; $p = .34$).

Meanwhile, no two-way interaction occurred between the audience and review type among participants in the praise condition ($F(1,232) = .81$; $p = .37$). No differences in impulsive behaviors could be identified among participants who shared emotional ($M_{\text{sharing}} = 3.50$, $M_{\text{private}} = 4.39$; $F(1,232) = 2.45$; $p = .12$) or rational ($M_{\text{sharing}} = 3.35$, $M_{\text{private}} = 3.68$; $F(1,232) = .13$; $p = .72$) reviews, compared with those who formed private opinions.

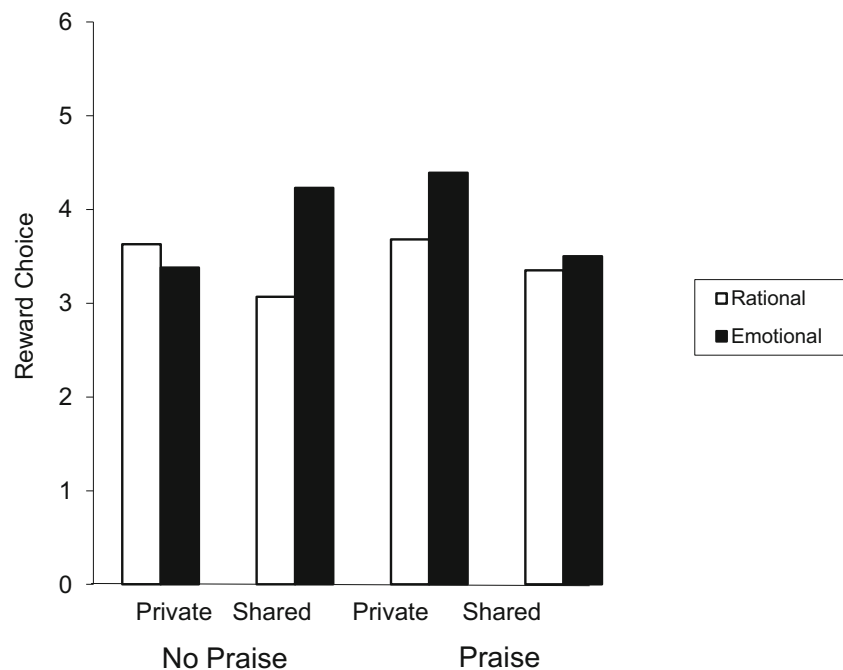
Discussion

The findings of Study 4 provide evidence of the underlying mechanism (reverse alliesthesia) that drives the emotional review–reward effect. When no satiation cue was presented (i.e., no praise), participants performed as they did in our previous studies. Those that shared an emotional review experienced more impulsivity than did those who simply formed these opinions in private. However, when participants were exposed to another reward, after writing a review and prior to the impulsivity measure, the differences between sharing emotional information publicly and expressing this information in private disappeared. These findings are consistent with cross-domain satiation, in that we show that an activated reward state can be satiated by the presence of another reward (Berger and Shiv 2011; Wadhwa et al. 2008).

Study 5: emotional reviews increase Amazon purchases

To confirm that sharing emotional reviews increases future impulse purchases, we conducted a retrospective field study among Amazon.com users, using real-world products and purchase data. In Studies 1–4, we compared how sharing emotional opinions publicly, versus forming such opinions privately, affects impulsive choices. In Study 5, our focus is solely on the public sharing condition, as manifested in Amazon review writing, which is inherently social and public in nature. For this field experiment, we asked existing Amazon.com users to access their account

Fig. 4 Study 4: effects of audience with review type in praise versus no praise



information and provide information about reviews they wrote in the past, then subsequent purchases they made. This unique research design offers further support for our proposition that a reviewer’s writing style influences her or his impulsive behaviors, for a period of at least two weeks.

Method

Design and procedure One hundred fifty-one Amazon.com reviewers were recruited from an online panel (47% female; age 19–68 years; mean = 32 years). Three participants (2%) were removed because they indicated at the end of the questionnaire that they did not provide correct information about either their reviews or their purchases. This check left 148 entries for analysis; an analysis conducted with these participants did not change the pattern of results.

The participants were invited to complete the questionnaire and were informed in advance that they would need to provide general, anonymous information about their product reviews and past purchases. Two screening questions then asked if they had ever purchased a product and had ever posted a review on Amazon.com. If participants answered “no” to either question, they were redirected to the end of the questionnaire. Participants who met these two criteria were asked to log in to their Amazon accounts, then cut and paste information from the last five product reviews they had posted. The requested information included the date of the review, star rating, title of the review, and its verbatim text. Next, we asked these respondents to review their purchase histories and indicate the total dollar amount of products they purchased in the two-week period following the date they wrote their reviews, as well as the total amount they spent on unplanned purchases during that time. They were instructed that if they had two reviews that overlapped within the two-week period, they should include only the purchases made before the next review was written, to ensure that purchases made could be attributed to that previous review. Finally, we asked them to indicate whether they provided truthful information.

Following the recommendations of Kollat and Willett (1967), we calculated the percentage of unplanned spending as our outcome variable to control for frequency and volume of shopping. We calculated the percentage of money spent on unplanned purchases over a two-week period after posting a review, divided by the total amount spent during this period. Because we excluded reviews that overlapped in two-week periods, this variable reflects the percentage of overall spending at Amazon.com that was unplanned.

A well-validated, commonly used computer program, the Linguistic Inquiry and Word Count dictionary (LIWC; Pennebaker Conglomerates, Inc. n.d.), enabled us to analyze the number of affective and cognitive words in each review, which then served as the independent variables (Berger and Milkman 2012; Tausczik and Pennebaker 2010). Affective

content (“AFFECT” in the model) is operationalized as words with emotional meaning, including *happy, pretty, ugly, good, hate, worthless, nervous, afraid, tense, hate, grief, cry, and sad*. Similarly, cognitive content (“COGMECH” in the model) is operationalized as words communicating rational thought, such as *cause, know, ought, think, effect, should, could, maybe, perhaps, always, never, include, except, without, because, hence, and constrain* (LIWC; Pennebaker Conglomerates, Inc. n.d.). The number of stars in the review and word count functioned as covariates.

Analytical procedure In these multilevel data, the 433 reviews are nested within 148 participants. Typical ordinary least square regression models are not suitable for such data, which violate the assumption of the independence of observations (Hox 2002). Therefore, we developed a hierarchical linear model (HLM; Raudenbush and Bryk 2002), using full maximum likelihood estimation. Due to the likely non-normality in the outcome variable (and to be conservative in our estimates), we calculated the effects using robust standard errors (Hox 2002). All predictor variables were entered using the natural X metric (uncentered) (Raudenbush and Bryk 2002), and all coefficients were entered as random effects.

The first level of analysis included the specific review characteristics; we did not include any variables at the second level. As a first step in the HLM analysis, we conducted a one-way ANOVA with random effects (i.e., null or intercept-only model, with no predictors specified for Levels 1 or 2) to investigate whether the data were suitable for multilevel modeling (Garson 2012). The results indicated significant between-group variance ($\chi^2(147) = 1217.98, p < .001$). Moreover, according to the intraclass correlation coefficient (ICC), 73% of the variance in the percentage of unplanned spending occurs between reviewers (Raudenbush and Bryk 2002). These results highlight the suitability of using multilevel modeling for the data. Therefore, we formulated HLM models for the hypothesis tests with the following Level 1 (specific review characteristics) and Level 2 equations:

Level 1

$$\begin{aligned} \text{UNPPERCS}_{ij} = & \beta_{0j} + \beta_{1j}^* (\text{WC}_{ij}) + \beta_{2j}^* (\text{STARS}_{ij}) \\ & + \beta_{3j}^* (\text{AFFECT}_{ij}) \\ & + \beta_{4j}^* (\text{COGMECH}_{ij}) + r_{ij}. \end{aligned} \tag{1}$$

Level 2

$$\begin{aligned} \beta_{0j} = & \gamma_{00} + u_{0j} \cdot \\ \beta_{1j} = & \gamma_{10} + u_{1j} \cdot \\ \beta_{2j} = & \gamma_{20} + u_{2j} \cdot \\ \beta_{3j} = & \gamma_{30} + u_{3j} \cdot \\ \beta_{4j} = & \gamma_{40} + u_{4j} \cdot \end{aligned} \tag{2}$$

Table 3 Study 5: means, standard deviations, and correlations

Variables	Mean	SD	1	2	3	4
LEVEL 1 Reviews Variables						
1. Word Count	91.41	109.13	–			
2. Stars	4.14	1.24	–.033	–		
3. Affective Processes	6.83	4.53	–.182**	.203**	–	
4. Cognitive Mechanisms	16.39	5.96	.042	–.099*	–.164**	–
LEVEL 2 Reviewer Variables						
–						

*No variables were included in the second level

In both equations, *i* and *j* represent each review and reviewer, respectively; UNPPERCS denotes the percentage of unplanned spending; WC is word count; STARS refers to the star ratings; AFFECT is affective processes; and COGMECH represents cognitive mechanisms. Table 3 summarizes the means and standard deviations.

Results

Table 4 contains the HLM models and results; we report unstandardized coefficients. Affective content of reviews significantly predicted unplanned purchases ($\gamma_{30} = .006, p = .053$), as did diminished use of cognitive/rational words ($\gamma_{40} = -.006, p = .014$). Lower star ratings were associated with a greater amount of subsequent unplanned

spending ($\gamma_{20} = -.016, p = .075$). Length of the review (word count) did not significantly affect the % of unplanned spending ($\gamma_{10} < .001, p = .769$), nor did age ($\gamma_{01} = -.001, p = .820$) or gender ($\gamma_{02} = .824, p = .177$).

Discussion

Building on the findings from Studies 1–4, we find support for the emotional review–reward effect: emotionally laden reviews lead to impulsive behaviors (in this case, spending more money on unplanned products). We also find a significant decrease in impulsive behaviors when reviewers share more rational content with their audience. Furthermore, lower star ratings lead to increased spending on unplanned purchases, perhaps reflecting consumers’ attempts to cope

Table 4 Study 5: hierarchical linear models

	Null Model: $UNPPERCS_{ij} = \gamma_{00} + u_{0j} + r_{ij}$	Intercepts and Slopes as Outcomes Model: $UNPPERCS_{ij} = \gamma_{00} + \gamma_{10} * WC_{ij} + \gamma_{20} * STARS_{ij} + \gamma_{30} * AFFECT_{ij} + \gamma_{40} * COGMECH_{ij} + u_{0j} + u_{1j} * WC_{ij} + u_{2j} * STARS_{ij} + u_{3j} * AFFECT_{ij} + u_{4j} * COGMECH_{ij} + r_{ij}$
Fixed Effects	Coefficient (SE)	Coefficient (SE)
For INTRCPT1, β_0	0.253 (0.031)***	0.361 (0.072)***
WORD COUNT, β_1		0.000 (0.000)
STARS, β_2		–0.016 (0.009) ⁺
AFFECTIVE PROCESSES, β_3		0.006 (0.003)*
COGNITIVE MECHANISMS, β_4		–0.006 (0.002)**
Random Effects	Variance Component (SD)	Variance Component (SD)
INTRCPT1, u_0	0.121 (0.347)***	0.232 (0.482)**
WORD COUNT, u_1		0.000 (0.001)**
STARS, u_2		0.000 (0.014)
AFFECTIVE PROCESSES, u_3		0.000 (0.004)
COGNITIVE MECHANISMS, u_4		0.000 (0.009)
Level-1, <i>r</i>	0.044 (0.209)	0.039 (0.196)
Model Fit		
Deviance (Parameters)	175.16 (3)	160.27 (21)
Δ Deviance (Parameters)		14.89 (18)***

*** $p \leq .001$, ** $p < .01$, * $p < .05$, + $p < .10$

with negative product experiences: Purchasing products may make them feel better (e.g., Garg et al. 2007). Similar to Study 3, affective content was significant even when we control for the valence of the review (star rating), such that the emotional review–reward effect appears to function based on the *intensity* of emotions, not the *valence* of the emotions in shared reviews.

The results of this retrospective field study admittedly could suffer selection biases. The participants had already posted reviews on Amazon.com, so it is possible that reviewers simply are more loyal to the website, such that they would be both more emotional in their reviews and more likely to make impulsive purchases. In addition, people who tend to write emotionally laden reviews could exhibit higher impulsivity in general. Although these concerns are valid, they seem unfounded when interpreted in conjunction with the preceding four studies. The confounds in this field study also are inherent to any field study, and the results of the tightly controlled Studies 1–4, which include randomly assigning participants to the various conditions, control for such types confounds. Because the results from both types of studies align, we find strong support and ecological validity for the emotional review–reward effect.

General discussion

To examine the emotional review–reward effect, we conducted a series of studies to understand the behavioral consequences of writing reviews on the reviewer. Drawing on the theory of reverse alliesthesia, we proposed that product reviews are naturally embedded in a social context, which, along with a consumer's propensity to share emotional content, creates a socially rewarding experience that activates the reward center of the brain and ultimately influences that consumer's impulsive behaviors. We tested these propositions in five studies, using a variety of established measures of impulsivity, and we find consistent support. When reviewers share emotional (but not rational) opinions, they subsequently engage in more impulsive behaviors than if they formed the same opinions privately but did not share them. These findings are affirmed by two studies among Amazon.com reviewers.

Generalizability meta-analysis

To test the robustness of our results, we ran a mini meta-analysis on the effects reported in the study following the standard meta-analytical procedures, as described in Grewal et al. (2018). We calculated the independent effect sizes associated with the planned contrasts pertaining to sharing (vs forming opinions privately) emotional reviews. For consistency across studies, we excluded the praise condition in Study 4. Using a fixed effects model, the average weighted η of sharing

emotional reviews is .15, ($z = 2.63$, $p < .01$) indicating a small to moderate, but significant effect size. Furthermore, Cochran's Q test of heterogeneity of effect sizes indicates that the effects are homogenous in nature ($Q(4) = 3.22$, $p = .52$). Finally, we calculated the file drawer N, which is an indication of how many null effect studies would be needed to reduce the mean effect significance to exactly .05. File drawer N analysis found it would take 10 null studies to reduce the significance to level to .05. The results of the mini meta-analysis provided confidence that the results reported in the paper are not due to chance.

Implications for theory

Our research offers three key contributions to theory. First, it contributes to the growing body of eWOM literature by expanding on traditional research that investigates solely how reviews influence readers' (i.e., non-reviewers') behavior (Chevalier and Mayzlin 2006; Ludwig et al. 2013). With our focus on the reviewer, instead of the reader, we demonstrate that these consumers are more likely to make impulsive choices when they share emotional opinions.

Second, our research contributes to research on reverse alliesthesia by demonstrating that social cues are capable of creating these effects. Prior research on reverse alliesthesia already has established that exposure to different, physiologically rewarding stimuli (e.g., food, sex) may affect impulsive behaviors (Wadhwa et al. 2008). Our results extend this theory, by showing that the social rewards (Berger and Shiv 2011) that a consumer accrues from sharing emotional information leads to motivated states, similar to those previously documented (Kim and Zauberger 2013; Li 2008; Van den Bergh et al. 2008). Beyond this critical finding, we add another, more minor contribution to reverse alliesthesia theory, in that we demonstrate that the writing style of customer reviews determines whether reverse alliesthesia gets activated. This finding aligns with the theory of reverse alliesthesia, which proposes that a reward drive results from exposure to rewarding stimuli. Because the act of sharing emotional reviews is socially rewarding, it can strengthen connectedness with others (Laurenceau et al. 1998; Peters and Kashima 2007) and prompt reviewers to exhibit impulsive behaviors. By demonstrating that the emotional review–reward effect occurs when sharing emotional, but not rational, reviews, we also rule out potential status effects as an alternative explanation.

Third, the current research demonstrates that social sharing through reviews is rewarding and that praise can mitigate the relationship between review writing and impulsive behavior.

Implications for managers

By studying customer reviews, which constitute a popular feature for online retailers such as Amazon, we shed new light

on how writing those reviews affects reviewers, as well as some potential concerns that may arise from the uses of reviews and social media. The relationship between emotional reviews and impulsivity is a critical insight for marketing managers, with practical implications. Our research suggests that impulsivity can be manifest in a wide range of outcomes. Even if a retailer prompts impulsivity successfully among consumers and reviewers, it has no guarantee that they purchase from it, rather than from competitors. We offer suggestions for retailers that seek to leverage the identified emotional review–reward effect and translate it into sales.

First, the findings suggest new opportunities for customer conversion. As methods to analyze online customer behavior in real time improve, firms can adapt their websites to each customer. Content within customer reviews could provide key information for determining how to display the site to them. If customers' reviews contain mostly emotional words for example, the firm should present more hedonic products in its online advertisements or product recommendations to these potential buyers. It also might offer discounts on these items, to increase their appeal and encourage impulsive buying. The order in which reviews for other products appear for a reviewer also can be customized, depending on the amount of emotion he or she shares in his or her own reviews.

Second, in combination with these personalization efforts, firms can direct customers to write their reviews in an emotional manner by subtly altering the instructions. For example, definitions of star ratings might feature emotional terms (5 stars = "I loved it," 1 star = "I hated it"). Retailers can ask customers explicitly to share how the products made them feel, which likely would activate and enhance the effects we have detailed herein, through a simple, effective influence. In a related point, the findings suggest that both writing reviews and what gets written have substantial impacts on reviewers' future behavior. An increased focus on incentivizing consumers who have not previously written reviews is likely to offer strong benefits for retailers.

Although encouraging reviewers to write emotional reviews may be beneficial to the retailer, it also has the potential for the abuse of customers. Put simply, reviewers suffer increased susceptibility to impulsive behaviors, simply because they share their personal views with others in a public forum. However, many customers remain unaware of the potential risks of social media participation (Wilcox and Stephen 2013). Industry associations should develop more specific guidelines for members to implement on their platforms, to help the public become more aware in their decisions. Reviewers who share opinions in an emotional manner are particularly susceptible to increased impulsive behaviors, so firms also might develop text mining (text analytics) tools that enable them to identify reviewers who are prone to writing emotionally, then develop targeted strategies to manage them.

To avoid some of these risks, firms might adopt other initiatives, such as integrating praise into their reviewer feedback

systems, presented to customers immediately after they submit a review. One drawback, however, is that customers may become accustomed to, or skeptical of, certain praise messages (Henderlong and Lepper 2002). Managers responsible for the social media functions of their companies must therefore take great care to make these messages as authentic as possible and tailor them to individual accomplishments. Because people derive social rewards from a variety of sources, managers can also consider other socially rewarding feedback such as acknowledging and thanking the reviewers for their contributions. These simple responses could be sufficient to deter impulsive behaviors.

Limitations and areas for research

The scope of this research is limited to customer reviews. Because the Internet is flourishing with user-generated content that can be shared on social networking sites, collaborative platforms, micro-blogs, forums, content communities, and many other forms of social media, further research should investigate whether sharing content on other platforms is perceived as equally rewarding and thereby leads to heightened impulsive behaviors. People share different information, depending on the size of their audience (Barasch and Berger 2014); it would be interesting to determine how audience size affects the extent to which the sharing experience is rewarding.

Additional research might concentrate on other factors, beyond praise, that can mitigate impulsive behaviors. Moreover, the effectiveness of praise likely differs across consumers, particularly about what is being praised and by whom (Henderlong and Lepper 2002). Similarly, the role of self-monitoring could be examined, in that it moderates customer preferences (Puccinelli et al. 2007). Strong self-monitors may be more susceptible to the emotional review–reward effect, because of their sensitivity to social rewards. Individual differences in trait impulsivity also might alter the passionate review–reward effect. In the experimental designs in Studies 1–4, participants received random assignments to the experimental conditions, which mitigated the effects of individual trait impulsivity across conditions. Thus, these studies can demonstrate a causal connection between writing emotionally and increased impulsivity, yet research needs further exploration of such individual differences.

A surprising finding from our research is the impulsivity effects associated with writing rational reviews. Although not consistently significant, we did find a pattern across studies in which reviewers who formed rational, private opinions became more impulsive than those who shared their rational opinions. We hope continued research tests this insight further.

To deal with the limitations of self-reported data, we used multiple measures of impulsivity, including unplanned spending, vice and virtue choices, and intertemporal choices between monetary rewards, as is common in prior literature (e.g., Bearden and Haws 2012; May and Irmak 2014; Yoon and Kim 2016). The consistency of the results across studies gives us confidence in the results, but we also call on further research to include other impulsivity measures.

Finally, Wilcox and Stephen (2013) find that greater social network use is associated with greater impulsivity, particularly among people with strong ties among them. We contribute to this theory by showing that active participation, through posting on social networking sites, may heighten impulsive behaviors. This finding has broad societal implications. Further research that delves into such effects can help advance our understanding of the consequences of social network use and provide consumers with more awareness of the potential influences of social media. This awareness in turn may grant them more control over their behaviors.

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