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Self-relevance and wishful thinking: Facilitation and distortion in source monitoring

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When making source attributions, people tend to attribute desirable statements to reliable sources and undesirable statements to unreliable sources, a phenomenon known as the *wishful thinking effect* (Gordon, Franklin, & Beck, 2005). In the present study, we examined the influence of wishful thinking on source monitoring for self-relevant information. On one hand, wishful thinking is expected, because self-relevant desires are presumably strong. However, self-relevance is known to confer a memory advantage and may thus provide protection from desire-based biases. In Experiment 1, source memory for self-relevant information was contrasted against source memory for information relevant to others and for neutral information. Results indicated that self-relevant information was affected by wishful thinking and was remembered more accurately than was other information. Experiment 2 showed that the magnitude of the self-relevant wishful thinking effect did not increase with a delay.

Suppose you have just moved. Having invested time, effort, and money into your new home, you read an article suggesting that contamination had been found in the groundwater of your new neighborhood. Concerned, you do more research and find conflicting information from various sources, some suggesting that the danger is real, others suggesting that you have nothing to fear. Whether you believe the danger to be real should depend in part on the origin of the information. For example, did the article suggesting that your groundwater is toxic appear in a reliable source (e.g., EPA inspection reports) or in an unreliable source (e.g., Biff's Anti-Chemical Panic Web site)? The potential value of information depends in part on the reliability of its source.

According to the source monitoring framework (Johnson, 1997; Johnson, Hashtroudi, & Lindsay, 1993; Johnson & Raye, 1981, 2000), the connection between information and its source is not necessarily recalled directly but may instead be reconstructed on the basis of various cues (Johnson, Foley, Suengas, & Raye, 1988). In the above example, a memory of bright flashing graphics would suggest Biff's Anti-Chemical Panic Web site, whereas a memory for the cognitive effort of interpreting long tables would suggest the EPA report. In general, we base source attributions on the characteristics of a given memory. This allows us to capitalize on the fact that particular sources usually produce consistent profiles of characteristics. Although source decisions based on these profiles can produce false attributions, especially when a source is atypical (e.g., Bayen, Nakamura, Dupuis, & Yang, 2000; Johnson, Foley, & Leach, 1988), their use is rational, and they tend for the most part to have high accuracy rates.

However, because source attributions are typically based on judgment processes rather than on direct retrieval, they should be susceptible to the same types of motivational and social factors that influence any type of goal-directed activity. One such factor is *desire*, which can have a powerful and pervasive effect on cognitive processing. People tend to distort their perceptions and judgments on the basis of their desires for emotional comfort, positive self-image, or corroboration of their beliefs (Kunda, 1990). For example, when people observe an offense in a sporting event, they tend to view the opposing team (rather than their own) as culpable (Boon & Davies, 1996). Perceptions of ambiguous figures are influenced by which interpretation is currently most beneficial to the observer (Balcetis & Dunning, 2006), and readers modify their ratings of the likelihood of story events on the basis of their own plot-driven preferences (Rapp & Gerrig, 2002).

Many memory distortions are consistent with such desire-based biases in judgment. Often, these distortions

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are in the direction of "improving" past or future self-related outcomes and self-images. For example, people recall their high school grades as being higher than they actually were, especially if their grades were low (Bahrick, Hall, & Berger, 1996), and they generally recall more information about personal successes than personal failures (e.g., Crary, 1966; Silverman, 1964; see also Messick, Bloom, Boldizar, & Samuelson, 1985). They also selectively recall positive critiques and fail to recall negative criticism that might, if remembered, encourage a pessimistic self-image (Green & Sedikides, 2004). Roese and others (e.g., Roese & Olson, 2007) have interpreted these effects as a component of affect regulation, allowing people to improve their evaluations of both self and environment through selective reasoning and memory.

Several lines of research have examined the influence of desire on source monitoring in particular. After choosing between two equally acceptable options, people tend to attribute positive features to the chosen option and negative features to the rejected one (Benney & Henkel, 2006; Henkel & Mather, 2007; Mather & Johnson, 2000; Mather, Shafir, & Johnson, 2000, 2003). These choice-supportive source attributions seem to serve the purpose of increasing people's satisfaction with their chosen options. Given that people prefer their choices to be as good as possible, they distort their memories to maximize the benefits and minimize the costs associated with their choice. However, an alternative explanation is that people assume, on the basis of past experience, that they usually pick the better of two options. Choice-supportive source attribution can therefore be seen as rational, since it would generally result in accuracy outside the lab. In fact, when researchers informed participants that their assignment had been made randomly (and thus did not reflect their own judgment), this choice-supportive bias disappeared (Mather et al., 2003), suggesting that a belief in one's own good judgment, rather than a desire for an idealized outcome, is the most plausible explanation for the effect.

A second line of research about desire's potential influence on source attributions focuses on unconscious plagiarism, or cryptomnesia (e.g., Bink, Marsh, Hicks, & Howard, 1999; Defeldre, 2005; Marsh & Bower, 1993). In the initial phase of this paradigm, people generate solutions to a puzzle with a partner. Later, they are asked to recall their original solutions as well as generate novel puzzle solutions. During this second phase, people sometimes falsely attribute their partner's solutions to themselves or inadvertently reproduce their partner's responses in trying to create a novel solution. One explanation of these findings is that people want to be the source of good ideas, and they distort their memories in service of this desire. This explanation is supported by the finding that people copy more from perceived experts than from perceived novices (Bink et al., 1999). However, as with choice-supportive source monitoring, it is also possible that this tendency comes from past experience of generating good solutions, and so using such a principle in making source attributions has a rational basis. These studies also typically use briefly stated, simple problems (e.g., how to reduce traffic accidents), and so solutions generated by participants in the brainstorming session are likely to have considerable overlap. Inadvertent plagiarism may therefore be due to this overlap between self- and other-generated ideas rather than to desire-based reasoning.

Of particular interest with respect to the present investigation, the wishful thinking effect is another area of research addressing the influence of desire on source attributions (Gordon, Franklin, & Beck, 2005). In each of two studies, people read a series of desirable and undesirable predictions made by two sources who varied in their reliability. Later, participants consistently misattributed desirable predictions to the reliable source and undesirable predictions to the unreliable source. In a third study, people distorted their source attributions for a set of scenarios to make the predictor of an unrelated, highly desirable outcome seem more reliable (by distorting their memory of the source's predictive track record). In all of these studies, the influence of desire-based processes on source monitoring is clear.

Returning to our opening example, if you choose to believe that the danger to the groundwater of your new home is real, you may have to move again (or live with the risk, if you cannot afford to move). Finding some way to believe that you have nothing to fear would therefore be to your benefit in many ways, and one strategy would be to engage in the sort of wishful thinking described above. Your desire to think well of your new home might lead you to remember the reassuring information about the groundwater as having come from a trustworthy source (the EPA) and the alarming information as having come from an untrustworthy source (Biff's Anti-Chemical Panic Web site).

Contrast the above with a different situation. Suppose it is an acquaintance of yours, and not you, who has moved into the potentially dangerous neighborhood. He calls you, concerned, and asks you to help with his research to determine whether the problem is a real one. While conducting research on your friend's behalf, are you as prone to desire-based reasoning as you were in the first situation? Are we more rational where our own lives are concerned—more attentive to the accuracy of information that informs our judgments? Or are we more prone to error due to deeper emotional involvement and, presumably, stronger wishes associated with self-relevant situations? Although desire-based reasoning has been demonstrated frequently (see also Lord, Ross, & Lepper, 1979), so have the performance advantages for self-relevant cognition over non-self-relevant cognition. In the studies described here, we examine these potentially opposing tendencies and try to determine whether decisions about remembered events become less or more vulnerable to desire-based reasoning when the desires relate to personal outcomes.

So far, the wishful thinking effect has been demonstrated only for memories of fictitious characters and events. It is impressive that people's wishes can be manipulated so strongly in a single brief paragraph about (for example) a Peruvian mining company that will (in one version) build a school and support the local community or (in another version) desecrate the land and abandon the locals to pick up the pieces. Imagine what might happen in the real world, where the delay between initial exposure and source retrieval is much longer than in the lab and

where the content of the memory is much more likely to have personal impact. Clearly, people have much more reason to harbor desires about themselves and their own lives than they do about the scenarios that would impact only third-person fictitious characters.

The present studies were inspired by an intriguing possibility that the wishful thinking effect might be exaggerated for self-relevant memories. If greater desire leads to greater memory distortion, the alarming results arising out of experiments using fictional scenarios (such as Peruvian miners) might be only a muted reflection of what people consistently do in their own lives.

A Potentially Opposing Force: Increased Memory Accuracy for Self-Relevance

Although self-relevant desire can lead to memory errors (e.g., Bahrick et al., 1996), studies involving self-relevance have largely led to the conclusion that self-relevance is *good* for memory accuracy. In the classic demonstration of this advantage (Rogers, Kuiper, & Kirker, 1977), people encoded single words, either structurally, phonetically, semantically, or self-relevantly, and recall was best for information that was encoded self-relevantly. The effect has been replicated numerous times, for both memory for content (Barney, 2007; Conway & Dewhurst, 1995; Klein & Loftus, 1988) and memory for source (Kahan & Johnson, 1992), and it is thought to reflect elaborative processing (Craik & Lockhart, 1972). A meta-analysis by Symons and Johnson (1997) suggests that the highly practiced and well-developed knowledge structures associated with the self have a particularly powerful facilitative effect on memory by promoting both elaboration and organization of study materials (see also Klein & Loftus, 1988).

In addition, self-relevance tends to provoke more careful cognition, reflecting the fact that the costs of inaccuracy are greater when consequences directly impact oneself (Johnson et al., 1993). Some of the findings in the literature may arise, at least in part, from this. Such findings and arguments would suggest that people may engage in *less* wishful thinking as information becomes self-relevant.

Certainly, though, self-relevance is not a magical quality that guarantees improved performance. The greater fluency of processing can facilitate the generation of false memories as well as true ones (Desjardins & Scoboria, 2007; Lindsay, Hagan, Read, Wade, & Garry, 2004; Wade, Garry, Read, & Lindsay, 2002). Furthermore, self-relevant processing is frequently associated with emotional involvement, which can impair source monitoring (Johnson, Nolde, & De Leonardis, 1996) and other aspects of memory (Talarico & Rubin, 2003). But more than just reducing accuracy, it can also produce systematic errors, as described in the review of self-serving effects above.

Self-Relevance Versus Desire?

The findings discussed so far have provided plenty of evidence, from different studies, suggesting that self-relevance can be a significant source of distortion *and* that it can increase accuracy. Both classes of effects have been found in a wide range of circumstances and with a wide range of tasks. Of interest in the present study is how these apparently contradictory tendencies, toward self-serving distortion and toward accuracy, may interact to guide behavior in circumstances like the one described at the beginning of the present article. Such situations have a potentially high impact on our lives and may be encountered frequently. According to the literature, these situations give us both the motivation to remember them in a self-serving way and the opportunity to encode information more effectively.

EXPERIMENT 1
Wishful Thinking and Self-Relevance

Up to this point, we have primarily discussed the wishful thinking effect as it was conceptualized in Gordon et al.'s (2005) Experiments 1 and 2. In these experiments, wishful thinking was demonstrated as a tendency to attribute desirable statements to a source that is known to be reliable (such as an EPA report) and undesirable statements to a source that is known to be unreliable (such as Biff's Anti-Chemical Panic Web site). In contrast, in Gordon et al.'s Experiment 3, participants read a set of vignettes in which two sources made mildly positive or negative predictions. After reading these predictions, participants read a final vignette in which one of the sources made either an extremely positive prediction (i.e., a miracle cancer drug will be invented) or an extremely negative prediction (i.e., an extremely dishonest person will steal from a humanitarian firm). Participants then completed a source monitoring test in which the accuracy of the earlier predictions was revealed and participants were asked to recall the original source of each prediction. Although each source was in fact accurate exactly 50% of the time, participants systematically made their source attributions in a way that distorted the sources' relative reliability. For example, attributing correct predictions to the source who had made the extremely positive prediction made that source appear more trustworthy, and in doing so, served the participants' desire to believe that the cancer drug prediction had come from a reliable source.

In the experiments described above, source attributions affected fictional others. In the present work, we modified this paradigm so that source accuracy affected either the fate of another person, the participants themselves, or no one. This allowed us to directly examine how self-relevant memory facilitation and wishful thinking affect source attributions. Either or both may affect performance in this paradigm.

Method

Design. The experiment was designed such that identical information from the same sources had personal meaning, meaning for a stranger, or no meaning. This was manipulated as a between-subjects factor. In brief, all participants read the same series of predictions made by two sources (*assigned* or *unassigned*, described below) and were told that they would later learn the outcome of each prediction (*accurate* or *inaccurate*). In both the *personal-impact condition* and the *other-impact condition*, accurate predictions from the assigned source and inaccurate predictions from the unassigned source had positive implications. In contrast, inaccurate predictions from

the assigned source and accurate predictions from the unassigned source had negative implications. In the *no-impact condition*, neither source's accuracy had any implication.

All participants later saw these same predictions (as well as new predictions), along with the outcome (accurate or inaccurate) for each prediction. Participants were asked to identify which source (assigned, unassigned, or new) had originally produced each one. Wishful thinking should lead people to attribute *accurate* predictions more frequently to the assigned source than to the unassigned source. Similarly, people should attribute *inaccurate* predictions more frequently to the unassigned source than to the assigned source. Therefore, wishful thinking would be demonstrated as an interaction between source (assigned or unassigned) and accuracy of prediction (accurate or inaccurate). We expected this effect to be greater in the two impact conditions than in the no-impact condition and were interested in whether it would be greater in the personal-impact condition than in the other-impact condition.

The experiment consisted of a 3 (predicting source: assigned, unassigned, or new) × 2 (accuracy of prediction: accurate or inaccurate) × 3 (condition: personal-, other-, or no-impact) mixed design. Both the predicting source and the accuracy of the prediction were manipulated within subjects.

Participants. A total of 131 Stony Brook University undergraduates (43 in the personal-impact condition, 46 in the other-impact condition, and 42 in the no-impact condition) received course credit for participating in a single 1-h session. Participants were always pairs of strangers. In the cases where only 1 participant was present for a session, the experimenter played the role of the second partner, but only the data from the real participant were used in analyses.

Materials and Procedure. At the beginning of the study, all participants were told of an online, virtual community where people interact with each other in various complex ways. (Although similar communities, such as Second Life, do exist, ours was fictional.) They were also told that a while ago, two groups of social scientists created expert computer systems (Systems A and B) that made a large number of predictions about the virtual society's continued developments.

The stimuli for all conditions of this experiment were 54 predictions about this virtual society. Each prediction consisted of two to four sentences describing the status of a situation at the time when the two expert systems made their predictions, followed by a sentence in which one of the systems predicted a particular outcome. (These predictions were previously rated as having neutral desirability by a norming group of 11 Stony Brook undergraduates who did not participate in any of the subsequent experiments.) For each situation, only one of the systems made a prediction. For purposes of experimental design, the 54 predictions were divided into three lists that counterbalanced the general subject matter of the prediction (e.g., business, politics, lifestyle). The scenarios from one of these lists were assigned to be the predictions from System A, the second were assigned to be the predictions from System B, and the third made up the set of new items presented at test. In this way, no one source was associated with predictions on a particular topic.

Desires about source accuracy were induced through instructions given to the pairs of participants at the beginning of the study. Participants in the *personal-impact* condition were each "assigned" to one of the two expert systems and were told that they would be competing against each other. In cases where only 1 participant was present, the experimenter informed the participant that, because the experiment required 2 participants, the experimenter would be acting as the competitor. Participants were then informed that they would earn a point every time their assigned system made an accurate prediction and lose a point every time their assigned system made an inaccurate prediction. The person with the most points at the end of the competition would win, and the loser would have to be videotaped singing karaoke.[1] Participants in this condition were expected to have a strong desire for their assigned system to be accurate and their competitor's system (i.e., the unassigned system) to be inaccurate.

The elaborate setup was justified to participants with the explanation that we were studying the effects of people identifying with computer systems. It should also be noted that we chose the karaoke manipulation in part because of the affect regulation framework discussed earlier. When faced with a threat (either a physical or psychological event that could cause harm), people become more self-serving in their judgments to regulate affect (e.g., Roese & Olson, 2007). In this experiment, the possibility of having to sing publicly should be viewed as threatening and should induce negative affect (Taylor, 1991). This, in turn, should prompt the need for affect regulation in the form of self-serving memory biases.

In the *other-impact* condition, participants watched a videotape depicting two strangers receiving the personal-impact condition instructions described above. Participants were led to believe that this videotape was actual footage of participants from a previous experiment. Of these two strangers, one was depicted as loud and rude. She arrived late to the experimental session and constantly interrupted the experimenter. In contrast, the other stranger was depicted as cooperative and polite. She was on time and listened quietly to the experimenter. The quiet, polite stranger explicitly expressed her anxiety about the possibility that she might have to sing. After watching this video, participants were told which system each stranger had been assigned to. They were expected to want the quiet, polite stranger's system to be accurate and the rude stranger's system to be inaccurate. We refer to the polite stranger's system as the "assigned" system and the rude stranger's system as the "unassigned" system. Participants were again expected to have a strong desire for the assigned system to be accurate and the unassigned system to be inaccurate.

In the *no-impact* control condition, participants did not watch a videotape and were not told about either a competition or karaoke. They simply read about the existence of the virtual world, the two prediction sources, and the set of specific predictions. These participants were not expected to have any preference between the two sources.

After being given instructions, all participants read the same 36 predictions about the virtual society, in a standard randomized order. Half of these predictions were made by System A, and half were made by System B. Participants read at their own pace and pressed a button to advance to the next prediction. After reading the predictions, the participants performed an unrelated multiplication task for 5 min to minimize recency and ceiling effects in the upcoming memory test.

Participants then saw the predictions they had seen previously as well as 18 new predictions, in a randomized order. Each prediction was presented in its entirety, except that a single asterisk replaced the predicting system's identity (e.g., System * rather than System A). Additionally, a brief description of the outcome was presented for each prediction, along with the single sentence: "Prediction was right" or "Prediction was wrong." Examples of both original predictions and predictions with outcomes are provided in the Appendix. Predictions originating with each system were accurate 50% of the time, and new predictions were also accurate 50% of the time. For each test item, participants were asked to decide whether the prediction had been made by System A or B or had not been presented. No feedback was given for these responses.

As soon as each participant had completed the test phase, they were asked a series of questions (depending on their condition) that served as manipulation checks. Specifically, participants were asked to identify which system they were assigned to (in the personal-impact condition) or which system each stranger was assigned to (in the other-impact condition). They were also asked to state whether they believed that the loser would have to sing karaoke and whether they had a preference about the winner of the competition. Additionally, participants in the other-impact condition were asked their opinions about the two women from the video at the beginning of the experiment, and participants in the personal-impact condition were asked whether they had been hoping to have the opportunity to sing. Finally, participants in the no-impact condition were asked whether they personally related to either of the computer systems. At the end of the experiment, all participants were informed that there would be no karaoke and were debriefed.

Table 1
Mean Proportion of Correct Source Attributions in Experiment 1 (and Standard Errors of the Mean) As a Function of Predicting Source (Assigned or Unassigned), Accuracy of Prediction (Accurate or Inaccurate), and Condition (Personal, Other, or No Impact)

		Personal-Impact Condition		Other-Impact Condition		No-Impact Condition	
Predicting Source	Accuracy of Prediction	*M*	*SE*	*M*	*SE*	*M*	*SE*
Assigned system	Accurate	.70	.03	.57	.03	.51	.03
	Inaccurate	.60	.03	.52	.03	.54	.04
Unassigned system	Accurate	.55	.03	.52	.04	.58	.03
	Inaccurate	.60	.03	.62	.03	.56	.03

Results

Wishful thinking was expected to occur only if there was a preference for a given competitor to win[2] and if the participant correctly remembered the mapping of participants to predicting systems. Data from participants (3 from the personal-impact condition and 6 from the other-impact condition) who did not meet these criteria were discarded. Finally, data from 2 participants who stated that they personally related to one of the computer systems in the no-impact control condition were discarded. Data from 40 participants in each condition remain in the following analyses.

Old versus new accuracy. We first examined participants' recognition accuracy, calculated as hits minus false alarms. Overall, recognition was quite high, reflecting the rich stimuli and brief delay used in the present study. However, a one-factor (condition: personal-, other-, or no-impact) ANOVA showed significant differences in recognition between the three conditions [$F(2,117) = 3.26$, $MS_e = .01$, $p = .04$, $\eta_p^2 = .05$]. In particular, recognition in the personal-impact condition ($M = .92$) and the other-impact condition ($M = .93$) were marginally and significantly higher, respectively, than recognition in the control no-impact condition ($M = .88$) [$F(1,78) = 3.61$, $MS_e = .01$, $p = .06$, $\eta_p^2 = .04$] and [$F(1,78) = 5.11$, $MS_e = .01$, $p = .03$, $\eta_p^2 = .06$]. However, recognition did not differ between the personal-impact and other-impact conditions [$F(1,78) < 1$].

Wishful thinking effect. Wishful thinking should occur only when there is a preference for a given competitor to win. As expected, in the no-impact control condition there was no significant interaction between predicting source (assigned or unassigned) and accuracy of prediction (accurate or inaccurate) on accurate source decisions, and therefore no evidence of wishful thinking [$F(1,39) < 1$]. In contrast, the other-impact condition did demonstrate a wishful thinking effect [$F(1,39) = 5.30$, $MS_e = .04$, $p = .03$, $\eta_p^2 = .12$]. This conceptually replicates previous findings by Gordon et al. (2005) that wishful thinking can contribute systematically to source decisions when the outcomes are relevant to others.

Of particular interest was whether a wishful thinking effect would occur in the personal-impact condition and, if so, how it would compare with that of the other-impact condition. The planned comparison showed a significant wishful thinking effect, as evidenced by a significant interaction between the predicting source and the accuracy of the prediction [$F(1,39) = 6.52$, $MS_e = .03$, $p = .01$, $\eta_p^2 = .14$]. However, wishful thinking was no greater (or smaller) in the personal-impact condition than in the other-impact condition [$F(1,78) < 1$]. Means and the standard errors of the means by condition are presented in Table 1.

However, further analyses did reveal differences in wishful thinking between the personal- and other-impact conditions. The wishful thinking effect actually consists of two separable biases: a tendency to attribute accurate predictions to the favored system (which increases the likelihood of winning and is referred to here as the *validate effect*) and a tendency to attribute inaccurate predictions to the nonfavored system (which decreases the likelihood of losing and is referred to here as the *discredit effect*). It is important to note that the wishful thinking interaction reported above could occur when both validate and discredit effects are present or when only one effect is present. We therefore conducted more specific comparisons, examining for validate and discredit effects separately.[3] To foreshadow, our results show differences in the pattern of validate and discredit effects between the three conditions.

A validate effect is present when participants correctly attribute more accurate predictions to the assigned source than to the unassigned source. A 2 (predicting source: assigned or unassigned) × 3 (condition: personal-, other-, or no-impact) ANOVA showed significant differences in the validate effect between the three conditions [$F(2,117) = 5.35$, $MS_e = .05$, $p < .01$, $\eta_p^2 = .08$]. Looking at the pattern of attributions within each condition separately, the validate effect is present in the personal-impact condition [$F(1,39) = 11.59$, $MS_e = .04$, $p < .01$, $\eta_p^2 = .23$] but is absent in both the other-impact condition [$F(1,39) < 1$] and the no-impact condition [$F(1,39) = 2.41$, $MS_e = .04$, $p = .13$, $\eta_p^2 = .06$]. Thus, the validate effect is associated only with the personal-impact condition.

We next examined for the complementary form of wishful thinking, a discredit effect. A discredit effect is present when participants correctly attribute more inaccurate predictions to the unassigned source than to the assigned source. A 2 (predicting source: assigned or unassigned) × 3 (condition: personal-, other-, or no-impact) ANOVA showed no significant differences in the discredit effect between the three conditions [$F(1,117) = 1.46$, $MS_e = .05$, $p = .24$, $\eta_p^2 = .02$]. However, follow-up comparisons showed that, although the discredit effect appeared in the other-impact condition [$F(1,39) = 4.85$, $MS_e = .05$, $p = .03$, $\eta_p^2 = .11$], it did not appear in either the personal-

impact [$F(1,39) < 1$] or the no-impact [$F(1,39) < 1$] condition. Thus, the discredit effect is associated only with the other-impact condition.

Facilitation effect. Within the self-relevance literature, it has been demonstrated that recognition is higher for self-relevant statements compared than for other-relevant statements (Bower & Gilligan, 1979) and that source memory is also higher for self-relevant statements compared than for other-relevant statements (Kahan & Johnson, 1992). In the present experiment, we examined only source memory, because ceiling effects occurred in recognition for both the personal-impact ($M = .92$) and other-impact ($M = .93$) conditions.

In the present experiment, a facilitation effect could be evidenced in two different ways. First, one would expect superior source accuracy in the personal-impact condition in comparison with the other conditions.[4] This was the only condition in which sources affected the self directly, and this relevance to one's own fate should facilitate source memory for predictions by both the assigned and unassigned systems. Second, within the personal-impact condition, self-relevant facilitation should produce higher source accuracy when the predicting source was the assigned system than when it was the unassigned system. Although both systems impact the participant's (or preferred other's) fate, the participant has been instructed to identify with the assigned system and that one is therefore likely to be perceived as *more* self-relevant. As will be seen below, both contributions to self-relevance (degree of personal impact and system assignment) turned out to produce facilitation effects.

We first tested the broader conceptualization of the facilitation effect: that overall source accuracy should be higher in the personal-impact condition than in the other conditions. A one-factor (condition: personal-, other-, or no-impact) ANOVA on source accuracy revealed a significant difference between the three conditions [$F(2,117) = 3.81$, $MS_e = .05$, $p = .03$, $\eta_p^2 = .06$]. Follow-up analyses confirmed that source accuracy was higher in the personal-impact condition ($M = .61$) than in the other-impact condition ($M = .56$) [$F(1,78) = 5.02$, $MS_e = .07$, $p = .03$, $\eta_p^2 = .06$]. Similarly, source accuracy was higher in the personal-impact condition than in the no-impact condition ($M = .55$) [$F(1,78) = 6.11$, $MS_e = .07$, $p = .02$, $\eta_p^2 = .07$]. In replication of previous findings, source memory was better when information was relevant to the self than when it was relevant to another person (Kahan & Johnson, 1992).

We next tested whether source accuracy was higher when the predicting source was the assigned system than when the predicting source was the unassigned system, and whether this effect differed across conditions. A 2 (predicting source: assigned or unassigned) × 3 (condition: personal-, other-, or no-impact) ANOVA on accurate source decisions showed a significant interaction between predicting source and condition [$F(2,117) = 3.36$, $MS_e = .05$, $p = .04$, $\eta_p^2 = .05$]. This demonstrates a difference in facilitation effects between the conditions. We then conducted planned comparisons to determine whether a facilitation effect was present in each condition when examined individually. As expected, there was no main effect of predicting source, and therefore no facilitation effect, in either the no-impact control [$F(1,39) = 1.67$, $MS_e = .05$, $p = .20$, $\eta_p^2 = .04$] or the other-impact [$F(1,39) < 1$] condition. The personal-impact condition did, however, produce a facilitation effect such that source accuracy was higher for the assigned system than for the unassigned system [$F(1,39) = 4.60$, $MS_e = .05$, $p = .04$, $\eta_p^2 = .11$].

Discussion

Participants who were motivated to want a particular source to be accurate and/or another source to be inaccurate showed wishful thinking effects in their source attributions. Such effects held both when information impacted a stranger (replicating Gordon et al., 2005) and when it had a personal impact. Participants in these conditions tended to attribute accurate predictions to the preferred system and/or inaccurate predictions to the nonpreferred system, thus making the preferred system appear to be right more often. The wishful thinking effect appeared to be carried by a validate effect when participants were induced to want a particular competitor to win (i.e., themselves) and by a discredit effect when they were induced to want a particular competitor to lose (i.e., the rude stranger). Thus, the type of wishful thinking observed seems to be a function of the particular desire that was induced by the experimental situation. In actual fact, each system's predictions were accurate 50% of the time. The obtained pattern of results is therefore best described as stemming from systematic cognitive biases that served participants' wishes.

It is important to note that, although the wishful thinking effects in the present experiment manifest primarily as a validate effect in the personal-impact condition and as a discredit effect in the other-impact condition, this is probably an artifact of our design. Self-relevant desires are certainly more likely to be focused on a wish for personal success rather than on a wish for others' failures. However, other-relevant desires can easily focus on both the success of a preferred other and on the failure of a nonpreferred other. In fact, in the original wishful thinking work by Gordon et al. (2005), both validate and discredit effects were seen. When people were encouraged to hope for particular predictions to come true, they attributed these predictions disproportionately to the more accurate source. When they were encouraged to hope for other predictions to not come true, they showed a similar tendency to attribute the prediction to the less accurate source. This raises the question of why the other-impact condition of the present experiment (modeled after the conditions of Gordon et al., 2005) showed only the discredit effect. An important point to keep in mind is that, in most of the Gordon et al. experiments, wishes were tied specifically to prediction content. Here, however, wishes are associated with source accuracy. Thus, the particular pattern of wishful thinking results should be sensitive to the specific nature of that source accuracy wish. It is plausible that, given the right circumstances, both validation and discrediting could contribute to wishful thinking in both self- and other-relevant situations.

Several alternative explanations for these wishful thinking findings can be ruled out. The participants were assigned arbitrarily to the two systems, about which they otherwise knew nothing, so there was no *rational* basis for them to assume that the one they were assigned to was superior (as in choice-supportive biases). Similarly, one might argue that the results could be attributed to a confirmation bias, by which participants would be inclined to process information that supports a hypothesis they hold. This possibility can be ruled out, however, because participants were not the ones making hypotheses that might be confirmed or disconfirmed. There would be no basis, other than desire, for them to assume that the assigned system's predictions were accurate and the unassigned system's predictions were inaccurate. There was also no clear way for the present situation to accommodate explanations involving event plausibility (Pezdek, Finger, & Hodge, 1997), imagination (Hyman & Pentland, 1996), or heightened fluency due to greater prior exposure to self-relevant content (Desjardins & Scoboria, 2007). Finally, these results cannot be explained by variations in encoding efficiency, since participants did not know at encoding which of the predictions would turn out to be accurate.

Of particular interest in this experiment was whether self-relevance exacerbates the effects of wishful thinking. On one hand, wishes pertaining to the self should be stronger than wishes pertaining to others. This could lead wishful thinking to be greater in the personal-impact than in the other-impact condition. On the other, source monitoring may be conducted more carefully when the source decision has personal significance. This could lead to a lowering of the frequency of memory distortion (including a wishful thinking effect) in the personal-impact condition. In fact, the size of the wishful thinking effect did not differ between the two conditions (although, as noted above, the precise form taken by the effect differed between the two conditions). We will address this further in a moment.

Interestingly, along with wishful thinking effects, we also observed memory facilitation in the personal-impact condition such that source accuracy was not only significantly higher in that condition compared with other conditions, but was also significantly higher for predictions made by one's own system than for those made by the competitor's system. However, this was not to the exclusion of a wishful thinking effect. As can be seen in Table 1, source accuracy was highest when a prediction was both made by one's own system and accurate, the only combination of factors for which self-relevant facilitation and wishful thinking bias would be acting cooperatively to increase source accuracy. The effects of self-relevant facilitation and bias therefore can occur in tandem, rather than being mutually exclusive. It may also be the case that across-the-board self-relevant facilitation is what prevents the wishful thinking effect from being larger in the personal-impact condition, in spite of an increased magnitude of desire.

To summarize, the data from Experiment 1 suggest that tendencies toward desire-based biases and self-relevant memory enhancement are not necessarily contradictory or mutually exclusive. Within the personal-impact condition, we observed evidence for both. Participants were more inclined to successfully encode and later retrieve source information in this condition, especially for the scenarios involving the system they were assigned to (following classic memory facilitation effects within the self-relevance literature). To the extent that the episodic information available to memory was insufficient to specify source, participants were prone to assign predictions to sources as a function of what would benefit themselves or the person they were rooting for.

If one of these effects (facilitation) operates on memory itself and the other (wishful thinking) operates as a cognitive bias in source reconstruction, experimental conditions known to reduce memory accuracy (thus increasing the opportunity for reconstruction) should affect the pattern of source attributions accordingly. Experiment 2 introduced a substantial delay between learning and testing phases, which should increase the difficulty of memory retrieval and create a greater *opportunity* for subsequent desire-based reconstruction. If such errors arise when specific source memory is absent, wishful thinking should occur as a function of forgetting or of factors known to produce forgetting, such as delay. However, because remembering in the real world often takes place after specific source information is lost, such a tendency toward desire-based reconstruction would carry the risk of runaway wishful thinking effects for memories concerning oneself. People may therefore be protected by cognitive safeguards against such effects. Experiment 2 explores this possibility by introducing a delay between learning and retrieval.

EXPERIMENT 2
Delay

Introducing a delay should lower memory accuracy across the board. To the extent that *memory* for particular cues produced participants' high source accuracies for their own systems, delayed testing conditions should reduce or eliminate those advantages. Such a loss of useful cues to draw on would then increase vulnerability to desire-based reconstruction, such as the wishful thinking effect (which is primarily due to biased reconstruction at retrieval; see Gordon et al., 2005). However, if there is some means by which people protect themselves from runaway wishful thinking errors and from the risks associated with behavior guided by such errors, we may find that desire-based reconstruction does not tend to fill the gap. That is, the size of the wishful thinking effect in self-relevant situations would *not* increase with delay.

Method

Design. The present experiment employed a 3 (predicting source: assigned, unassigned, or new) × 2 (accuracy of prediction: accurate or inaccurate) × 2 (delay condition: 5 min or 1 week) mixed design. Both source and accuracy were manipulated within subjects, whereas delay was a between-subjects variable.

Participants. A total of 70 undergraduates at Stony Brook University (29 participants in the 5-min delay condition and 41 participants in the 1-week delay condition) received course credit for

participation. As in the previous experiment, participants were run as pairs of strangers. When only 1 participant was present, the experimenter played the role of the competitor, but only the data from the real participants were used in analyses.

Materials and Procedure. This experiment consisted of two delay conditions (testing either 5 min or 1 week after learning). The procedure and materials for the 5-min delay condition were identical to those for the personal-impact condition in Experiment 1. The procedure for the 1-week delay condition was almost identical, except for a minor modification. Participants in this condition received the same initial instructions and read the same set of predictions as participants in the 5-min delay condition, but after completing the encoding task, they were dismissed and were instructed to return 1 week later. Upon returning to the laboratory, they were reminded of the competition rules and then completed the surprise source memory test. The 1-week delay condition participants did not receive the distractor task.

Results

As in the first experiment, wishful thinking was expected only when participants knew which system they were assigned to and wanted that system to win. Data from participants who did not meet these criteria were not included in analyses (4 participants from the 5-min delay condition and 5 from the 1-week delay condition). In addition, 11 participants in the 1-week delay condition did not return for the second session and so did not provide any memory data. Twenty-five participants contributed to each condition in the following analyses.

Old versus new accuracy. A one-factor (delay condition: 5 min or 1 week) ANOVA revealed that recognition accuracy (hits minus false alarms) was significantly higher for participants in the 5-min delay condition ($M = .90$) than for those in the 1-week delay condition ($M = .79$) [$F(1,48) = 13.14$, $MS_e = .01$, $p < .01$, $\eta_p^2 = .22$]. Follow-up comparisons confirmed that this pattern was present in both hits and in correct rejections. Participants were significantly more able to correctly identify new items as new in the 5-min delay condition ($M = .90$) than in the 1-week delay condition ($M = .66$) [$F(1,48) = 12.22$, $MS_e = .06$, $p < .01$, $\eta_p^2 = .20$]. They were also marginally more able to correctly identify old items as old in the 5-min delay condition ($M = .90$) than in the 1-week delay condition ($M = .85$) [$F(1,48) = 2.67$, $MS_e = .01$, $p = .11$, $\eta_p^2 = .05$]. So, although performance is still quite good after a 1-week delay, the trend is that it is better soon after learning.

Wishful thinking. Both the 5-min and 1-week delay conditions of the present paradigm involve personal impact, and so, as in the previous experiment, wishful thinking would most likely be carried largely or completely by the *validate* component of the wishful thinking effect. In particular, people should be more likely to correctly attribute accurate predictions to their own system (the assigned system) than to their competitor's system (the unassigned system) and may also be more likely to correctly attribute inaccurate predictions to their competitor's system (the unassigned system) than to their own (the assigned system). Within the source accuracy data, therefore, we expect an interaction between the predicting source and prediction accuracy, carried primarily by a validate effect (the tendency to attribute correct predictions to the assigned system rather than to the unassigned system).

Looking first at the 5-min delay condition, a 2 (predicting source: assigned or unassigned) × 2 (accuracy of prediction: accurate or inaccurate) ANOVA on correct source attributions showed a significant interaction between predicting source and accuracy of prediction, indicative of a wishful thinking effect [$F(1,24) = 5.08$, $MS_e = .05$, $p = .03$, $\eta_p^2 = .18$]. This finding replicates the personal-impact wishful thinking effect from Experiment 1.

Of particular interest was whether a wishful thinking effect would be found in the 1-week delay condition, and, if so, how it would compare with that of the 5-min delay condition. Looking at the 1-week delay, a 2 (predicting source: assigned or unassigned) × 2 (accuracy of prediction: accurate or inaccurate) ANOVA confirmed the presence of a wishful thinking effect [$F(1,24) = 4.51$, $MS_e = .10$, $p = .04$, $\eta_p^2 = .16$]. However, in the 2 (predicting source: assigned or other) × 2 (accuracy of prediction: accurate or inaccurate) × 2 (delay condition: 5 min or 1 week) ANOVA, the three-way interaction was nonsignificant, giving no indication that wishful thinking was greater after a longer retention interval [$F(1,48) < 1$]. Although it is difficult to draw strong conclusions from null results, we do note that the observed effect size of this three-way interaction was very small ($\eta_p^2 = .003$). Even if a difference in wishful thinking exists between these conditions, it is not likely to be observed or to have a strong influence on behavior. Means and the standard errors of the means by condition are listed in Table 2.

As in Experiment 1, we next examined whether the wishful thinking effect took the form of a validate effect (a tendency to attribute accurate predictions to the favored system) or a discredit effect (a tendency to attribute inaccurate predictions to the nonfavored system). Looking first at the validate effect, a 2 (predicting source: assigned or unassigned) × 2 (delay: 5 min or 1 week) ANOVA on correct source attributions of accurate predictions showed a main effect of predicting source (i.e., a validate effect) [$F(1,48) = 20.49$, $MS_e = .04$, $p < .01$, $\eta_p^2 = .30$] but no difference in the validate effect between conditions [$F(1,48) < 1$]. Follow-up comparisons revealed that the validate effect was present both after a 5-min [$F(1,24) = 21.86$, $MS_e = .02$, $p < .01$, $\eta_p^2 = .48$] and after a 1-week [$F(1,24) = 6.18$, $MS_e = .05$, $p = .02$, $\eta_p^2 = .21$] delay. These results replicate those of the personal-impact condition of Experiment 1.

To examine for a discredit effect, we ran a similar repeated measures ANOVA on correct source attributions of the inaccurate predictions. This analysis revealed no main effect of predicting source (i.e., no discredit effect) [$F(1,48) = 1.48$, $MS_e = .06$, $p = .23$, $\eta_p^2 = .03$] and no difference in the discredit effect between conditions [$F(1,48) < 1$]. Thus, there was no evidence at either delay of a discredit effect. Again, these results replicate those of the personal-impact condition of Experiment 1.

In the present experiments, the discredit effect would emerge if participants had a specific desire for their competitor to lose. However, it seems that this effect is unlikely to emerge when the more salient competitor is the participant. It is likely that participants in the personal-impact conditions of the present experiments are focused on their

Table 2
Mean Proportion of Correct Source Attributions in Experiment 2 (and Standard Errors of the Mean) As a Function of Predicting Source (Assigned or Unassigned), Accuracy of Prediction (Accurate or Inaccurate), and Delay Condition (5 Min or 1 Week)

		5-Min Delay Condition		1-Week Delay Condition	
Predicting Source	Accuracy of Prediction	*M*	*SE*	*M*	*SE*
Assigned system	Accurate	.65	.03	.57	.04
	Inaccurate	.56	.04	.46	.05
Unassigned system	Accurate	.47	.03	.41	.04
	Inaccurate	.58	.04	.56	.04

desires to win and do not maintain an explicit desire for their competitor to lose. In the present paradigm, the more sensible outcome is, in fact, what we see, an emphasis on the *validate* component of wishful thinking.

Facilitation effect. Because this experiment did not have an other-impact condition, a facilitation effect could be evidenced only as superior memory for predictions made by the assigned system compared with those made by the unassigned system. A 2 (predicting source: assigned or unassigned) × 2 (delay condition: 5 min or 1 week) ANOVA showed a statistically significant main effect of predicting system [$F(1,48) = 5.72$, $MS_e = .03$, $p = .02$, $\eta_p^2 = .11$]. Across delay conditions, participants made more accurate source attributions for predictions made by the assigned system ($M = .56$) than for predictions made by the unassigned system ($M = .51$). Although there was no significant interaction between predicting source and delay condition [$F(1,48) = 1.13$, $MS_e = .03$, $p = .29$, $\eta_p^2 = .02$], we nevertheless proceeded to our planned comparisons. As expected, a significant facilitation effect was observed in the 5-min delay condition [$F(1,24) = 5.85$, $MS_e = .03$, $p = .02$, $\eta_p^2 = .20$]: Participants had higher source accuracy for the assigned ($M = .61$) than for the unassigned ($M = .53$) system. A facilitation effect was not observed in the 1-week delay condition [$F(1,24) < 1$]: Participants had equivalent source accuracy in the assigned ($M = .52$) and in the unassigned ($M = .49$) system. These results indicate that as memory decreases over time, the facilitation effect is attenuated.

Discussion

After the introduction of a delay, a decrease in overall accuracy should result in an increased opportunity for biased memory reconstruction. Therefore, wishful thinking should increase as veridical memory decreases. However, if people are protected against excessive self-relevant source misattributions, wishful thinking may not increase. The results supported this second conclusion. Although the 1-week delay still produced fairly good recognition, the data suggested some memory loss. Still, Experiment 2 revealed no difference in the degree of wishful thinking between a 5-min and a 1-week delay.

Why did wishful thinking not increase? One intriguing possibility is that there is some means by which wishful distortions are kept under control. Given how deeply intertwined memory and behavioral choices are, people could be at serious risk of delusionally guided actions—and the resulting negative consequences—if wishful thinking were to simply rush in and fill the gap left by fading memories. Although wishful thinking may aid affect regulation, its primary advantage may be its relatively easy and rapid application to a situation in which one does not experience having much control. Given a week in which to prepare, participants may use other strategies (e.g., practicing their singing or raising their estimation of their performance skills) to respond to a possible negative outcome. These more effortful strategies have the advantage of being effective even if the participant *is* called on to sing, and so they may become more dominant with decreased time pressure. The greater dominance of these strategies could help to explain why the increased opportunity for wishful thinking as delay increases does not necessarily lead to greater distortion: With delay also comes (at least in the present situation) less need for wishful thinking.

Finally, some of the 11 participants who failed to return for the second session in the 1-week delay condition may have self-selected out of the study because of a fear of singing. This group would likely include those participants with the strongest wishes regarding the relative performance of assigned and unassigned systems. We imagine that our effects would have been even clearer had this not been possible, and we suggest that future work aim to reduce such self-selection opportunities (e.g., by using single-session designs that do not rely on long delays).

GENERAL DISCUSSION

We know from a growing literature that desire-based motivations can profoundly influence cognition, and we also know that it does not take much to produce these sorts of effects. If people read, for example, a one-paragraph description of a mining company that makes it seem to deserve success (or failure), they will systematically distort their memory toward the outcome they desire (Gordon et al., 2005). These types of errors perform a useful role in mood maintenance, helping to maintain comfort and happiness. When we are faced with unpalatable information, we may alter aspects of our perception, memory, or judgment so that they become more consistent with our desires (e.g., Alicke, 1985; Bradley, 1978; Hawkins & Hastie, 1990; McFarland & Alvaro, 2000; Pronin, Lin, & Ross, 2002).

In the present studies, we examined the strength of these desire-based memory distortions in situations that directly affect the rememberer. "Improved" memories can make our pasts seem more pleasant and can increase our feelings of self-esteem and of self-efficacy for future tasks. But despite making us feel better, their inaccuracy makes them potentially problematic for guiding behavior. If the information concerns someone else (the friend with the new house or a fictitious Peruvian mining company, for example), we are not likely to be called on to take any action ourselves, and so our wishful distortions probably would not carry much negative consequence. If, on the other hand, the information concerns ourselves, we face a clearer conflict among psychological goals. On the one hand, the pull toward blissful self-delusion is potentially even stronger than it is for third-person situations. Although we would soon get over a friend's poor house-hunting decision, the stakes are much higher for our own poor decisions, and the motivation to distort memory so we do not have to think about unpleasant information is arguably higher. On the other hand, we rely heavily on personally relevant information in guiding our action choices. So, whether the news is good or bad, it is arguably always a good idea to maintain accurate information in memory.

The present experiments address these conflicting goals of accuracy and emotional comfort when situations relate to oneself. We created a situation in which participants' fates (in the personal-impact condition) or preferred-others' fates (in the other-impact condition) were tied to the relative accuracy of two predictors. Emotional goals would favor distortion of source attributions, whereas accuracy goals would favor improved memory for information relating to oneself and one's fate.

The results of the present work first replicated the findings of Gordon et al. (2005), finding desire-based distortions with the modified paradigm and using real, rather than fictitious, others. When participants were made to dislike a particular competitor, they misremembered the information to be consistent with their desire for that person to lose the competition (i.e., a discredit effect). We then found a complementary wishful thinking effect in the personal-impact condition—that is, a tendency to misremember source to be consistent with their own desire to win (i.e., a validate effect). This effect was found, despite the potentially greater advantages of memory accuracy in situations that have a personal impact on the self.

The wishful thinking effects, and similar distortions in source monitoring, illustrate the way that source decisions are made on the basis of probabilistic—or in this case, irrational—biases in setting the threshold for attributing information to a particular origin. A large body of past research shows that we change our willingness to attribute source on the basis of sensory vividness, cognitive detail, and context (Johnson et al., 1993). The wishful thinking findings demonstrate that we also set these bias thresholds on the basis, in part, of our own desires.

The present findings also demonstrate the strength of the need for affect regulation (Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000). Even when there may be a cost, desire-based distortions occur for information that directly impacts oneself. This may help to explain the sometimes irrational behavior we see when people are facing a negative outcome but cling to irrational judgments, believing, for example, that it was their doctor and not their friend (the real source) who had predicted an easy recovery.

However, a tendency to distort self-relevant memories toward the positive could become dangerous if entirely unchecked, and so a well-adapted memory system should operate in a way that is likely to prevent wishful thinking errors from exceeding an acceptable level. To that end, the classic self-relevance effect comes to the rescue. People had better memory for self-relevant scenarios (i.e., ones from the assigned system that contributed to their own scores) than for scenarios relevant to the competitor's system. No corresponding spike in memory accuracy occurred in the other-impact condition, despite the fact that the materials and task were the same as for the personal-impact condition. So we see that self-relevance effects depend, not merely on self-relevant content, but also on self-relevant processing. And we see that the very information that typically would be used to guide behavior (that is, information associated directly with oneself) is more likely to be actually *remembered*, protecting it (at least to some extent) against wishful distortion.

Self-delusion can have its costs, and self-relevant memory facilitation may not be enough to fully guard against it. Additional reassuring findings, however, come from Experiment 2, where source distortions remain constant even as overall memory accuracy decreases. This is particularly interesting, because source decisions usually do rely more on such biases as direct memory decreases. Here, we find what appears to be a limit on people's long-term reliance on what earlier had been a dominant tendency. Although a reduction in actual memory should increase reliance on reconstructive biases, here we see something quite different. It seems likely that, between the first and second sessions, participants were able to engage in more effortful and flexible affect regulation strategies, reducing their dependence on the wishful thinking bias.

Generalizability of the Findings

The effects here were investigated under admittedly unusual circumstances. Our methodological decisions were made for practical reasons (i.e., to allow comparisons among conditions and to maximize the likelihood of wishful thinking about oneself in a laboratory context). Given the artificiality of our task, it makes sense to consider the degree to which our findings would be expected to generalize outside the lab.

First, was our paradigm unreasonably biased for producing self-relevant wishful thinking effects? We do not think so. Desire-based judgments tend to appear only when people have a reasonable justification for making them, given the available information (Kunda, 1990). So motivated reasoning, and presumably corresponding memory effects, are certainly not guaranteed. But as we saw earlier, there is a diverse literature demonstrating a wide range of self-serving biases in cognition. We do not believe that our paradigm creates an unusually encouraging context for it.

One could argue, however, that one's responses in the present paradigm had no effect on who the winner of the competition would be. So, these experiments avoided what we argue to be the usual reality check on one's wishful distortions. One would be free to maintain a high level of wishful self-delusion, attributing all accurate predictions to one's own system and all inaccurate ones to the competitor's system. It remains to be seen whether a modified paradigm would lead to even stricter boundary effects, but remarkably, there still seemed to be limits on wishful thinking effects under the present circumstances. It is also worth noting that even with the present paradigm, there might be advantages to accuracy. To the extent that they could keep track of their developing score and could calculate that they had high odds (always hovering around 50%) that they would have to sing, participants could prepare themselves for that outcome.

Finally, we emphasize that our findings that the validate effect occurs in personal-impact conditions whereas the discredit effect occurs in other-impact conditions are likely due to the paradigm used in these experiments. It is probably the precise framing of the preferred outcome, rather than whether the preference relates to oneself or others, that dictates how wishful thinking manifests itself. We expect that, given other framings, both validate and discredit effects could be observed in both personal- and other-impact conditions. The covariance that we saw between the validate component and personal-impact conditions should not necessarily generalize to all other situations.

Future Directions

It is possible that wishful thinking stems from a desire for whatever is most *beneficial* to oneself, even under circumstances in which all is well already. Alternatively, if its role is largely in service of affect regulation, the effect may arise out of the experience of concern or stress and may be particularly likely to occur in the presence of a threat (Taylor, 1991). The present studies capitalized on threat, although we have not yet answered whether self-relevant wishful thinking is limited to that sort of circumstance. For instance, imagine that the personal-impact outcome had involved a monetary reward rather than karaoke. It would have been to the participant's benefit to win, although there would have been no specific threat. Would wishful thinking have occurred, and, if so, would the magnitude of the wishful thinking effect be different between these situations? There is some evidence from Gordon et al. (2005) that wishful thinking with regard to fictional others can occur in the absence of a specific threat, but there is still much to explore with respect to the role of affect regulation in driving self-relevant wishful thinking.

With regard to affect regulation, if we are to understand the relationship between affect, affect regulation strategies, wishful thinking, and cognition, we need to develop measures for understanding the scope and nature of each. Future work might test specifically for the presence of effortful affect regulation strategies that people may invoke in situations like those used here, as well as measure changes in the level of desire that may result from their use and the resulting effects on memory and source decisions. Such studies should also seek ways to encourage effective coping strategies *within a single session*, in order to eliminate any possible effects of participant attrition, and ways to examine how people may be protected against runaway wishful thinking under circumstances that are likely to produce poorer memory but that do not involve sufficient time to formulate alternative affect-regulating strategies. That is, compensating affect-regulation strategies may provide one means by which people are protected from runaway wishful thinking, but there may be others.

Conclusion

These findings fit in with the larger literature on desire-based reasoning. Wishful thinking (which supports our desire for pleasant information to come from reliable sources) is one of many tools available for affect regulation, alongside the confirmation bias (which supports our desire to have been right in our judgments) and the tendency to misremember our pasts in ways that improve our self-images. All of these effects together create a possibly unflattering portrait of the human mind: We appear to put a great many resources, and a great deal of flexibility, into the goal of thinking well of ourselves and the world at large, even at the cost of inaccuracy. However, our results also provide reason to believe that there are limits on this biased optimism.

We rely on our memories to predict future developments, to guide our future actions, and to help us maintain an optimistic view of what is to come. These needs give us conflicting goals of accuracy (which improves the database guiding our decisions) and distortion (which improves our worldview and self-image). The present study demonstrates how both of these goals can operate in parallel and how the former can, under the right circumstances, limit the latter. Wishful thinking does appear to influence source monitoring, even when the resulting errors might cause one to misjudge one's own fate.

AUTHOR NOTE

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NOTES

1. We borrowed this technique from Balcetis and Dunning (2006), who previously demonstrated its effectiveness in inducing self-relevant desires, and we thank them for their guidance in using it.

2. At the end of the experiment, participants in the other-impact condition were asked explicitly, "While you were completing the study, did you want one of the computer systems to win? If so, which system did you want to win?" Counter to our expectations, many participants an-

swered "no" in response to this question (M = .64). Rather than exclude all of these participants, we excluded only those who expressed an explicit preference for the rude competitor's system to win. Although it may be desirable for future studies to include a different preference manipulation to obtain stronger explicit preferences, we note that the present manipulation produced preference-driven source attributions. We also note that these responses support our initial claims that desires would be stronger in the personal-impact condition (since an analogous pattern was not observed there).

3. We thank Chad Dodson for suggesting this.

4. We thank our reviewers for the observation that there are multiple ways that a facilitation effect could be conceptualized in this experiment.

APPENDIX

Examples of Prediction

Currently, whenever a profane word is used, it is replaced with a phrase the moderators have found more acceptable (e.g., "gosh darn" or "doodoo"). The Cosmopolis Free Speech Group (CFSG) is an organization that campaigns for the abolition of speech censorship within the virtual community. System A predicts that a compromise will be reached so that profanity will be allowed within private locations.

The Cosmopolian lottery allows its grand prize winners to choose either to take the full amount spread out in incremental payments over many years, or a smaller lump sum immediately. Grand prize lotteries are held once a month, and there is always a single winner. System B predicts that over the 6 months that follow, 5 of the 6 winners will choose the lump sum and 1 will choose the incremental payments.

Examples of Predictions and Outcomes With Source Information Removed

Prediction Originally Made by System A That Was Correct

Currently, whenever a profane word is used, it is replaced with a phrase the moderators have found more acceptable (e.g., "gosh darn" or "doodoo"). The Cosmopolis Free Speech Group (CFSG) is an organization that campaigns for the abolition of speech censorship within the virtual community. * predicts that a compromise will be reached so that profanity will be allowed within private locations.

A law was passed within the month following the prediction that allows for complete freedom of speech in private locations.

Prediction was right.

Prediction Originally Made by System B That Was Incorrect

The Cosmopolian lottery allows its grand prize winners to choose either to take the full amount spread out in incremental payments over many years, or a smaller lump sum immediately. Grand prize lotteries are held once a month, and there is always a single winner. * predicts that over the 6 months that followed, 5 of the 6 winners would choose the lump sum and 1 would choose the incremental payments.

Only 4 of the 6 winners chose the lump sum (and 2 chose the incremental payments).

Prediction was wrong.

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