Hedonic Contrast Effects Are Larger When Comparisons Are Social

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A hedonic contrast effect occurs when comparing a stimulus to its alternatives makes it better or worse. We find that counterfactual comparisons induce larger hedonic contrast effects when they are also social comparisons. Hedonic contrast effects influence happiness with a food or wage more when another person receives its counterfactual alternative than when no person receives its counterfactual alternative. Social attention, the propensity to attend to the experiences of other people, underlies the larger hedonic contrast effects induced by social comparisons. People pay more attention to counterfactual alternatives when they are also social comparison standards, and this difference in the allocation of attention mediates the larger hedonic contrast effects that social counterfactual comparisons induce. Reducing attentional resources with cognitive load or time pressure reduces the impact of social counterfactual comparisons, and drawing attention to nonsocial counterfactual comparisons increases their impact. Social attention makes comparisons stronger when they are social.

Keywords: social comparison, hedonic contrast effects, social attention, counterfactual thinking, affect

One dark side of variety is foregoing alternatives to our experiences. Choosing a job, marrying a spouse, or ordering a salad usually precludes one from having other jobs, spouses, and entrées. A hedonic contrast effect occurs when comparing an experience to such foregone counterfactual alternatives—experiences one could have had, but didn't—makes the experience subjectively better or worse (Cooke, Meyvis, and Schwartz 2001; Novemsky and Ratner 2003; Tversky and Griffin 1991). Many alternatives to one's experiences, however, are not simply foregone. Another person experiences them. Other people are making wine, marrying one's former lovers, and ordering the burger. These kinds of counterfactual comparisons are also social comparisons (Festinger 1954).

We suggest that counterfactual comparisons induce more potent hedonic contrast effects when they are also social comparisons. We report the results of six experiments comparing similar social and nonsocial counterfactual comparisons. We find that social counterfactual comparisons induce larger hedonic contrast effects. Process tests examining mediators and moderators support a social attention account of this difference. People are more likely to attend to and consider a counterfactual alternative when another person experiences it. This increased attention and consideration increases its hedonic impact.

HEDONIC CONTRAST

Judgment is relative. Whether judging the quality of a job, the tidiness of a spouse, or the virtue of a salad,

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Editors: Vicki G. Morwitz and Linda L. Price

Associate Editor: Andrea C. Morales

Advance Access publication September 18, 2018

 • Vol. 46 • 2019
DOI: 10.1093/jcr/ucy070

judgments are made by comparison between the target of judgment and a comparison standard such as other jobs, people, and entrées (Buechel and Morewedge 2014; Helson 1964; Kahneman and Miller 1986; Morewedge 2015; Mussweiler 2003; Parducci 1965). Comparison standards can both facilitate and change the evaluation of the focal stimulus (i.e., the target). Comparison standards calibrate and increase the sensitivity of judgment (Hsee et al. 1999; Morewedge et al. 2009). If people notice sufficient differences between the target and the standard, however, the comparison produces a contrast effect that shifts the evaluation of the target in the opposite direction of the comparison standard (Anderson 1973; Campbell, Lewis, and Hunt 1958; Helson 1964; Herr 1986; Lynch, Chakavarti, and Mitra 1991; Manis and Armstrong 1971; Mussweiler and Strack 2000; Sherif and Hovland 1961). Boston is large by comparison to Lisbon, but small by comparison to Tokyo.

Hedonic contrast effects, the focus of our investigation, occur when comparison between a target and a standard makes the subjective experience of the target better or worse (Cooke et al. 2001; Meyvis and Cooke 2007; Huh et al. 2016; Novemsky and Ratner 2003; Sood and Drèze 2006; Tversky and Griffin 1991). Winning $5 feels better when its alternative was $3 compared to when its alternative was $7 (Kassam et al. 2011; Mellers et al. 1997). Even winning nothing can be good when the alternative was a loss (Larsen et al. 2004). Hedonic contrast effects can be strong enough to make objectively superior outcomes feel worse than outcomes that are objectively inferior. Olympians are happier winning a bronze than silver medal because bronze medalists compare their outcome to winning no medal (a downward comparison), whereas silver medalists compare their outcome to winning the gold (an upward comparison; Medvec, Madey, and Gilovich 1995).

Behavioral, neural, and physiological evidence suggests that hedonic contrast effects are not a scaling effect (Huh et al. 2016). They change not only the ratings of the experience, but also the subjective experience itself (Lynch et al. 1991). People work harder for the same reward after comparing it to an inferior than a superior alternative (Morewedge and Buechel 2013), and the relative value of a target stimulus changes external physiological responses to it, such as how much one smiles or frowns when one sees it (Larsen and Norris 2009).

While prevalent, contrast effects—particularly hedonic contrast effects—do not always occur when an experience is compared to an alternative. Contrast effects require people to first identify similar dimensions on which to compare a target and standard, and then to have sufficient attentional resources and motivation to notice differences on those dimensions. When comparing vacations in Fiji and Florida, one first identifies their similar features (e.g., beaches, warm weather, palm trees, fruity cocktails). Only after those similarities are established does one notice their differences. Whether a contrast effect occurs is thus contingent on whether attentional resources are available and expended when comparing a target and standard (Gentner and Markman 1997; Mussweiler 2003; Strack et al. 1993). Even extreme comparison standards may fail to induce a contrast effect if attention is largely directed toward the focal experience rather than the standard during judgment, as is frequently the case with complex hedonic experiences (e.g., eating, drinking, reading, appreciating art, watching films, winning prizes; Buechel et al. 2014; Buechel, Zhang, and Morewedge 2017; Ebert and Meyvis 2014; Gilbert et al. 2004; Morewedge et al. 2010; Novemsky and Ratner 2003; O'Brien and Roney 2017).

COUNTERFACTUAL AND SOCIAL COMPARISONS

One kind of comparison standard is a counterfactual alternative, which is an experience one might have had but did not (Byrne 2016; Kahneman and Miller 1986). It is a fictional situation or scenario. While counterfactual alternatives are cognitive experiences grounded in mental simulation, they can also induce potent hedonic contrast effects and emotions, including joy, regret, and disappointment (Gilbert et al. 2004; Hsee et al. 2009; Kassam et al. 2011; Larsen et al. 2004; Mellers et al. 1997; Sood and Drèze 2006). Drawing on parallels to the literature on episodic and semantic memory, we make a distinction between counterfactual alternatives to one's personal experience (i.e., episodic counterfactuals), and more general alternatives to the present that might have occurred with a change to history, society, or the natural world (i.e., semantic counterfactuals; Roese and Epstude 2017). Simulating how your own life would be different if you were president is an episodic counterfactual. Simulating how the world would be different if Hillary Clinton had been elected president is a semantic counterfactual. We examine episodic counterfactual comparisons, comparisons between one's personal experience and counterfactual experiences one might have had.

Another kind of comparison standard is a social comparison (Bearden and Rose 1990; Dahl 2013; Dahl, Argo, and Morales 2012; Han, Nunes, and Drèze 2010; McFerran et al. 2010; Xia et al. 2004), whereby people compare themselves to other people (Olson, Buhrmann, and Roese 2000). People judge their houses and incomes not only in absolute terms (e.g., how much they earn), but also in comparison to the houses and incomes of their friends, neighbors, and coworkers (e.g., how much they earn relative to other people; Luttmer 2005; Miller and Prentice 1996). These social comparisons can induce hedonic contrast effects as well (Buunk et al. 1990; Lyubormirsky and Ross 1997, 1999; Ma and Roese 2013; Medvec et al. 1995;

Smith 2000; Van Boven 2005; Wheeler and Miyake 1992; Wills 1981).

Social comparisons typically represent factual alternatives to one's experience (Summerville and Roese 2008). When Bob compares his vacation to Carol's vacation, he is comparing his experience to a factual alternative. But when social comparisons involve alternatives that one might plausibly have experienced (e.g., if Bob imagines taking Carol's vacation), they can produce a counterfactual comparison as well. Many classic examples of counterfactual thinking are instances where social and counterfactual comparisons overlap, from counterfactuals elicited by athletic performances (Kahneman and Varey 1990; Medvec et al. 1995) to cases in which a last-minute change in plans led another person to die in one's stead (Miller and Taylor 1995). For the sake of clarity, we refer to cases of counterfactual comparison where the comparison standard involves another person as *social counterfactual comparisons*. We refer to cases where the comparison standard does not involve the experience of another person as *nonsocial counterfactual comparisons*.

In the present research, we propose that counterfactual comparisons induce larger hedonic contrast effects when they are social than when they are nonsocial (hypothesis 1). Initial support for our proposition is provided by economically suboptimal behaviors that people perform to avoid unfavorable social comparisons. In economic surveys, one such behavior is a preference for *positional goods*. People prefer goods that maximize relative value (value compared to goods owned by their peers) to goods that maximize objective value (the absolute value of the good). For example, the majority of people say they would prefer to live in a world in which their income was $50,000 and others earned $25,000 rather than in a world in which their income was $100,000 and others earned $200,000, even if the purchasing power of that money was held constant (Solnick and Hemenway 1998, 2005). People prefer to maximize relative value at the expense of objective value across an array of outcomes, ranging from the size of their home to the attractiveness and intelligence of their children (Solnick and Hemenway 2005).

People also exhibit a variety of forms of *inequity aversion*. In extreme cases, people will forego rewards entirely rather than receive a smaller reward than a peer (Fehr and Schmidt 1999). In ultimatum games, people offered an inequitable division of rewards by another person often choose to reject the division and receive no reward rather than accept that division and earn less than the divider—the person making the offer (Camerer 2003; Güth, Schmittberger, and Schwarze 1982; Yamagishi et al. 2009). Primates exhibit similar behavior. Monkeys will pull a lever so that they and another monkey both receive the same reward, whether the reward is cucumber (less preferable) or grapes (more preferable). However, they will not pull the lever if the reward they receive is worse than the reward received by the other monkey (e.g., if they will receive cucumber and the other monkey will receive grapes; Brosnan and de Waal 2003).

Inequity aversion appears to be greater when the recipient of the larger (inequitable) reward is a person than when the recipient is not a person. People are less likely to accept inequitable ultimatum game offers made by a person than by a computer program (Sanfey et al. 2003). When someone else obtains a superior reward, people are more motivated to obtain that reward than when no one else obtains it (Crusius and Mussweiler 2012). People are more likely to continue to sink money into failed investments if that money will prevent another person from profiting from their failed investments than if no one else might profit from it (Hoelzl and Loewenstein 2005). People are more likely to prefer risky than safe investments when risky investments give them a chance to outearn another person, compared to when there is no other person to outearn (Bault et al. 2011).

These decision and actions, however, are based on indirectly inferred beliefs about the potency of social comparisons, which are questionable because hedonic contrast effects are more prevalent in prospect and memory than experience. While hedonic contrast effects occur, people overestimate their potency (Buechel et al. 2014; Gilbert et al. 2004) and even recall hedonic contrast effects that they did not experience (Novemsky and Ratner 2003). These mistakes occur because people fail to recognize that they will have fewer cognitive resources to attend to comparison standards when having multisensory experiences than when imagining them in prospect or recalling them from memory. As a result, they are less likely to compare a focal experience to its alternatives while having that experience than when imagining or remembering it (Morewedge et al. 2010; Novemsky and Ratner 2003).

THE PRESENT RESEARCH

To date, only indirect evidence inferred from choices supports the assumption that counterfactual comparison standards induce larger hedonic contrast effects when they are social than when they are nonsocial. We suggest that counterfactual comparisons do induce larger hedonic contrast effects when another person experiences the counterfactual alternative than when no other person experiences it: when they are social versus when they are nonsocial. More important, we directly test our prediction and identify a process mechanism responsible for the larger hedonic impact of social counterfactual comparisons. We suggest that social counterfactual comparisons are more potent because they are more likely to attract the attention and consideration necessary to induce hedonic contrast effects.

We argue that the impact and influence of social counterfactual comparisons may be traced, in part, to social attention. From infancy onward, people tend to orient their attention toward the objects attended to by other people (Corkum and Moore 1995; Friesen and Kingstone 1998; Friesen, Moore, and Kingstone 2005). At nine months of age, infants exhibit an early form of this propensity, *joint attention*. They naturally look at objects gazed at by adults in their environment (Striano et al. 2006). At 12 and 18 months of age, infants will crawl around a barrier to see to which object an adult is attending (Moll and Tomasello 2004). In adults, orienting attention to a new object is facilitated when other people direct their gaze toward it (Friesen and Kingstone 1998). The purpose of joint attention is to orient people toward a common set of referents. It enables one to know which objects other people are thinking about, talking about, and intending to act upon. Joint attention is viewed as an automatic and foundational ability enabling the development of social cognition; an understanding of shared intentions, language, and goals; and the construction of a shared social reality (for a review, see Frischen, Bayliss, and Tipper 2007).

In adulthood, social attention manifests itself in more expansive forms. People readily seek and use the experiences of others as a means to assess and understand the self, which makes social comparison a pervasive feature of life (Dunning and Hayes 1996; Mussweiler 2003; Suls and Wheeler 2000). Whereas counterfactual comparisons are typically evoked when outcomes are unusual, unpleasant, recent, or have resulted in a failure to achieve a particular goal (Byrne 2016; Galinsky and Moskowitz 2000; Kahneman and Miller 1986; Roese 1997; Roese and Epstude 2017), social comparisons are evoked for good and bad outcomes often (Gerber, Wheeler, and Suls 2018; Summerville and Roese 2008), automatically, and unintentionally (Gilbert, Giesler, and Morris 1995; Mussweiler and Rüter 2003).

People treat social comparison standards as diagnostic comparisons standards. When provided with both social and objective standards, people explicitly prefer to compare themselves to social standards (e.g., whether they are more or less likely than their peers to contract a disease) rather than to objective standards that would provide them with actionable information about themselves and their world (e.g., their objective likelihood of contracting the disease; Klein 1997). When engaged in self-assessment, people are sensitive to relevant social comparisons that arise outside their conscious awareness (Mussweiler, Rüter, and Epstude 2004). People even compare themselves to others who are explicitly nondiagnostic comparison standards—such as people who are pursuing different goals, or are pursuing the same goal under easier circumstances—and only discount these irrelevant comparisons when they have time to consciously reflect on their diagnosticity (Gilbert et al. 1995).

We suggest that social attention amplifies the hedonic impact of counterfactual comparison. When counterfactual comparisons arise, social attention leads people to be more likely to attend to and consider counterfactual alternatives when another person experiences them. This increases the impact of the counterfactual alternatives on judgments of the target experience, leading social counterfactual comparisons to produce larger hedonic contrast effects than similar nonsocial counterfactual comparisons. More formally:

H1: Counterfactual comparison induces a larger hedonic contrast effect on a focal stimulus when it is social (i.e., when another person experiences the counterfactual alternative) than when it is nonsocial (i.e., when no other person experiences the counterfactual alternative).

H2: Counterfactual comparison induces larger hedonic contrast effects when it is social versus nonsocial, because consumers are more likely to attend to and consider the counterfactual alternative.

We report six experiments testing our two hypotheses. We report all conditions, measures, and participants sampled and excluded in all experiments. In experiments 1 and 2, we tested hypothesis 1 by examining whether happiness with a food or wage would be more affected by social versus nonsocial counterfactual comparisons. In experiments 3 – 6 we tested our social attention hypothesis (hypothesis 2). In experiment 3, we examined whether people allocate more attention to social versus nonsocial counterfactual comparisons, and if the difference in their allocation of attention mediated the larger hedonic contrast effects induced by social counterfactual comparisons. Experiments 4 and 5 modulated the ability of participants to attend to and consider counterfactual alternatives with cognitive load (experiment 4) and time pressure manipulations (experiment 5). According to hypothesis 2, restricting the cognitive resources available to attend to and consider counterfactual alternatives should produce a larger reduction in hedonic contrast effects induced by social versus nonsocial counterfactual comparisons. In experiment 6, we tested our social attention account by modulating the cognitive accessibility of counterfactual alternatives. We predicted that exogenously increasing the accessibility of a counterfactual alternative would increase attention allocated to it. This should produce a greater increase in the size of hedonic contrast effects induced by nonsocial versus social comparisons (which should already be more accessible).

EXPERIMENT 1: LARGER AND SMALLER PRIZES

In our first experiment, each participant won a prize and then reported his or her happiness with that prize. We

manipulated the size of the prize they won (i.e., one or two "fun size" packages of M&Ms), and their knowledge of its alternative. Participants in a no comparison condition simply received their prize. They had no knowledge of its alternative. Participants in a nonsocial counterfactual comparison condition won their prize in a coin toss, and saw its alternative. Participants in a social counterfactual comparison condition won their prize in a coin toss, and saw another participant win its alternative.

We tested for hedonic contrast effects by comparing the happiness of participants in the three conditions. Relative to participants in the no comparison condition, we predicted that participants in both counterfactual comparison conditions would be more sensitive to the size of their prize (Hsee et al. 1999). They would be happier if they won the larger prize than if they won the smaller prize. More important, we also compared the magnitude of the hedonic contrast effects induced by social and nonsocial counterfactual comparisons. We predicted that hedonic contrast effects would be larger when counterfactual comparisons were social.

Method

Participants. Two hundred forty-three students at the University of South Carolina (153 women; $M_{age} = 20.36$; SD = 1.65) participated in the experiment for course credit. Sample size was set in advance to all students participating in one lab collection cycle; 13 participants who did not want the prize (due to dietary restrictions, allergies, etc.) and five participants who did not follow the instructions (e.g., completed measures before their prize was determined) were excluded before analyses were performed, leaving a final sample of 225 participants. There were no other participant exclusions.

Design. The experiment employed a 3 (counterfactual comparison: none, nonsocial, social) × 2 (prize value: one pack of M&Ms, two packs of M&Ms) between-subjects design.

Procedure. The experiment was run as part of several studies conducted in 30 minute lab sessions with groups of approximately 25 participants per session, conducted over four days. Assignment to level of the first factor (i.e., counterfactual comparison: none, nonsocial, social) was done by session (i.e., all 25 participants in the session were assigned to the same counterfactual comparison condition). The order of treatments in the lab schedule was randomly determined to minimize effects of daytime, type of student, and so on. During the session, each participant was instructed to go to a desk at the front of the laboratory and participate in a paper-and-pencil study. Each participant won a prize, either one or two "fun size" packs of M&Ms.

Participants in the no comparison condition approached the desk individually. Each participant received a single prize with no mention of its alternative. For this condition, prize assignments alternated by session (i.e., all participants in a session received the same prize). There was no chance that these participants knew about the alternative prize.

Participants in the nonsocial counterfactual condition approached the desk individually and saw both prizes. An instruction sheet explained that the experimenter would toss a coin to determine their prize (i.e., two packs if heads and one pack if tails). Once each participant read and understood the instructions, the experimenter tossed a fair coin that determined which prize the participant won.

Participants in the social counterfactual condition approached the desk in pairs and were shown both prizes. The instructions explained that the experimenter would flip a coin to determine who in the pair would win each prize (i.e., one participant would receive one pack and the other would receive two packs if heads, and vice versa if tails). Once both participants read and understood the instructions, the experimenter tossed a fair coin that determined which prize each participant won.

After receiving their prize, all participants rated their happiness on an analog scale by drawing an X through an 8 inch horizontal line with endpoints, "Not at all happy" (0) and "Very happy" (8). Finally, in this and all other studies, participants reported their age and gender.

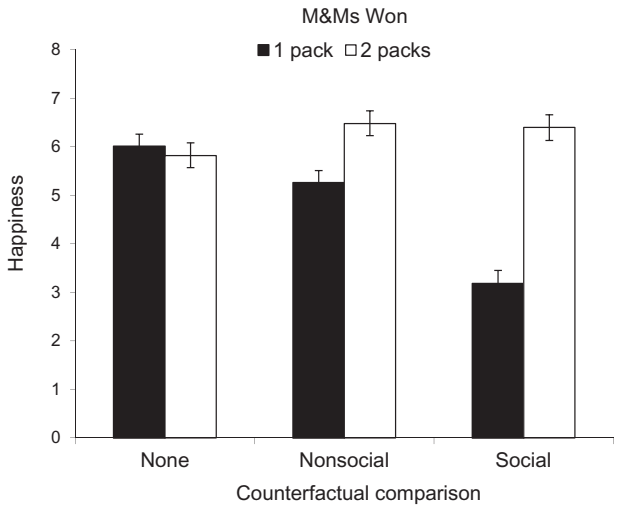
Results

Happiness ratings were analyzed in a 3 (counterfactual comparison: none, nonsocial, social) × 2 (value: one pack of M&Ms, two packs of M&Ms) between-subjects ANOVA. The analysis revealed a main effect of counterfactual comparison ($F(1, 219) = 11.97$, $p < .001$), a main effect of value ($F(1, 219) = 45.24$, $p < .001$), and the predicted counterfactual comparison by value interaction ($F(1, 219) = 21.61$, $p < .001$). To decompose this interaction, we broke the analyses down into pairwise comparisons for all combinations of the three counterfactual comparison conditions. All means are presented in figure 1.

We first examined happiness reports in the no comparison and nonsocial conditions in a 2 (counterfactual comparison: none, nonsocial) × 2 (value: one pack of M&Ms, two packs of M&Ms) between-subjects ANOVA. It revealed no main effect of counterfactual comparison ($F < 1$), a main effect of value ($F(1, 149) = 4.22$, $p = .04$), and a significant counterfactual comparison by value interaction ($F(1, 149) = 7.99$, $p = .005$). Participants were more sensitive to the size of their prize in the nonsocial condition than in the no comparison condition. As evidence of this hedonic contrast effect, participants in the nonsocial condition who received the larger prize were happier

FIGURE 1

RESULTS OF EXPERIMENT 1



NOTE.—Happiness with superior and inferior prizes (one or two packs of m&ms) by counterfactual comparison: none, nonsocial, and social. Counterfactual comparisons induced hedonic contrast effects, which were larger in social than in nonsocial counterfactual comparison conditions. Bars indicate ±1 SEM.

($M = 6.48$, SD = 1.60) than participants who received the smaller prize ($M = 5.25$, SD = 1.63; $F(1, 149) = 12.16$, $p = .001$), whereas participants in the no comparison condition were no happier if they received the larger prize ($M = 5.82$, SD = 1.43) or smaller prize ($M = 6.01$, SD = 1.51; $F < 1$). With regard to the relative impact of upward and downward comparisons, participants who received two packs of M&Ms were marginally happier in the nonsocial condition than in the no comparison condition ($F(1, 149) = 3.30$, $p = .07$), and participants receiving one pack of M&Ms were significantly less happy in the nonsocial condition than in the no comparison condition ($F(1, 149) = 4.81$, $p = .03$).

We next examined happiness reports in the no comparison and social conditions in a 2 (counterfactual comparison: none, social) × 2 (value: 1 pack of M&Ms, 2 packs of M&Ms) between-subjects ANOVA. It revealed a main effect of counterfactual comparison ($F(1, 143) = 19.37$, $p < .001$), a main effect of value ($F(1, 143) = 34.75$, $p < .001$), and a significant counterfactual comparison by value interaction ($F(1, 143) = 44.22$, $p < .001$). Participants were more sensitive to the size of their prize in the social condition than in the no comparison condition. As evidence of this hedonic contrast effect, participants in the social condition who received the larger prize were happier ($M = 6.40$, SD = 1.37) than participants who received the smaller prize ($M = 3.18$, SD = 1.88; $F(1, 143) = 77.07$, $p < .001$), whereas participants in the no comparison condition were no happier if they received the larger prize or smaller prize ($F < 1$). With regard to the relative impact of upward and downward comparisons, participants who received two packs of M&Ms were equally happy in the social and the no comparison conditions ($F(1, 143) = 2.55$, $p = .11$), but participants receiving one pack of M&Ms were significantly less happy in the social counterfactual condition than in the no comparison condition ($F(1, 143) = 60.54$, $p < .001$).

Most important, we compared happiness reports in the social and nonsocial conditions in a 2 (counterfactual comparison: nonsocial, social) × 2 (value: one pack of M&Ms, two packs of M&Ms) between-subjects ANOVA, which revealed a main effect of counterfactual comparison ($F(1, 146) = 16.41$, $p < .001$), a main effect of value ($F(1, 146) = 69.65$, $p < .001$), and the predicted counterfactual comparison by value interaction ($F(1, 146) = 14.01$, $p < .001$). While participants were sensitive to the value of their prize in both conditions, participants were more sensitive to value in the social condition ($F(1, 146) = 70.24$, $p < .001$) than in the nonsocial condition ($F(1, 146) = 11.04$, $p = .001$). With regard to the relative impact of upward and downward comparisons, while participants who received two packs of M&Ms were similarly happy in the social and nonsocial conditions ($F < 1$), participants who received one pack of M&Ms were significantly less happy in the social condition than in the nonsocial condition ($F(1, 146) = 30.24$, $p < .001$).

Discussion

Happiness with a prize was influenced by counterfactual alternatives, but the hedonic contrast effect they induced was larger when comparisons were social versus nonsocial. Whereas participants in the no comparison condition were equally happy winning a larger or smaller prize, participants in both counterfactual comparison conditions were happier when they won the larger prize than when they won the smaller prize. More important, counterfactual comparisons were most potent when they were also social comparisons. As evidenced by the significant interaction between the social and nonsocial counterfactual conditions (Nieuwenhuis, Forstmann, and Wagenmakers 2011), the magnitude of the hedonic contrast effect induced by social counterfactual comparisons was larger than the hedonic contrast effect induced by similar nonsocial counterfactual comparisons. While we did not predict a directional effect due to their absence in the social comparison literature (Gerber et al. 2018), in line with counterfactual thinking research observing a greater impact of upward than downward counterfactual comparisons (Roese and Epstude 2017), this difference in experiment 1 appears to have been

driven by greater dissatisfaction with the inferior prize than by greater satisfaction with the superior prize.

EXPERIMENT 2: BETTER AND WORSE WAGES

Experiment 2 tested two facets of our theory. First, we tested the generalizability of the effect in the domain of wages. All participants received the same bonus wage (the "target" bonus) via "random assignment" rather than a smaller or larger counterfactual bonus (i.e., an inferior or superior "standard" bonus, respectively). The standard bonus was paid to no one in nonsocial counterfactual conditions. It was paid to an anonymous partner in social counterfactual conditions. We predicted that these counterfactual bonuses would induce larger hedonic contrast effects when they were social (hypothesis 1), as in experiment 1.

Experiment 2 also examined a potential confound in experiment 1. Prizes won in the social counterfactual condition were contingent on the prize that another participant received, but prizes won in the nonsocial counterfactual condition were not contingent on what other participants received. It is possible that the contingent outcomes evoked a norm of equity (Blount 1995; Ma and Roese 2013; Sanfey et al. 2003), and that the results of experiment 1 might be due to different outcome contingencies. When the distribution of different outcomes to participants was contingent, an equity norm could have made unfavorable outcomes feel worse (Blount 1995; Ma and Roese 2013; Sanfey et al. 2003). To address this potential confound, we manipulated the contingency of social counterfactual comparisons in experiment 2. In a social *dependent* condition, bonus assignments for participants and their partners were ostensibly contingent on each other (as in experiment 1). The same "random" draw assigned participants to the target bonus and their partners to a standard bonus. In a social *independent* condition, the bonus assignments for participants and their partners were independent of each other. One "random" draw assigned participants to the target bonus. A separate "random" draw assigned their partners to the standard bonus.

If social attention is the primary driver of the different hedonic contrast effects induced by social and nonsocial counterfactual comparisons, as we predict, then both kinds of social counterfactual comparisons (i.e., independent and dependent) should induce larger hedonic contrast effects than nonsocial counterfactual comparisons in experiment 2. If the results of experiment 1 were purely due to the different contingencies of outcomes, then the largest hedonic contrast effects should be induced by social dependent counterfactual comparisons, and smaller hedonic contrast effects should be induced in both the social independent and nonsocial counterfactual comparison conditions (Camerer 2003; Güth et al. 1982; Yamagishi et al. 2009).

Method

Participants. Three hundred seven Americans recruited through Amazon Mechanical Turk (216 women; $M_{age} = 28.23$; SD = 9.84) received 25¢ for their participation and an unanticipated 25¢ bonus. No participant was excluded from the analyses.

Design. The experiment employed a 3 (counterfactual comparison: nonsocial, social dependent, social independent) × 2 (counterfactual bonus: 5¢, 50¢) between-subjects design.

Procedure. All participants first rated 10 products as part of an online market research survey for what they believed to be an anonymized national retailer, "Store X." Next, all participants were told that they would rate a second set of 10 products for one of two anonymized national retailers, either "Store Y" or "Store Z." Each offered a different bonus for rating its products. Store Y paid a bonus of 5¢ in the inferior standard condition and 50¢ in the superior standard condition. Store Z paid a bonus of 25¢. Assignment to store was determined through an ostensibly random process in which Store Y and Store Z (and the bonus each paid) were displayed on left and right side of the computer monitor. An arrow oscillated back and forth between the two stores until it stopped on Store Z, to which all participants were assigned (figure 2).

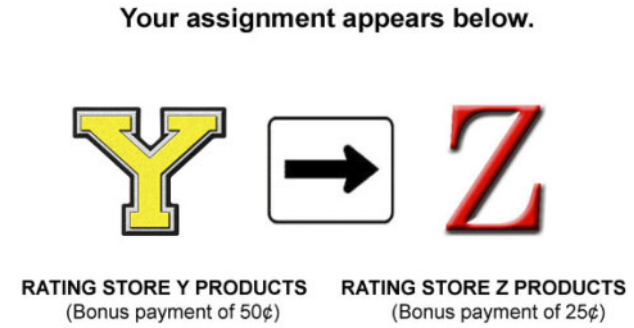
Participants in the nonsocial condition were assigned to rate products for Store Z rather than Store Y. Participants in the social dependent condition were assigned to rate products for Store Z. As a result of that "randomization" trial, an anonymous partner with whom they were paired was assigned to rate products for Store Y. Participants in the social independent condition were "randomly" assigned to evaluate goods from Store Z rather than Store Y in a first randomization trial. Their anonymous partner was then assigned to rate products form Store Y rather the Store Z in an identical, separate "randomization" trial. All participants then reported how happy or unhappy they felt on a seven-point scale with endpoints, "Very unhappy" (1) and "Very happy" (7). Finally, participants rated the 10 products and provided demographic information.

Results

Happiness reports were analyzed in a 3 (counterfactual comparison: nonsocial, social dependent, social independent) × 2 (counterfactual bonus: 5¢, 50¢) between-subjects ANOVA. The analysis revealed a significant main effect of counterfactual comparison ($F(2, 301) = 8.94$, $p < .001$) and a significant main effect of counterfactual bonus ($F(1, 301) = 147.09$, $p < .001$). More important, a significant

FIGURE 2

BONUS ASSIGNMENT SCREEN (EXAMPLE) IN EXPERIMENT 2



NOTE.—Assignment of a participant to the target bonus (25¢) rather than the superior standard bonus (50¢).

counterfactual comparison by counterfactual bonus interaction ($F(2, 301) = 6.54$, $p = .002$) revealed that both dependent and independent social counterfactual comparisons evoked larger hedonic contrast effects than did nonsocial counterfactual comparisons (Nieuwenhuis et al. 2011; $F_{CF\times SI}$ (2, 202) = 6.49, $p = .01$ and $F_{CF\times SD}$ (2, 201) = 13.13, $p = .001$, respectively; see figure 3). A 2 (counterfactual comparison: social dependent, social independent) × 2 (counterfactual bonus: 5¢, 50¢) between-subjects ANOVA revealed no interaction between the two social counterfactual comparison conditions ($F < 1$).

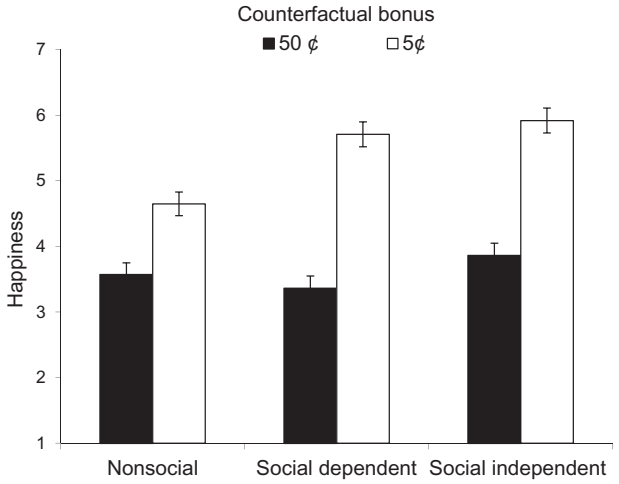
Planned comparisons revealed that happiness with the target bonus was greater when the counterfactual bonus was 5¢ than when it was 50¢ across all three counterfactual comparisons (nonsocial: $F(1, 301) = 17.31$, $p < .001$; social dependent: $F(1, 301) = 79.05$, $p < .001$; social independent: $F(1, 301) = 62.05$, $p < .001$). More important, whereas happiness with the target was similar across all three counterfactual comparisons when the counterfactual bonus was 50¢ ($M_{NS} = 3.58$, SD = 1.53; $M_{SD} = 3.36$, SD = 1.31; $M_{SI} = 3.86$, SD = 1.39; $ps > .05$), happiness with the target was significantly greater in both the social dependent and social independent conditions than in the nonsocial condition when the counterfactual bonus was 5¢ ($M_{NS} = 4.65$, SD = 1.47; $M_{SD} = 5.71$, SD = 1.05; $M_{SI} = 5.92$, SD = 1.11; $Fs(1, 301) \geq 16.61$, $p < .001$). There were no differences between the social dependent and social independent conditions when the counterfactual bonus was 5¢ ($F < 1$).

Discussion

Comparisons to counterfactual alternatives induced larger hedonic contrast effects when they were social than when they were nonsocial. Participants were happier to receive the larger of two bonuses when another person received the smaller bonus than when no other person received the smaller bonus. This was true whether or not their bonus assignment was contingent on the bonus received by their partner. These results conceptually replicate experiment 1 with a substantively different kind of counterfactual comparison. Moreover, they suggest that the difference between social and nonsocial counterfactual comparisons is not due to different contingencies of social and nonsocial counterfactual comparisons.

FIGURE 3

RESULTS OF EXPERIMENT 2



NOTE.—Happiness with a bonus (25¢), by the size of the counterfactual bonus (5¢ OR 50¢), and the kind of counterfactual comparison. Bars indicate ±1 sem.

EXPERIMENT 3: MEDIATION BY ATTENTION

We began testing our attentional account in experiment 3. We examined whether more attention is allocated to counterfactual alternatives (e.g., a prize one didn't win) when counterfactual comparisons are social than nonsocial. In a paradigm similar to experiment 1, all participants won the inferior of two prizes (i.e., one rather than two packs of M&Ms) and reported their happiness with it. We manipulated whether its counterfactual alternative was a social or nonsocial counterfactual comparison, and included a question that measured the extent to which participants attended to the prize they won versus its alternative.

This design allowed us to test both of our hypotheses. In line with our first hypothesis, we predicted a replication of the larger hedonic contrast effect in the social versus nonsocial counterfactual comparison condition, as in experiments 1 and 2. Participants should be less happy winning the inferior prize when its counterfactual alternative was a

social rather than nonsocial counterfactual comparison. Testing our second hypothesis, we predicted that this larger contrast effect would be mediated by the allocation of more attention to the counterfactual alternative when it was social rather than nonsocial.

Method

Participants. Three hundred sixty-seven students[1] at the University of South Carolina (195 women; M_{age} = 20.34; SD = 1.08) participated in the experiment for course credit. The number of students who participated in two lab collection phases determined the sample size. Three participants who did not want their prize (e.g., due to dietary restrictions, allergies) and 15 participants who did not follow the instructions (e.g., completed measures before their prize was determined) were excluded before analyses, leaving a final sample of 349.

Design. The experiment employed a one-factor with two levels (counterfactual comparison: nonsocial, social) between-subjects design.

Procedure. The experiment was run as part of several studies conducted in 30 minute lab sessions with groups of approximately 25 participants per session. At one point in the lab session, participants were instructed to go to a desk at the front of the room and participate in a paper-and-pencil study.

Participants in the nonsocial condition approached the desk individually and were shown two prizes, the first was one "fun size" pack of M&Ms and the other was two "fun size" packs of M&Ms. An instruction sheet explained that the experimenter would flip a coin to determine the prize they would win. Once participants read and understood the instructions, the experimenter flipped the coin. Unbeknownst to the participants, the coin was rigged (i.e., it was double-sided) such that all participants won one pack of M&Ms.

Participants in the social condition approached the desk in pairs and were shown both prizes. An instruction sheet explained that the experimenter would flip a coin to determine who in the pair would win each of the two prizes. Once participants read and understood the instructions, the experimenter flipped a fair coin. Only participants who won one pack of M&Ms were included in the analyses (see footnote 1).

After receiving their prize, all participants indicated their happiness by drawing an X through an 8 inch line with endpoints, "Not at all happy" (0) and "Very happy" (8).

Finally, as a measure of the relative attention devoted to the comparison standard versus the focal prize, participants rated the extent to which they based their happiness rating on "thoughts about the prize they did not win" versus "thoughts about the prize they won" on a seven-point scale with endpoints, "Entirely on prize I didn't win" (–3) and "Entirely on the prize I did win" (3).

Results and Discussion

Happiness. Happiness ratings were analyzed in a two-level (counterfactual comparison: nonsocial, social) between-subjects ANOVA, which revealed a significant main effect, such that participants were less happy winning the inferior prize when the counterfactual comparison was social ($M = 4.69$, SD = 2.04) than when it was nonsocial ($M = 5.30$, SD = 1.85; $F(1, 347) = 8.62$, $p = .004$).

Attention. A similar two-level (counterfactual comparison: nonsocial, social) between-subjects ANOVA on the attention measure revealed a significant main effect, such that participants in the social condition ($M = .41$, SD = 1.57) devoted more attention to the counterfactual alternative than did participants in the nonsocial condition ($M = .79$, SD = 1.52; $F(1, 344) = 5.37$, $p = .02$).

Mediation. To test whether differences in attention mediated the differences in happiness ratings, we used model 4 of the PROCESS macro (Hayes 2013) with counterfactual comparison as the predictor variable, attention as the mediator variable, and happiness as the dependent variable. Supporting our hypotheses, the path from counterfactual comparison to happiness ratings through attention was significant and did not include zero (indirect effect, B = –.32, SE = .14; 95% CI = –.58 to –.04; Zhao et al. 2010; direct effect, B = –.30, SE = .16; $t = –1.92$, $p = .06$; 95% CI = –.62 to .01).

As in experiments 1 and 2, then, comparison to a counterfactual alternative induced a larger hedonic contrast effect when the comparison was social rather than nonsocial. More important, the larger contrast effect induced by the social than nonsocial comparison was attributable to differences in the allocation of attention to the counterfactual alternative.

EXPERIMENT 4: MODERATION BY DISTRACTION

As a first moderation test of our social attention account, we examined whether reducing the cognitive resources available to attend to and consider counterfactual alternatives would reduce the hedonic contrast effects that social counterfactual comparisons induce, making them similar in impact to nonsocial counterfactual comparisons. With one exception, participants in experiment 4 followed the same procedure as participants in the social and nonsocial counterfactual comparison conditions in experiment 1. Participants rehearsed a two-digit or eight-digit string of numbers to induce cognitive load (Barrouillet et al. 2007)

1 Note that this number excludes 175 participants who won the larger of two prizes in the social standard condition, who were automatically excluded.

while they were assigned to a prize and reported their happiness. We predicted that the eight-digit load would reduce participants' ability to attend to the counterfactual alternative, but that the two-digit load would not. We thus expected to replicate the larger hedonic contrast induced by social than nonsocial counterfactual comparisons in the two-digit load conditions. Under the eight-digit load, however, we predicted that the hedonic contrast effect induced by counterfactual comparison should be similar in the social and nonsocial conditions.

Method

Participants. Six hundred thirty-seven students at the University of South Carolina (300 women; $M_{age} = 20.34$, SD =1.49) participated in the experiment for course credit. The students participating in three available lab phases over the course of one semester determined the sample size. Ten participants who did not want their prize (e.g., due to a dietary restrictions, allergies), 23 participants who did not follow the instructions (e.g., completed measures before their prize was determined), and an additional 73 participants who reported having participated in the study before were excluded before the analyses were conducted, leaving a final sample of 541 participants.

Design. The experiment employed a 2 (cognitive load: two digit, eight digit) × 2 (counterfactual comparison: nonsocial, social) × 2 (value: one pack of M&Ms, two packs of M&Ms) between-subjects design.

Procedure. The experiment was run as part of several studies conducted in 30 minute lab sessions with groups of approximately 25 participants per session. Participants started the study on a computer. It displayed a string of numbers either two digits or eight digits in length for 15 seconds, which participants would recall later in the session. Participants were then prompted to go to a desk at the front of the laboratory to participate in a paper-and-pencil study. At the desk, participants followed the same procedure as participants in the nonsocial and social counterfactual comparison conditions in experiment 1.

After completing the same measures as in experiment 1, participants recalled the digit string they were asked to remember. Participants who participated in the third data collection phase (in which repeat participation was possible and likely) were also asked if they had previously participated in the experiment. If they had, they were excluded from all subsequent analyses.

Results

Happiness ratings were analyzed in a 2 (cognitive load: two digit, eight digit) × 2 (counterfactual comparison: nonsocial, social) × 2 (value: one pack of M&Ms, two packs of M&Ms) between-subjects ANOVA. The analysis revealed a significant main effect of counterfactual comparison ($F(1, 533) = 20.88$, $p < .001$), a significant main effect of value ($F(1, 533) = 88.34$, $p < .001$), a significant counterfactual comparison by value interaction ($F(1, 533) = 4.57$, $p = .03$), and a marginally significant cognitive load by value interaction ($F(1, 533) = 2.94$, $p = .09$). Most important, these were qualified by the predicted cognitive load by counterfactual comparison by value interaction ($F(1, 533) = 4.69$, $p = .03$; Figure 4). For purposes of clarity, we decompose the interaction by splitting analyses across low- and high-cognitive-load conditions.

Low-Load Conditions. In the low-load condition there were significant main effects of counterfactual comparison ($F(1, 275) = 9.21$, $p = .003$), and value ($F(1, 275) = 69.01$ $p < .001$), and a significant counterfactual comparison by value interaction ($F(1, 275) = 10.34$, $p = .001$), indicating that, as in experiment 1, participants exhibited a larger hedonic contrast effect in the social conditions ($F(1, 275) = 69.88$, $p < .001$) than in the nonsocial conditions ($F(1, 275) = 12.34$, $p = .001$).

High-Load Conditions. In the high-load condition there were significant main effects of counterfactual comparison ($F(1, 258) = 11.57$, $p = .001$) and value ($F(1, 258) = 26.49$ $p < .001$). Most important, there was no counterfactual comparison by value interaction ($F < 1$), indicating that hedonic contrast effects were no larger in the social conditions ($F(1, 258) = 14.27$, $p < .001$) than in the nonsocial conditions ($F(1, 258) = 12.36$, $p = .001$).

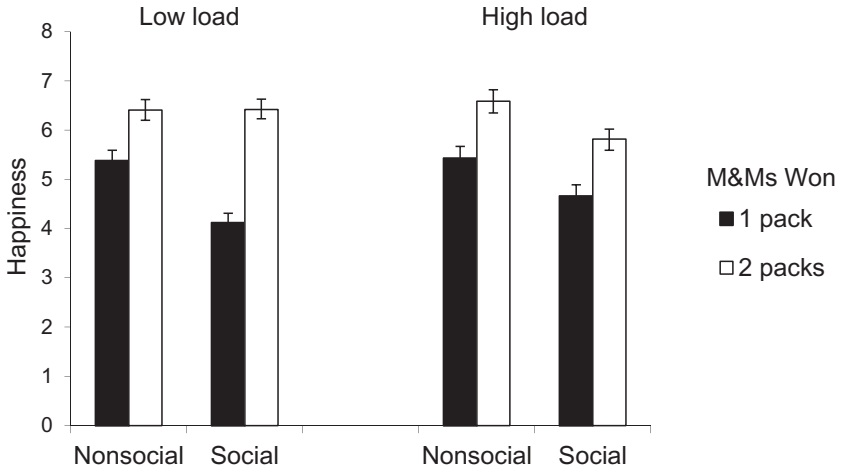
Put differently, in the social counterfactual comparison condition there was a significant 2 (cognitive load: two digit, eight digit) × 2 (value: one pack of M&Ms, two packs of M&Ms) interaction ($F(1, 286) = 7.62$, $p = .006$), such that the load manipulation reduced the size of the hedonic contrast effect. In the nonsocial counterfactual comparison conditions, however, the cognitive load manipulation had no effect on the size of the hedonic contrast effect ($F_{interaction} < 1$).

Discussion

When participants rehearsed an easier two-digit number, a low cognitive load, social counterfactual comparisons induced larger hedonic contrast effects than did nonsocial counterfactual comparisons, as in experiments 1, 2, and 3. When participants rehearsed a more taxing eight-digit number (i.e., a high cognitive load), the hedonic contrast effect induced by social counterfactual comparison was diminished to the level induced by nonsocial counterfactual comparisons. When a concurrent task required little attention, then, happiness with a prize was more affected by a counterfactual alternative that elicited a social than nonsocial comparison. When the concurrent task required considerable attention, happiness with a prize was similarly

FIGURE 4

RESULTS OF EXPERIMENT 4



NOTE.—Participants exhibited larger hedonic contrast effects in social versus nonsocial counterfactual comparison conditions when both groups concurrently rehearsed a two-digit cognitive load. Hedonic contrast effects were no larger in social or nonsocial counterfactual comparison conditions when both groups concurrently rehearsed an eight-digit load. Bars indicate ±1 sem.

affected by a counterfactual alternative whether it elicited a social or nonsocial comparison.

When these results are considered together with the results of experiment 3, it appears that the greater allocation of attention to and consideration of social counterfactual comparisons underlies their larger hedonic impact. Of course, cognitive load can influence affect and other cognitive processes. In experiment 5, we thus tested our social attention hypothesis with a different manipulation of attentional resources.

EXPERIMENT 5: MODERATION BY TIME PRESSURE

As a third test of our social attentional hypothesis, we examined whether reducing the time to attend to and consider social counterfactual comparisons reduces the hedonic contrast effects that they induce, making them more similar in potency to nonsocial counterfactual comparisons. Participants in experiment 5 followed the same procedure as participants in experiment 4, but with a different process manipulation. Rather than manipulate the difficulty of rehearsing a string of numbers, we manipulated whether or not participants were under time pressure while they were assigned to a prize and reported their happiness with it.

We predicted that time pressure would reduce participants' ability to attend to and consider counterfactual alternatives. Consequently, under no time pressure, we expected to replicate the results of experiments 1, 3, and 4. Social counterfactual comparisons should induce larger hedonic contrast effects than nonsocial counterfactual comparisons. Under time pressure, however, we expected that social counterfactual comparisons should induce hedonic contrast effects similar to those of nonsocial counterfactual comparisons (as in the high load conditions in experiment 4).

Method

Participants. A total of 290 participants were recruited in two samples (103 women; $M_{age} = 21.26$, SD $= 4.12$). One student sample included all students participating in the last laboratory session for credit at the University of South Carolina (USC; $n = 225$). The other consisted of a convenience sample of pedestrians who volunteered to participate in the study during a four-hour period of data collection in the lobby of the Questrom School of Business at Boston University ($n = 65$). Four participants who did not want their prize (e.g., due to dietary restrictions, allergies) and ten participants who did not follow the instructions (i.e., completed measures before their prize was determined) were excluded before the analyses were conducted, leaving a final sample of 276 participants.

Design. The experiment employed a 2 (time pressure: control, yes) × 2 (counterfactual comparison: nonsocial, social) × 2 (value: one package of M&Ms, two packages of M&Ms) between-subjects design.

Procedure. For the laboratory sample at USC, the experiment was run as one part of multistudy 30 minute lab sessions, run in groups of approximately 25 students per session. For the convenience sample at Boston University, the experiment was run as a single study conducted in the lobby of the business school.

The study followed the procedure of experiment 4, but with a time pressure manipulation in lieu of the cognitive load manipulation. Half of the participants were given no time limit to complete the paper-and-pencil portion of the study. The other half of participants were given 15 seconds to complete the paper-and-pencil portion of the study. A stopwatch started the moment the coin landed and determined to which prize they were assigned.

To increase subjective time pressure in the high-time-pressure condition, we added filler and manipulation-check questions to the end of the paper-and-pencil form on which participants reported their happiness after winning the prize. These fillers included three questions in a multiple-choice format: whether they had participated in the study before [yes; no], how much time they were given to complete the survey [10 seconds; 12 seconds; 15 seconds; no limit], and their current standing in college [Freshman, Sophomore; Junior; Senior]. The fillers also included open-response-format questions, including their undergraduate major and the name of their marketing professor (the last question applied only to undergraduates completing the experiment for course credit).

Results

Happiness ratings were analyzed in a 2 (time pressure: control, yes) × 2 (counterfactual comparison: nonsocial, social) × 2 (value: one pack of M&Ms, two packs of M&Ms) between-subjects ANOVA. The analysis revealed a significant main effect of counterfactual comparison ($F(1, 268) = 7.51$, $p = .007$), a significant main effect of value ($F(1, 268) = 24.99$, $p < .001$), a significant time pressure by value interaction ($F(1, 268) = 4.41$, $p = .04$), and a significant time pressure by counterfactual comparison interaction ($F(1, 268) = 4.46$, $p = .04$). Most important, these were qualified by the predicted time pressure by counterfactual comparison by value interaction ($F(1, 268) = 4.56$, $p = .03$; see figure 5). For purposes of clarity, we decompose the interaction by splitting the analyses across no time pressure and time pressure conditions.

No Time Pressure Conditions. For participants under no time pressure, the analyses revealed significant main effects of counterfactual comparison ($F(1, 128) = 13.94$, $p < .001$), and value ($F(1, 128) = 29.57$, $p < .001$), and a significant counterfactual comparison by value interaction ($F(1, 128) = 6.24$, $p = .01$). Replicating the results of earlier studies, participants exhibited a larger hedonic contrast effect in the social conditions ($F(1, 128) = 31.10$, $p < .001$) than in the nonsocial conditions ($F(1, 128) = 4.37$, $p = .04$).

Time Pressure Conditions. For participants under time pressure, there was a marginally significant main effect of value ($F(1, 140) = 3.74$, $p = .06$). Most important, there was no counterfactual comparison by value interaction ($F < 1$). The time pressure manipulation eliminated all hedonic contrast effects in both the social conditions ($F(1, 140) = 1.00$, $p = .32$) and in the nonsocial conditions ($F(1, 140) = 2.84$, $p = .09$).

We compared the effects of each level of counterfactual comparison across no time pressure and time pressure conditions. Within social counterfactual comparisons, a 2 (time pressure: control, yes) × 2 (value: one pack of M&Ms, two packs of M&Ms) ANOVA revealed a significant interaction, ($F(1, 145) = 9.38$, $p = .003$). As predicted, social counterfactual comparisons induced larger hedonic contrast effects under no time pressure versus under time pressure. Within nonsocial counterfactual comparisons, however, there was no significant time pressure by value interaction ($F < 1$).

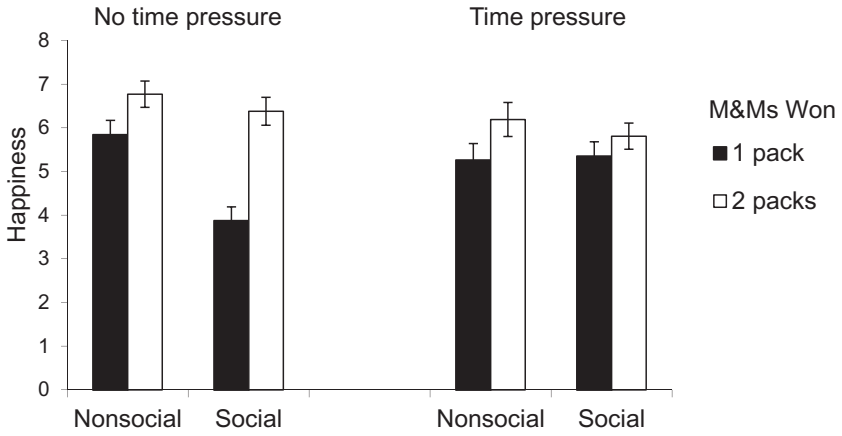
Discussion

Replicating our previous experiments, participants under no time pressure exhibited larger hedonic contrast effects when counterfactual comparisons were social rather than nonsocial. Participants under time pressure, however, exhibited hedonic contrast effects that were similar in size when counterfactual comparisons were social and nonsocial. Happiness with a prize was affected more by social than nonsocial counterfactual comparisons when participants had time to attend to and consider the counterfactual alternative, but not when attentional resources were constrained. Indeed, hedonic contrast effects were fully eliminated in all of the time pressure conditions.

When these results are considered together with the results of experiments 3 and 4, it appears that social attention makes counterfactual comparisons more potent. Participants were more likely to attend to and consider a counterfactual alternative to their prize when another participant won that alternative than when no other participant won that alternative (experiment 3). Moreover, counterfactual comparisons induced larger hedonic contrast effects when they were social rather than nonsocial, but only when participants had sufficient cognitive resources to attend to and consider them. When cognitive resources were constrained via a cognitive load or time pressure, counterfactual comparisons were no more potent whether they were social or nonsocial (experiments 4 and 5). A time pressure manipulation eliminated hedonic contrast effects entirely in experiment 5.

FIGURE 5

RESULTS OF EXPERIMENT 5



NOTE.—Under no time pressure, participants exhibited larger hedonic contrast effects in social versus nonsocial counterfactual comparison conditions. Under time pressure, hedonic contrast effects were no larger in social or nonsocial counterfactual comparison conditions. Bars indicate ±1 sem.

EXPERIMENT 6: MODERATION BY COGNITIVE ACCESSIBILITY

Our social attention hypothesis suggests that just as reducing the cognitive resources available to attend to and consider counterfactual alternatives should reduce the greater hedonic contrast effect induced by social counterfactual comparisons, so too should increasing attention to counterfactual alternatives enact an increase in the hedonic contrast effect induced by nonsocial counterfactual comparisons. We tested this second prediction in experiment 6 by exogenously manipulating the cognitive accessibility of counterfactual alternatives. As in experiment 2, we paid participants a 25¢ bonus for performing a short task instead of an inferior or superior counterfactual bonus (either 5¢ or 50¢) and they reported their happiness with their bonus.

In a low-salience condition, participants received no reminder of the counterfactual bonus before reporting their happiness with their 25¢ bonus. In a high-salience condition, participants were prompted to recall the counterfactual bonus before reporting their happiness with their 25¢ bonus. Our social attention theory suggests that, because social attention should already lead participants to attend to and consider social counterfactual comparisons, exogenously drawing attention to social counterfactual comparisons should not influence the size of hedonic contrast effect they induce. However, because participants are less likely to endogenously attend to and consider nonsocial counterfactual comparisons, exogenously drawing their attention to nonsocial counterfactual comparisons should increase the hedonic contrast effects that they induce. Put differently, in the low-salience conditions, counterfactual comparisons should induce larger hedonic contrast effects when social than when nonsocial. In the high-salience conditions, however, hedonic contrast effects should be as large for nonsocial as for social counterfactual comparisons.

Method

Participants. Four hundred forty Americans recruited through Amazon Mechanical Turk (190 women; M_{age} = 37.78; SD = 13.53) received 50¢ for their participation and an unanticipated 25¢ bonus. Twenty-four participants who did not correctly follow the instructions (i.e., incorrectly recalled the alternative wage) were excluded before the analyses, leaving a total of 416 participants.

Design. The experiment employed a 2 (counterfactual salience: low, high) × 2 (counterfactual comparison: nonsocial, social) × 2 (counterfactual bonus: 5¢, 50¢) between-subjects design.

Procedure. Participants were randomly assigned to social or nonsocial counterfactual comparison conditions, which followed the procedures of the nonsocial and social dependent conditions in experiment 2. Immediately after assignment to the target bonus, participants randomly assigned to the high-salience condition first recalled the bonus that they did not receive in an open-ended format ("What was the alternative payment to the bonus you won? The alternative bonus payment was _____cents."). They then reported how happy or unhappy they felt on a seven-point scale with endpoints "Very unhappy" (1) and "Very

happy" (7). Participants in the low-salience condition answered these two questions in the reverse order.

Results

Happiness ratings were analyzed in a 2 (counterfactual salience: low, high) × 2 (counterfactual comparison: nonsocial, social) × 2 (counterfactual bonus: 5¢, 50¢) between-subjects ANOVA. The analysis revealed a significant main effect of counterfactual bonus ($F(1, 408) = 362.94$, $p < .001$), and a significant main effect of counterfactual salience ($F(1, 408) = 21.64$, $p < .001$). Indeed, planned comparisons revealed that participants were happier receiving the target bonus when the alternative bonus was 5¢ rather than 50¢ in all conditions (all Fs $(1, 408) \geq 59.76$, ps $< .001$). Most important, as illustrated by figure 6, the analysis revealed the predicted counterfactual salience by counterfactual comparison by counterfactual bonus three-way interaction ($F(1, 408) = 4.50$, $p = .03$). No other main effects or interactions were significant (all Fs < 1.3, all ps $> .26$).

We first decomposed the three-way interaction by examining how counterfactual salience influenced sensitivity to the value of social and nonsocial counterfactual comparisons. Separate 2 (counterfactual salience: low, high) × 2 (counterfactual bonus: 5¢, 50¢) between-subjects ANOVAs revealed that, while making counterfactual alternatives salient did not increase the hedonic contrast effects induced in social conditions ($F_{\text{interaction}}(1, 199) = .48$, $p = .49$), making counterfactual alternatives salient did increase hedonic contrast effects in nonsocial conditions ($F_{\text{interaction}}(1, 209) = 5.41$, $p = .02$).

We next split the analyses by low- and high-salience conditions. Separate 2 (counterfactual comparison: nonsocial, social) × 2 (counterfactual bonus: 5¢, 50¢) ANOVAs revealed that in the low-salience condition, hedonic contrast effects were marginally larger in social than in nonsocial conditions ($F_{\text{interaction}}(1, 206) = 2.47$, $p = .06_{\text{one-tailed}}$), whereas in the high-salience condition, hedonic contrast effects were similarly large in the social and nonsocial conditions ($F_{\text{interaction}}(1, 202) = 2.06$, $p = .15$).

Discussion

Hedonic contrast effects induced by social counterfactual comparisons did not increase from the low-salience condition to the high-salience condition, when attention was exogenously drawn to counterfactual alternatives. Presumably, participants were already attending to the counterfactual alternatives in these low-salience conditions. More important, a different pattern emerged for nonsocial counterfactual comparisons. Hedonic contrast effects induced by nonsocial counterfactual comparisons did increase from the low-salience to the high-salience condition, when attention was exogenously drawn to counterfactual alternatives.

It is important to note that in the high-salience conditions, there was no difference in the size of the hedonic contrast induced by social and nonsocial counterfactual comparisons. Both counterfactual comparisons were similarly impactful when attention was exogenously directed toward counterfactual alternatives. This reveals an important point about the distinction between social and nonsocial counterfactual comparisons. It suggests that making comparisons social does not change the value of that comparison standard. A superior bonus does not become subjectively larger or more desirable when it is paid to another person. If that were the case, in the high-salience condition, hedonic contrast effects should have increased for both social and nonsocial counterfactual comparisons.

Instead, the results provide novel evidence that social attention underlies the larger hedonic contrast effects induced by counterfactual comparisons that are social. Exogenously constraining attention in experiments 4 and 5 reduced hedonic contrast effects induced by social comparisons to a level equivalent to those induced by nonsocial comparisons. Exogenously increasing attention to counterfactual alternatives in experiment 6 increased hedonic contrast effects induced by nonsocial comparisons to the level of those induced by social comparisons.

One concern with the results of experiment 6 is that the (predicted) interaction between social and nonsocial counterfactual comparisons was only marginally significant. To assuage our concerns with this final issue, we conducted a single-paper meta-analysis, which provided converging evidence for the robustness of the larger hedonic contrast effects induced by social versus nonsocial counterfactual comparisons across the six experiments reported in this article.

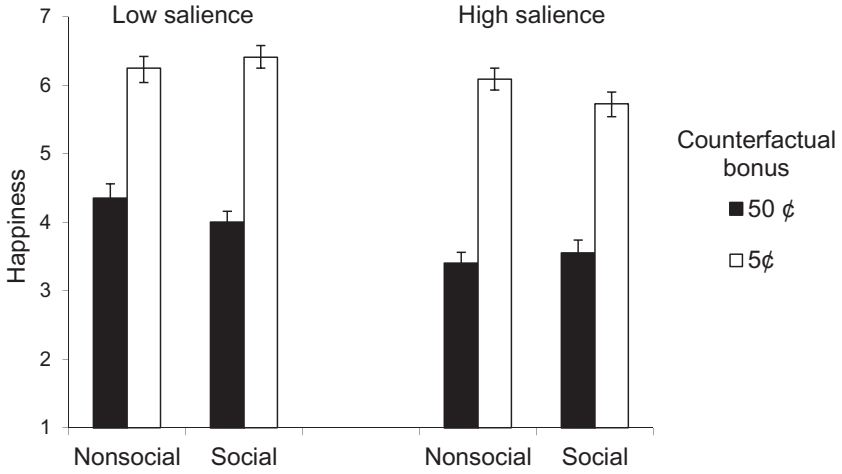
META-ANALYSIS

Across six experiments, we found that social counterfactual comparisons induced larger hedonic contrast effects than nonsocial counterfactual comparisons. Submitting the results of our studies to a single-paper meta-analysis (SPM; McShane and Bockenholt 2017) yields several relevant findings. Including all conditions in which we expected to observe the effect,[2] hedonic contrast effects were found for both social counterfactual comparisons (simple effect estimated at 2.79, 95% CI = 2.06, 3.51), and nonsocial counterfactual comparisons (simple effect estimated

2 Experiment 1: social, nonsocial conditions; experiment 2: social dependent and social independent (pooled), and nonsocial conditions; experiment 3: social, nonsocial conditions; experiment 4: low-load social, nonsocial conditions; experiment 5: no time pressure social, nonsocial conditions; experiment 6: low-salience social, nonsocial conditions.

FIGURE 6

RESULTS OF EXPERIMENT 6



NOTE.—Participants exhibited larger hedonic contrast effects in social versus nonsocial counterfactual comparison conditions when they were not reminded of the counterfactual bonus (low-salience condition). When participants were reminded of the counterfactual bonus (high-salience condition), hedonic contrast effects were as large in social and nonsocial counterfactual comparison conditions. Bars indicate ±1 sem.

at 1.47, 95% CI = .74, 2.20). More important, an SPM estimated the 2 (counterfactual comparison: social, nonsocial) × 2 (standard value: inferior, superior) interaction effect at 1.32 (95% CI = .31, 2.32), indicating that across all six experiments, social counterfactual comparisons induced larger hedonic contrast effects than did nonsocial counterfactual comparisons. The direction of the comparison appeared to influence the magnitude of this difference. Hedonic contrast effects were larger for upward social than for nonsocial counterfactual comparisons (simple effect estimated at 1.12, 95% CI = .44, 1.80), but were equivalent for downward social and nonsocial counterfactual comparisons (simple effect estimated at .20, 95% CI = –.54, .93).

GENERAL DISCUSSION

Comparison is a ubiquitous feature of social life, and social comparison provides a rich source of information by which to calibrate judgment (Festinger 1954; Suls and Wheeler 2000). People deliberately and spontaneously seek out social comparisons to assess themselves (Dahl et al. 2012; Feinberg, Krishna, and Zhang 2002; Klein 1997; McFerran et al. 2010), even when those standards provide them with little diagnostic information (Gilbert et al. 1995; Mussweiler et al. 2004). The cognitive processes that underlie social comparisons are similar to those that underlie comparisons in other domains (De Brigard et al. 2015; Mussweiler 2003; Olson et al. 2000). Yet we found that social attention, the propensity to orient the mind toward the experiences of others (Langton, Watt, and Bruce 2000), infuses social comparisons with a more potent hedonic impact than nonsocial comparisons. In six experiments examining the hedonic contrast effects induced by counterfactual alternatives, social comparisons had a larger impact.

Counterfactual comparisons were more likely to influence happiness with a food or wage when another person received its counterfactual alternative (hypothesis 1). In experiment 1, relative to controls provided with no comparison, both social and nonsocial counterfactual comparisons induced hedonic contrast effects. More important, the hedonic contrast effects induced by social comparisons were larger than the contrast effects induced by nonsocial comparisons. Participants were less happy winning a smaller amount of chocolate if another person won the larger amount than if no person won the larger amount. In experiment 2, hedonic contrast effects had a larger influence on happiness with a wage when counterfactual comparisons were social rather than nonsocial. People were happier with their wage if a smaller wage was paid to someone else. This was true whether or not the wage paid to their partner was contingent on the wage they received. The greater hedonic contrast effects induced by social than nonsocial counterfactual comparisons were robust. They were directly replicated in experiments 3, 4, and 6, and were conceptually replicated in experiment 5.

Social attention appears to underlie the greater hedonic impact of social versus nonsocial counterfactual

comparisons. Social counterfactual comparisons were more impactful because people were more likely to attend to and consider counterfactual alternatives when they were social rather than nonsocial (hypothesis 2). In experiment 3, participants were more likely to attend to a counterfactual alternative when it was social rather than nonsocial, and this difference in attention mediated the larger hedonic contrast effect that comparison induced when it was social. In experiments 4 and 5, restricting the ability to endogenously attend to counterfactual alternatives via a cognitive load or time pressure manipulation only reduced the hedonic contrast effects induced by social comparisons; nonsocial comparisons were not affected. In experiment 6, exogenously directing attention to counterfactual alternatives only increased the hedonic contrast effect induced by nonsocial comparisons. The hedonic contrast induced by social comparisons did not change; presumably, they already had endogenously attracted attention.

Theoretical and Practical Contributions

Our findings make a valuable contribution toward understanding the role of attention in emotions evoked by social contexts. As social stimuli capture attention, they increase both positive and negative emotional responses to experiences had at the same time as other people (Boothby, Clark, and Bargh 2014; Shteynberg et al. 2014). Shared experiences are a common feature of social life, but so are solitary experiences that are markedly better or worse than the experiences had by someone else. These experiences can evoke a host of strong emotions, such as pride, envy, pity, and schadenfreude (Cikara, Botvinick and Fiske 2011; Crusius and Mussweiler 2012; Smith 2000). Indeed, people appear strongly affected by disparities between self and others, particularly in regards to inequity in their income (Oishi, Kesebir, and Diener 2011; Ordabayeva and Chandon 2010). Happiness is influenced not only by the absolute income of members of a society, but also by the disparities between its more and less fortunate members (Easterlin 1974; Oishi and Kesebir 2015). As sociality increases the hedonic impact of shared experiences through the direction of attention, our findings reveal similar attentional mechanisms amplify hedonic contrast effects when people have experiences of unequal value.

Our work also reveals insight into the considerable value of positional goods and related forms of conspicuous consumption. An obvious form of value conferred by positional goods is the status with which they are associated. The present research provides insight into the consumption value of status (Heffetz and Frank 2008), the idea that status itself can be pleasurable (see also Crusius and Mussweiler 2012). The consumption value of status has been demonstrated in many correlational analyses examining the relationship between relative and absolute income. Satisfaction with income, for example, is considerably affected by the income earned by peers (Clark and Oswald 1996; Luttmer 2005). In addition to any qualitative benefits of status-conferring objects (e.g., pleasure derived from the power with which they are associated), the results of the present research suggest that status-conferring positional goods may provide greater consumption value than goods divorced from social contexts. They are more likely to elicit and benefit from favorable comparisons. Goods purchased for conspicuous consumption, then, not only provide consumers with positive self- and social-signaling value (Ordabayeva and Chandon 2011; Wang and Griskevicius 2014); the favorable comparisons they elicit may provide considerable direct hedonic benefits as well—at least, relative to goods that do not intersect with the social life of the consumer.

It has been proposed that joint attention is foundational in the process of affective social referencing, the process through which children learn which affective responses are appropriate to novel and unfamiliar stimuli (Klinnert 1984). Infants' preferences for novel objects (e.g., toys) are influenced by the emotions others express while interacting with the object. If an adult responds to a novel toy with an expression of anger, fear, surprise, or happiness when interacting with it, children observing the interaction will modulate their relative preference for that toy over a neutral toy accordingly (Martin et al. 2014). Our research adds to this literature by illustrating the role that social attention plays in shaping emotional responses to objects and experiences. Social attention facilitates learned emotional responses to new objects, and amplifies the influence of context on affective responses to objects new and familiar.

The origin of social attention is unclear, but our process studies yield insight into its boundaries in the context of counterfactual comparison. When attention was similarly oriented to social and nonsocial counterfactual alternatives in experiments 4, 5, and 6, both were similarly influential in the hedonic contrast effects that they produced. This suggests that making a comparison social does not add associations that change its perceived size or value. Similarly, social counterfactual comparisons were not more automatically processed than their nonsocial counterparts. If so, resource constraints like cognitive load and time pressure should have amplified their influence. Instead, resource constraints had a leveling effect, making social counterfactual comparisons no more influential than nonsocial counterfactual comparisons. While social comparison standards are chronically accessible in memory (Mussweiler and Rüter 2003), both social and nonsocial counterfactual comparisons were novel in our experiments, suggesting that an accessibility advantage is unlikely to have played a role in their different impact. It is more likely that the peculiar diagnosticity of social comparison information (Festinger 1954; Klein 1997) led participants to preferentially attend to and consider it. Events are more

likely to elicit counterfactual thinking if they possess features that make them unusual, controllable, actions (rather than inactions), or recent (Byrne 2016). Our results suggest that the social nature of an event may be a feature to add to this list.

Our results dovetail with recent findings suggesting that hedonic, affect-rich experiences create *attentional collapse*. The more vivid, arousing, and intense a hedonic experience, the more attention is drawn to the experience itself, which reduces the attention and cognitive resources devoted to present and abstract standards of comparison (Buechel et al. 2014, 2017; Ebert and Meyvis 2014; Morewedge et al. 2010; O'Brien and Roney 2017). People are often insensitive to more abstract features of hedonic experiences—such as their probability, psychological distance, magnitude, or value relative to alternatives—unless they are motivated to engage in comparison (Kassam et al. 2011) and the comparison standards capture their attention, as when comparison standards are the experiences of other people. We examine only the propensity to be affected by hedonic contrast effects in the present research, but our findings should generalize to other cases. People should be more sensitive to abstract attributes of hedonic experiences when other people experience comparison standards that would make those attributes evaluable (Hsee et al. 1999) than when no one else experiences those comparison standards.

Open Questions

While the difference in the contrast effect induced by social and nonsocial counterfactual comparisons held in all experiments that included both superior and inferior alternatives, it is worth noting that our meta-analysis reveals the interaction was driven to a greater extent by upward than by downward comparisons. These directional effects follow the typically greater prevalence of upward versus downward counterfactual comparisons (Roese and Epstude 2017). People find it particularly aversive to be in last place in a distribution (Kuziemko et al. 2014), and unfavorable social comparisons may capture some of the aversion to being worse off than one's peers. We are hesitant, however, to make strong claims about the generalizability of the directional effects demonstrated here.

Upward comparisons may have been more likely to prompt counterfactual comparisons when social than when nonsocial in our experiments, but it is also possible that stronger hedonic responses to negative versus positive stimuli (Kahneman and Tversky 1979) produced a larger contrast effect. Analyses of upward comparisons may, then, have been better powered to detect an effect than analyses of downward comparisons. We also did not calibrate the hedonic impact of losses and gains to be equivalent. It is possible that an idiosyncratic feature of our paradigms produced larger effects for unfavorable than for favorable comparisons. In addition, a recent meta-analysis of more than 60 years of social comparison research found that upward and downward social comparisons are similar in the strength of their impact on judgment (Gerber et al. 2018). Future research is needed to resolve this interesting question.

Another intriguing question is why participants in the nonsocial counterfactual comparison conditions did not naturally imagine the alternative prize would be assigned to another participant. In other words, one might wonder why there were differences between social and nonsocial comparisons in our experiments. We think participants treated alternatives in the social and nonsocial counterfactual comparison conditions differently because people are considerably more sensitive to local social comparisons than distant social comparisons. In other words, people are more likely to compare themselves to others who are physically, temporally, and semantically proximal than distant (Gerber et al. 2018). Assignment to a focal reward when another participant was simultaneously assigned to its counterfactual alternative appears to have been sufficiently proximal to elicit a social comparison. Another participant receiving the counterfactual alternative in the past or future did not. While we manipulated this distance through temporal proximity, it's likely that semantic and physical distance act similarly as moderators. People may attend more to the salaries of their friends, coworkers, and neighbors than to physically and socially distant relations, which may make the hedonic contrast effects induced by the latter groups considerably weaker.

Readers familiar with the marketing literature on hedonic contrast effects may be surprised that counterfactual standards produced strong hedonic contrast effects in our experiments, given their greater prevalence in prospect and memory than in experience (Morewedge et al. 2010; Novemsky and Ratner 2003). We think that the prevalence of hedonic contrast effects in our counterfactual comparison conditions is tied to an important moderator of hedonic contrast effects: the complexity of the stimuli compared. More complex stimuli make comparisons difficult. They reduce the likelihood that people will be able to identify dimensions on which to compare a target and standard, and then notice enough differences between them to induce a contrast effect (Buechel and Morewedge 2014; Gentner and Markman 1997; Martin, Seta, and Crelia 1990). People have a harder time comparing complex experiences, such as vacations, than more simple material goods, such as digital cameras, and are consequently less affected by comparisons between experiential goods than between material goods (Carter and Gilovich 2010). Hedonic contrast effects are prevalent for such easy-to-compare stimuli. People exhibit contrast effects in a variety of cases where stimuli differ on one or two dimensions that are discriminable in joint evaluation, including quantities of money, ice cream, pieces of dinnerware, and better- and worse-tasting potato chips (Hsee 1998; Hsee et al. 1999; Kassam et al. 2011; Ma and Roese 2013; Medvec et al. 1995; Morewedge et al. 2010). The

prevalence of hedonic contrast effects in our experiments was thus likely due to the relative ease of comparing smaller and larger amounts of chocolate or money.

A final caveat to note is that our six experiments examined outcomes that participants could not control. We think that the findings should extend to controllable outcomes. Hedonic contrast effects resulting from controllable and uncontrollable outcomes appear to draw on similar comparison processes (Gilbert et al. 2004; Sevdalis and Harvey 2007). Of course, it is possible that the greater propensity to engage in social versus counterfactual comparisons for controllable outcomes differs from uncontrollable outcomes due to their greater certainty and reduced mutability (Byrne 2016; Kahneman and Miller 1986; Roese and Epstude 2017).

Conclusion

Social comparisons are potent comparisons. Happiness with experiences was most potently influenced by comparison to counterfactual alternatives experienced by other people. The larger hedonic contrast effects induced by social versus nonsocial counterfactual comparisons seem attributable, at least in part, to social attention. A greater propensity to attend to and consider social rather than nonsocial counterfactual alternatives leads the former to induce larger hedonic contrast effects. Our experiences are made much better or worse by the experiences of others because we are so attuned to their experiences.

DATA COLLECTION INFORMATION

The first and second author managed the collection of Amazon Mechanical Turk data for experiments 2 and 6. Experiment 2 was run in January 2013. Experiment 6 was run in July 2015. Both authors performed analyses of the data for these experiments. The third author supervised collection and entry of data by research assistants, and analyzed all data for experiments 1, 3, 4, and 5 at the University of South Carolina and Boston University. Experiment 1 was run in January 2017. Experiment 3 was run in November 2017. Experiment 4 was run in February and March 2017. Experiment 5 was run in April and May 2018. All data is available from the authors upon request.

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