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FlashReport

The ambivalent mind can be a wise mind: Emotional ambivalence increases judgment accuracy

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HIGHLIGHTS

- Emotional ambivalence v. single-valence affect leads to more accurate judgment.
- Ambivalence boosts accuracy by increasing receptivity to alternative perspectives.
- Ambivalence improves decision making accuracy across divergent estimation tasks.

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ABSTRACT

This article provides evidence that *emotional ambivalence*, the simultaneous experience of positive and negative emotions, improves judgment accuracy. Two experiments demonstrate that individuals experiencing emotional ambivalence are more accurate in weather temperature forecasts (Experiment 1) and estimation tasks (Experiment 2) than are those experiencing happiness or sadness. Experiment 3a provides suggestive evidence that emotional ambivalence increases individuals' receptivity to alternative perspectives. Experiment 3b provides evidence for the full model: ambivalence increases estimation accuracy by increasing receptivity to alternative perspectives. The experience of ambivalence may be an important tool for encouraging greater receptivity to and consideration of alternative perspectives, and thus greater accuracy in judgments.

Introduction

Whether one is estimating where to launch a product, making important financial predictions, or simply trying to forecast if it will rain on one's wedding day, the desire to increase the accuracy of estimates and forecasts appears ubiquitous. Prior research suggests that forecasts and estimates can be made more reliable (i.e., accurate) by encouraging individuals to view the estimation task through contrasting lenses. For instance, when individuals are encouraged to make an estimate and then consider "the opposite" of their initial estimate (e.g., Larrick & Soll, 2006; Lord, Lepper, & Preston, 1984), or to consider others' perspectives (e.g. See, Morrison, Rothman, & Soll, 2011), their accuracy improves. This article provides new insights into how psychological states might encourage individuals to consider alternative perspectives, and in turn achieve greater accuracy. In particular, we describe a series of experiments that examine how emotional ambivalence—the simultaneous experience of positive and negative emotions (Fong, 2006; Larsen, McGraw, & Cacioppo, 2001)—increases accuracy by increasing receptivity to alternative perspectives.

Past findings on judgment accuracy

A growing body of research has shown that by considering alternative perspectives individuals are able to improve the accuracy of their forecasts and estimates. For example, accuracy is improved by thinking about a problem dialectically, that is, by thinking "on the one hand" and then "on the other hand" (Nisbett, Peng, Choi, & Norenzayan, 2001), or by considering the opposite, such as why one's initial judgment might be wrong (Herzog & Hertwig, 2009; Lord et al., 1984). Forming a judgment based on multiple, diverse perspectives can increase accuracy by increasing the diversity of information considered when forming the judgment, and thus allowing for statistically independent errors across multiple perspectives to be cancelled out (Larrick & Soll, 2006), even when the multiple perspectives come from the same person (Herzog & Hertwig, 2009; Vul & Pashler, 2008). Similarly, averaging one's initial estimate with estimates made by *others* is also an effective strategy for increasing accuracy (Gino & Schweitzer, 2008). Ignoring or heavily discounting estimates made by others, however, reduces this fundamental benefit of averaging, resulting in lower accuracy (Mannes, 2009; Soll & Larrick, 2009; Yaniv, 2004). Thus, psychological states that increase discounting of alternative perspectives, like feelings of power (See et al., 2011), are likely to reduce accuracy, and psychological states that increase receptivity to alternative perspectives are likely to increase accuracy. We propose that the psychological state of emotional

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ambivalence increases accuracy because it increases individuals' receptivity to alternative perspectives.

In the psychological literature, emotional ambivalence is distinct from its lay connotation as indifference, or the lack of strong emotional reactions. Rather, ambivalence is conceptualized as the experience of strong emotions that pull people in different directions simultaneously. Despite the prevalence of ambivalence (Larsen et al., 2001; Williams & Aaker, 2002), much remains unknown about how, if at all, ambivalence influences judgments. The experiments reported in this article advance our understanding of how emotional ambivalence influences estimations and accuracy by examining its effect on accuracy and a psychological process underlying this effect.

Past findings on affect, emotional ambivalence, and cognition

A rich literature from a variety of disciplines reveals pervasive causal influences of emotion on cognition. For example, affect has been shown to influence individuals' depth of cognitive processing (Schwarz, 2002), as well as thinking style (Ashton-James, Maddux, Galinsky, & Chartrand, 2009). Schwarz and Clore's (1983) *affect-as information* model suggests that specific emotional experiences inform people about the current state of their world and their standing in it (Roseman, 1984), thereby alerting people to the effectiveness of their current thinking and behavior (Schwarz & Clore, 2007). By doing so, emotions motivate people to think and behave in ways that help them adapt to their environment and enhance their potential to survive and thrive (Forgas, 2000; Izard & Tomkins, 1966; Mowrer, 1960; Schwarz & Clore, 1988; Smith & Lazarus, 1990). For instance, people interpret negative affect (e.g., sadness) as a signal that the situation is in some way problematic, and so they react to this signal by engaging in more careful, systematic, and deep information processing (Gasper & Clore, 2002; George & Zhou, 2002; Martin, Ward, Achee, & Wyer, 1993). Alternatively, people interpret positive affect (e.g., happiness) as a signal that their environment is safe and respond to this signal by being more playful and engaging in more heuristic cognitive processing (DeDreu, Baas, & Nijstad, 2008; Fredrickson, 2001). Together, this body of research has established that people in different affective states tend to think in different ways, thereby arriving at different decisions.

Research on the influence of emotional ambivalence on cognitive processing, however, has been more limited. The work that has been done thus far has primarily focused on the conditions that elicit emotional ambivalence (for exceptions see Fong, 2006; Rothman, 2011). This work demonstrates that ambivalence is often triggered by emotionally complex situations. For example, individuals can feel both happiness and sadness simultaneously when reflecting upon shifts in life stages (e.g., college graduation day), or when witnessing acts of humanity in the context of horror (e.g., while watching the film *Life is Beautiful*, a tragic comedy set in World War II; Larsen et al., 2001; Williams & Aaker, 2002).

A few notable studies investigating the effects of ambivalence on cognition do suggest that emotional ambivalence (Fong, 2006) as well as the broader notion of mind–body dissonance (Huang & Galinsky, 2011) lead individuals to see the world in new ways, for instance by expanding their cognitive categories. For example, Huang and Galinsky (2011) demonstrate that when bodily displayed affective expressions are dissonant with mentally experienced affective states (e.g., smiling while thinking about a negative event), individuals are more likely to embrace atypical exemplars of a category. A camel (an atypical example of a vehicle for many), for instance, is rated as more prototypical of a vehicle when individuals are experiencing mind–body dissonance than when they are experiencing mind–body coherence. As these authors argue, mind–body dissonance signals that the environment is dissonant or atypical, that a change in one's approach towards the environment is necessary, and that cognitive boundaries should be expanded—for instance by considering additional alternatives. Similarly, when individuals experience emotional ambivalence, an emotional state characterized by dissonance between a positive and a negative emotion, they are able to identify associations between words that are not normally associated, compared to when individuals experience happiness or sadness alone (Fong, 2006). Relative to happy or sad individuals (who do not differ from one another), ambivalent individuals score higher on the Remote Associates Task, a task that measures cognitive associative ability (RAT; Mednick, 1962).

Emotional ambivalence and judgment accuracy

Informed by this prior work on ambivalence and psychologically dissonant states, in this article we focus on whether ambivalent individuals are more accurate when making estimates, relative to happy or sad individuals. For example, for ambivalent individuals, the simultaneous experience of happiness and sadness should signal that the environment is both safe (based on feelings of happiness) and problematic (based on feelings of sadness) (Schwarz, 2002). Such complex and dissonant signals should suggest that a change in one's approach towards the environment is necessary, and that cognitive boundaries should be expanded—for instance by considering a broader set of alternatives. For example, emotionally ambivalent individuals may be more likely to consider a problem from alternative perspectives by thinking dialectically (Nisbett et al., 2001), or by considering the opposite before making a judgment (Lord et al., 1984). Similarly, ambivalent individuals may also consider alternative perspectives provided by others (Gino, Brooks, & Schweitzer, 2012; Gino & Moore, 2007; Harvey & Fischer, 1997; See et al., 2011). Thus, ambivalence may facilitate receptivity to alternative perspectives, thereby increasing accuracy in judgments.

It is important to note that the relative advantage we predict ambivalence to have over single affective states on judgment accuracy may be weaker when ambivalence is compared to sadness versus happiness. A number of studies suggest that, at least for some types of tasks, sadness increases accuracy relative to happiness (e.g., Sinclair & Mark, 1995; but see Ambady & Gray, 2002). The relative advantage of sadness over happiness appears to be due to the increase in focused, deep information processing by individuals feeling sad (Martin et al., 1993). Thus, for example, when estimating correlation coefficients from scatter plots, sad participants more carefully process information in the visual field, thus increasing their accuracy on this task (Sinclair & Mark, 1995). Considering how sadness tends to elicit cognitive processing that is narrower in scope (Gasper & Clore, 2002; Storbeck & Clore, 2005), however, it is less clear whether sadness would improve accuracy on tasks that benefit from increased receptivity to alternative perspectives. It remains an empirical question whether the boost sadness often provides over happiness on some measures of performance will emerge for the types of forecasting and estimation tasks explored in the present article. Regardless, the goal of this article is to shed light on the benefits of ambivalence for judgment accuracy, through the positive influence of ambivalence (v. sadness or happiness) on receptivity to alternative perspectives.

Specifically, we hypothesize that relative to less complex, single-affect psychological states (e.g., only happiness or only sadness), the experience of emotional ambivalence increases individuals' receptivity to alternative perspectives. In turn, such receptivity to alternative perspectives will improve ambivalent individuals' estimation accuracy.

Overview of studies

Four experiments examine evidence that emotional ambivalence increases judgment accuracy. Given prior work showing that an affect-*less* state is not found among normal populations (Damasio, 1995), the influence of emotional ambivalence was compared to the influence of single-valence affective states. While numerous potential combinations of conflicting emotions are plausible—for example, feeling both frustration and hope while searching for a new job—our studies focus on the form of emotional ambivalence most well understood in the

ambivalence literature: that is, feeling both happy and sad at the same time (Larsen et al., 2001; Williams & Aaker, 2002).

To test our hypotheses, we used multiple types of estimation tasks. Experiments 1 and 2 examine the causal link between emotional ambivalence and increased accuracy. Experiment 3a examines whether emotional ambivalence increases receptivity to alternative perspectives—measured as requests for more types of information. Experiment 3b tests the full model in which emotional ambivalence increases accuracy in estimates through an increase in receptivity to alternative perspectives.

Experiment 1: the effect of emotional ambivalence on weather temperature forecast accuracy

Experiment 1 examines the effect of ambivalence on participants' accuracy in the context of estimating future weather temperatures for a variety of US cities.

Method

Participants and procedure

Seventy-six participants (26 males, 50 females; *M*age = 31.97), from a national online paid participant survey (Buhrmester, Kwang, & Gosling, 2011), were assigned to one of three affective priming conditions: positive (happy), negative (sad), or ambivalent (simultaneously happy and sad), in which they were asked to write about a time when they felt the respective affective state (cf., Ashton-James et al., 2009). In an ostensibly unrelated task, participants were then asked to provide their best estimate for the average daily temperature in eight major, geographically varied US cities (New York, Atlanta, San Francisco, Philadelphia, Houston, Seattle, Chicago, and Denver) two weeks from the time of the study. Finally, as a manipulation check, participants rated their happiness and sadness (1 = not at all; 10 = extremely).

Results and discussion

Emotion manipulation check

Manipulation check analyses confirmed that participants in the happy condition felt happier ($M = 8.71$, $SD = 0.76$) than participants in the sad condition ($M = 3.73$, $SD = 1.59$), $t(52) = -14.86$, $p < 0.01$, and that participants in the sad condition felt sadder ($M = 6.65$, $SD = 1.33$) than participants in the happy condition ($M = 1.07$, $SD = 0.26$), $t(52) = 21.85$, $p < 0.01$. Participants in the ambivalent condition fell in-between on both happiness and sadness, and reported feeling both happiness and sadness: (happiness: $M = 5.18$, $SD = 1.71$; sadness: $M = 4.14$, $SD = 1.73$). Ambivalent participants were also more happy than the participants in the sad condition, $t(46) = 3.05$, $p < 0.01$, and more sad than participants in the happy condition, $t(48) = 9.28$, $p < 0.01$. Further, a paired sample t-test within the ambivalent condition showed no significant differences between happiness and sadness ratings for ambivalent participants, $t(21) = 1.74$, $p = 0.10$.

Judgment accuracy

All forecasts were converted to degrees Fahrenheit and average individual squared errors were calculated across the eight forecasts. If a participant forecasted 88 °F and the actual temperature for that city was 85 °F, the squared error for that forecast would be nine. Squared errors were then averaged across the eight cities for each participant. The omnibus ANOVA main effect was marginally significant, $F(2, 73) = 2.53$, $p = 0.09$. As hypothesized, forecasts made by participants experiencing emotional ambivalence had lower average squared errors ($M = 116.00$, $SD = 55.25$) compared to forecasts made by participants in the happy state ($M = 160.86$, $SD = 93.20$), $t(48) = -2.00$, $p = 0.05$, or the sad state ($M = 159.87$, $SD = 76.35$), $t(46) = -2.24$, $p = 0.03$, who did not differ from each other, $t(52) = -0.04$, $p = 0.97$ (see Fig. 1).

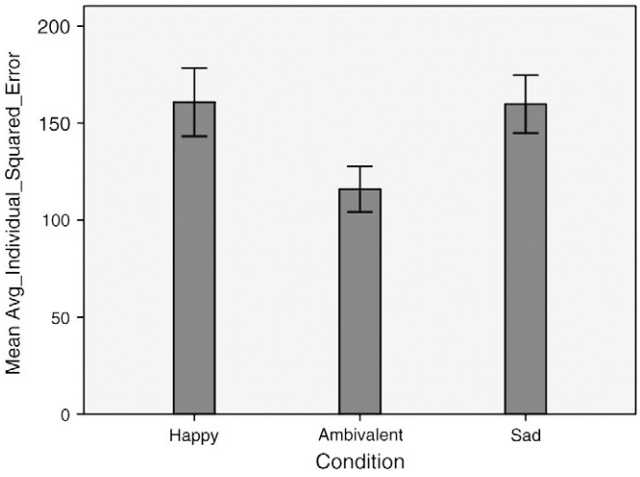

Fig. 1. Forecasting error for future average daily temperatures across cities as a function of condition as happy, sad, or ambivalent (Study 1). Error bars show standard errors.

These results support our hypothesis that the experience of ambivalence improves accuracy in forecasting weather temperatures relative to the experience of happiness or sadness.

Experiment 2: the effect of emotional ambivalence on general knowledge accuracy

Experiment 2 provides a replication test of Experiment 1 but moves from examining the effect of ambivalence on accuracy in weather temperature forecasts to examining accuracy in the types of general knowledge estimates assessed in prior dialectical bootstrapping studies (e.g., Herzog & Hertwig, 2009).

Method

Participants and procedure

Four hundred participants (256 males, 135 females, 4 unspecified; *M* age = 19.14) completed the affect priming instructions used in Experiment 1 and, in an ostensibly unrelated task, were then asked to provide best estimates for a seven-item trivia task on general knowledge facts (cf., Soll & Klayman, 2004; Yaniv & Milyavsky, 2007). Specifically, participants were asked to estimate four historical events (e.g., in what year was Margaret Thatcher first elected Prime Minister?) and three facts relevant to their university campus (e.g., what percentage of the 2010 undergraduate freshman student body can be considered minorities?).

Results and discussion

Emotion manipulation check

Two research assistants, blind to condition, coded responses to the affect manipulation, particularly for affect words related to happiness, sadness, and the co-occurrence of happiness and sadness (inter-rater agreement, Cohen's $\kappa = .854$, $p < 0.01$). Analyses indicated the manipulation was successful. One-hundred percent of words written in the positive affect condition had a positive valence and one-hundred percent of words written in the negative affect condition had a negative valence. Words written by each participant in the emotional ambivalence condition contained both positively and negatively valenced words. Moreover, although ambivalent individuals wrote the most about their life event in terms of the number of words they used (ambivalence: $M = 139.53$, $SD = 78.66$; happiness: $M = 112.94$, $SD = 60.64$; sadness: $M = 128.57$, $SD = 71.37$), this effect was not significant for both contrasts. That is, ambivalent individuals wrote significantly more than happy individuals but did not write significantly more than sad individuals (ambivalence v. happiness: $t(260) = 3.07$, $p < 0.01$; v. sadness: $t(265) = 1.19$,

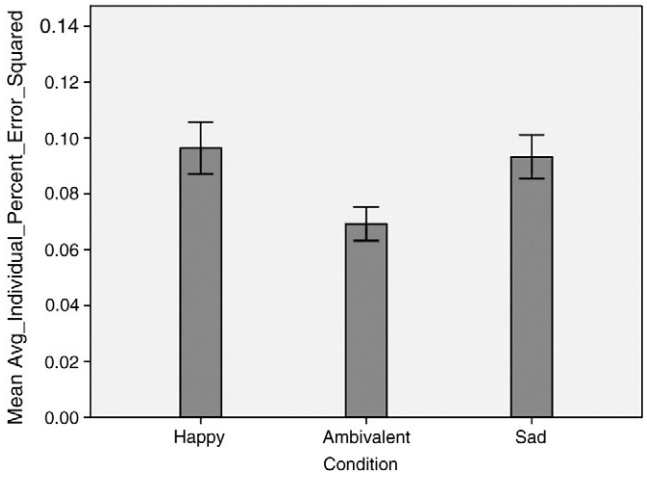

Fig. 2. Forecasting error for participant's estimates of general knowledge questions as a function of condition as happy, sad, or ambivalent (Study 2). Error bars show standard errors.

$p = 0.23$). Further, sad individuals also wrote significantly more than happy individuals, $t(269) = 1.94$, $p = 0.05$. Overall, given the lack of consistent and significant differences in word counts across conditions, we do not consider this variable further in the analyses described below.[1]

Judgment accuracy

Average percentage individual squared errors were calculated across the seven general knowledge questions. Using percentage squared errors in this case also allowed us to include estimates using different units (e.g., years for some questions, percentages for others). Ten participants were excluded for incomplete or invalid responses. The omnibus ANOVA main effect was significant, $F(2, 387) = 3.49$, $p = 0.03$. As hypothesized, and consistent with forecasts made in Experiment 1, estimates made by participants experiencing emotional ambivalence had lower average percentage individual squared errors ($M = 6.93\%$, $SD = 6.77\%$) compared to estimates made by participants in either the happy state ($M = 9.65\%$, $SD = 10.59\%$), $t(254) = -2.43$, $p = 0.02$, or the sad state ($M = 9.33\%$, $SD = 9.04\%$), $t(257) = -2.40$, $p = 0.02$. Participants in the happy and sad conditions did not differ from each other, $t(263) = -0.26$, $p = 0.79$ (see Fig. 2).

Consistent with the pattern of results found in Experiment 1, these data provide additional evidence that the experience of ambivalence improves accuracy in estimates compared to the experience of a single-affect state. Specifically, results in Experiment 2 show higher accuracy across multiple categories of general knowledge (historical and local-knowledge facts) among those experiencing ambivalence compared to those experiencing happiness or sadness alone.

Experiment 3a: the effect of emotional ambivalence on receptivity to alternative perspectives

The goal of Experiment 3a was to directly test the proposed underlying mechanism linking ambivalence to accuracy. Specifically, emotional ambivalence was expected to increase receptivity to alternative perspectives prior to forming a judgment. In this experiment, receptivity was measured by whether participants were receptive to diverse perspectives (e.g., positive and negative judgments) when evaluating the merits of an employee up for promotion.

[1] Given the inconsistent pattern of results in word counts, we also analyzed the time participants took in our first two studies as a potential alternative mechanism but found no reliable differences or evidence that ambivalent individuals took more time to make a final decision. Further, in Experiment 3b we included time measurements throughout the study to directly test this idea. In this study we also find no empirical evidence that ambivalent individuals are slower to make estimates.

Method

Participants and procedure

Fifty three (53) participants (37 males, 16 females; M age = 20.72) were randomly assigned to one of three affective priming conditions: positive (happy), negative (sad), or ambivalent (simultaneously happy and sad). Participants received extra-credit in a university course for their participation. Participants were told that the study was about how people make decisions and that they would be asked to imagine themselves in a situation in which they were reviewing a promotion candidate and reporting what type of information they would consider as the basis for their decision. It was further noted that, "unfortunately, due to time and resource limitations, it is never possible to thoroughly review every bit of information available before making decisions. This means that decision makers must rely on their gut reactions to assist them in narrowing what information to use. In this study, we ask that you imagine yourself in such a situation."

Affect manipulation

Happy, sad, and ambivalent affective states were manipulated by asking participants to imagine they were a supervisor and had been asked by the Human Resources Department to evaluate a candidate whom they knew professionally for a promotion. They were then told to close their eyes and picture this situation and the candidate. In the sad condition participants were asked imagine that this candidate's performance makes them feel "extremely sad. In other words, you are feeling down and depressed about this candidate." In the happy condition, participants were asked to imagine that this candidate's performance makes them feel "extremely happy. In other words, you are feeling excited and enthusiastic about this candidate." In the ambivalent condition, participants were asked to imagine that "some aspects of this candidate's performance make you feel extremely happy, while at the same time, other aspects make you feel extremely sad. In other words, you are feeling mixed (simultaneously positive and negative) about this candidate." Participants were told that they could continue to the next page once they thought about this situation enough that they truly felt the emotion noted.[2]

Measures

Manipulation checks

The affect manipulations were verified by asking participants the extent to which they felt happy, sad, or had mixed feelings (respectively) towards the candidate they were reviewing.

Receptivity to alternative perspectives

We measure receptivity to alternative perspectives by having participants rate the extent to which they wanted to review both positive and negative information about the promotion candidate, rather than just positive or just negative information. Participants indicated how likely they would be to: "seek positive feedback about the candidate" (1 = strongly disagree, 10 = strongly agree) and "seek negative feedback about the candidate" (1 = strongly disagree, 10 = strongly agree).

[2] In this article, we focus on the influence of incidental emotions in Experiments 1, 2, and 3b, and incorporate integral emotions in Experiment 3a. The emotions literature distinguishes between integral emotions, emotions triggered by the current situation, and incidental emotions, emotions triggered by a prior, unrelated experience (Lerner & Keltner, 2001). Integral emotions are likely to exert a stronger influence on advice consideration and accuracy than incidental emotion because integral emotions are generated from the decision context itself and are more likely than incidental emotions to be infused into the decision process. Our main focus on incidental emotions in three of our four experiments, therefore, serves as a more conservative test of the role of emotions on advice consideration and accuracy. However, we find the proposed effects replicate with both incidental and integral emotions. Future research should explore the boundary conditions and potential differential effects of incidental v. integral emotions across various decision-making contexts.

Results

Emotion manipulation check

Manipulation check analyses confirmed that participants in the happy condition reported feeling more happy ($M = 7.71$, $SD = 1.33$) than participants in the sad condition ($M = 2.67$, $SD = 1.37$), $t(35) = -11.37$, $p < 0.01$, or ambivalent condition ($M = 6.59$, $SD = 1.38$), $t(33) = -2.44$, $p = 0.02$. Participants in the sad condition reported feeling more sad ($M = 7.39$, $SD = 1.24$) than participants in the happy condition ($M = 1.63$, $SD = 1.38$), $t(35) = -13.29$, $p < 0.01$, or ambivalent condition ($M = 4.31$, $SD = 1.62$), $t(32) = -6.25$, $p < 0.01$. Finally, participants in the ambivalent condition reported feeling more mixed feelings ($M = 6.88$, $SD = 2.33$) than participants in the happy condition ($M = 3.00$, $SD = 2.05$), $t(33) = -5.22$, $p < 0.01$, or sad condition ($M = 4.94$, $SD = 2.04$), $t(32) = -2.57$, $p = 0.02$.

Receptivity to alternative perspectives

A mixed-model analysis of variance (ANOVA) with affect prime condition as a between-subject factor and the positive feedback and negative feedback questions as within-subject factors revealed a main effect for affect prime condition, $F(1, 50) = 13.28$; $p < 0.01$. As hypothesized, there was a significant interaction effect, $F(1, 50) = 13.71$, $p < 0.01$. This interaction revealed that ambivalent participants were equally likely to seek positive feedback ($M = 7.88$, $SD = 1.36$) and negative feedback ($M = 7.44$, $SD = 1.75$), $t(15) = 1.16$, $p = 0.26$, whereas happy participants were more likely to seek positive feedback ($M = 6.79$, $SD = 1.72$) than negative feedback ($M = 4.05$, $SD = 2.34$), $t(18) = 4.92$, $p < 0.01$. Sad participants showed a non-significant tendency to be more likely to seek negative feedback ($M = 5.89$, $SD = 1.68$) than positive feedback ($M = 5.00$, $SD = 1.68$), $t(17) = 1.66$, $p = 0.12$.

These results provide suggestive evidence that ambivalence increases receptivity to alternative perspectives—in this case, seeking both positive and negative information about a promotion candidate—compared to happiness, though the effect appeared less strong when compared to sadness. Experiment 3b extends this finding to test the full theorized model: Emotional ambivalence increases accuracy by increasing receptivity to alternative perspectives.

Experiment 3b: receptivity to alternative perspectives as mediator

Experiment 3b tested the proposed psychological process linking emotional ambivalence to estimation accuracy. Specifically, after inducing one of the three affective states, we assessed participants' receptivity to alternative perspectives (e.g., others' estimates) about college tuitions, and then calculated participants' accuracy on university tuition estimations.

Method

Participants and procedure

Six hundred fifty-eight participants (325 males, 332 females, 1 opting not to report gender; M age = 31.34) completed the affect priming instructions used in Experiments 1 and 2 and, in an ostensibly unrelated task, were then asked to provide best estimates for college tuitions (See et al., 2011). Participants read on the computer screen that they would be estimating tuitions for seven US universities as reported by a recent edition of the US News and World Report. Ten participants were eliminated from the study at this point for failing a basic attention check question following the instructions screen: "this study is about tuition estimation" (true/false). All participants were asked about the same mix of seven public and private universities, which appeared on the computer screen one at a time in an order that was randomized for each participant within the computer program. Participants provided their tuition estimate, in dollars, for each school before they could proceed to the next screen and school. Participants read that they would later review their initial tuition estimates and have the opportunity to change them if they wished.

Alternative perspectives

We predicted that ambivalent participants would be more likely to consider alternative perspectives before making a final estimate or forecast. Thus, to provide an explicit opportunity for participants to consider alternative perspectives, participants were told that, for each school, they would be allowed to view the estimate provided by between 0 and 5 other students who had recently participated in the same study (hereafter referred to as the "peer advisors"). The answers from the peer advisors were randomly selected from an external file comprised of answers from pre-test participants who were all current university students.[3] Thus, the advice was realistic and varied in quality. This also provided a precise behavioral measure of receptivity to alternative perspectives.

Revised estimates

Following completion of the seven initial estimates, each of the universities reappeared, one screen at a time, in randomized order. For each school, the participant's initial estimate appeared on the screen, and participants were asked if they wanted to view advice from a peer advisor (yes/no). If they clicked "no," participants typed in their final answer before proceeding to the next screen and school. If they clicked "yes," they would see the peer advice before typing in their final answer. They could consider the estimates of up to five peer advisors before making their final estimate. Participants followed this procedure until they had indicated their final estimates for all seven universities.

Manipulation check

At the conclusion of the study, we asked participants to think back to the beginning of the study in which they were asked to write about a time in which they felt a specific emotion, and to indicate the extent to which they felt various emotions, including: happy, positive, or pleased; sad, negative, or displeased; and mixed feelings, both positive and negative on a scale from 1 = not at all to 10 = extremely. Participants then answered demographic questions and were debriefed on the final screen of the study.

Mediator: receptivity to advice

Consistent with prior research in the advice-taking literature, we used the average "weight on advice" (WOA) measure to assess participants' receptivity to advice. This measure gauges the extent to which participants revise their estimates in the direction of the peer advisor's estimate (Harvey & Fischer, 1997; Yaniv & Foster, 1997). The WOA measure ranges from zero, which indicates that the advice has no impact on the individual's final estimate, to one, which indicates that the final estimate is equal to the advice. The WOA measure is computed as follows: WOA = |final estimate − initial estimate|/|average peer advice seen − initial estimate|. Following prior studies (e.g., Gino & Schweitzer, 2008), we calculated WOA for each participant and for each school as the proportionate shift in the final estimate away from the initial estimate and towards the peer advice. Participants' weights on advice for each school were then averaged to create the receptivity variable. Further, to remain consistent with prior research (e.g., See et al., 2011), if receptivity fell outside 0 or 1 for any school, we truncated this value to the closer of these two bounds, so that all values fell between 0 and 1. While using non-truncated values did not alter the pattern of results we found, we used truncated values to follow standard procedure in this paradigm as well as to simplify interpretation of the results. Thus the closer to 1 the receptivity value, the more a participant was receptive to the peer advice and incorporated it into his final estimate.

Dependent variable: final accuracy

Following previous research using this paradigm (e.g., See et al., 2011; Soll & Larrick, 2009), overall final error was computed for each participant as the mean absolute deviation (MAD) in dollars between

[3] We thank See and her colleagues for sharing these data (See et al., 2011).

participants' final answers and the true answers. A participant with a MAD score of 5000, for example, would have been on average $5000 off in his estimations of tuition. Lower MAD numbers for final estimates (lower error) thus directly correspond to greater accuracy, and vice versa.

Covariates

We first report all results with no covariates. However, for our analyses on accuracy, we remained consistent with prior studies that have used this tuition-estimation paradigm (Gino & Schweitzer, 2008; Yaniv, 2004) and also controlled for characteristics unique to the decision context itself and domain-specific knowledge: participants' average initial error prior to considering others' perspectives, student status (0 if not a current student, 1 if a current student; $M=0.43$, $SD=0.50$), level of education (1 = high school degree to 6 = professional or doctoral degree; $M=3.17$, $SD=1.29$), and average familiarity with the seven universities in our study (1 = not at all familiar, I had never heard of the school; 7 = extremely familiar; $M=3.35$, $SD=1.13$). Three individuals reported that they had not completed high school and were excluded from further analyses considering the nature of our estimation tasks (i.e., college tuitions).

Results and discussion

Emotion manipulation check

Only six of the 658 participants (2.9%) failed the manipulation check and were removed from further analyses. Including these participants, however, did not change the overall pattern of results. Manipulation check analyses confirmed that participants in the happy condition felt happier ($M=8.34$, $SD=1.76$) than participants in the sad condition ($M=2.70$, $SD=2.31$), $t(426)=28.44$, $p<0.01$, and that participants in the sad condition felt sadder ($M=7.19$, $SD=2.75$) than participants in the happy condition ($M=1.82$, $SD=1.28$), $t(426)=25.82$, $p<0.01$. Ambivalent participants were more happy ($M=6.31$, $SD=2.27$) than participants in the sad condition, $t(425)=16.33$, $p<0.01$, and more sad ($M=5.42$, $SD=2.44$) than participants in the happy condition, $t(421)=18.97$, $p<0.01$. Further, ambivalent participants reported feeling more mixed emotions ($M=7.22$, $SD=2.56$) than did either happy ($M=2.78$, $SD=2.20$), $t(421)=19.14$, $p<0.01$, or sad participants ($M=3.95$, $SD=2.61$), $t(425)=13.03$, $p<0.01$.

Main effects

Receptivity to alternative perspectives

ANOVA revealed a significant main effect of emotion condition on receptivity to alternative perspectives, $F(2, 636)=6.36$, $p<0.01$. Participants in the ambivalent condition were significantly more receptive to alternative perspectives ($M=0.38$, $SD=0.25$) than participants in the happy condition ($M=0.31$, $SD=0.23$), $t(421)=-3.39$, $p<0.01$, and than participants in the sad condition ($M=0.32$, $SD=0.22$), $t(425)=-2.61$, $p=0.01$. Participants in the happy and sad conditions were not significantly different from one another in their receptivity to alternative perspectives, $t(426)=-0.78$, $p=0.43$. Given that the happy and sad conditions did not differ from one another, we collapsed these conditions and found a significant effect of emotional ambivalence on receptivity to alternative perspectives, $F(1, 637)=12.11$, $p<0.01$.[4]

Final judgment accuracy

We first ran an ANOVA of the main effect of emotion condition on final estimate error without any control variables. This ANOVA revealed a significant main effect of emotion condition on final error, $F(2, 636)=2.99$, $p=0.05$. Once we controlled for factors unique to the decision context itself (e.g., MAD initial) and factors related to the participants' knowledge related to the task (e.g., familiarity with the universities), the ANOVA of emotion condition on final estimate error remained significant, $F(2, 632)=5.11$, $p=0.01$. Participants' initial estimate error was the only covariate significantly related to the final estimate error (MAD scores - mean absolute deviation from true answer), $F(1, 632)=277.71$, $p<0.01$. Consistent with our hypothesis, the ambivalent condition had lower MAD scores ($M=9{,}245.71$, $SD=3{,}266.08$) than did the happy condition ($M=10{,}464.48$, $SD=6941.20$), $t(421)=3.19$, $p<0.01$. The ambivalent condition showed a tendency to have lower MAD scores than did the sad condition ($M=10{,}083.90$, $SD=4875.17$), $t(425)=1.74$, $p=0.08$, though this effect did not reach statistical significance. However, given that participants in the happy and sad conditions were not significantly different from one another on MAD scores, $t(426)=1.47$, $p=0.14$, we combined these conditions to compare with the ambivalent condition and found a significant effect of emotion condition on final MAD scores, $F(1, 633)=8.05$, $p=0.01$. Participants in the ambivalent condition had lower MAD scores ($M=9245.71$, $SD=3266.08$) than participants in the single affective state conditions ($M=10{,}272.41$, $SD=5984.27$).[5]

Initial judgment accuracy

Although we only gave participants the explicit opportunity to consider alternative perspectives (in the form of peer advice) before making their final estimates, and not before making initial estimates, we also examined the effect for emotional ambivalence on initial estimate accuracy. The ANOVA of emotion condition on initial estimate error, both excluding and including covariates, failed to reach statistical significance (excluding covariates: $F(2, 636)=0.25$, $p=0.78$; including covariates: $F(2, 633)=0.09$, $p=0.91$). While this specific analysis did not mirror certain findings in Experiments 1 and 2, this could reflect a key difference in the type of estimations participants faced. Specifically, estimating historical private and public (in- and out-of-state) university tuition rates (four years old) for participants that had a range of exposure to these rates was plausibly a more difficult task compared to the more familiar estimation tasks used in Experiment 1 (forecasting weather temperatures) and in Experiment 2 (estimating common knowledge and local trivia questions). Thus in this study receptivity and use of external alternative perspectives (i.e., tuition estimates from actual students) may have been especially helpful in reaching more accurate final estimations. This, of course, is only a tentative explanation. At least partial support for this interpretation would require evidence that accuracy increases when greater weight is placed on advice from others in making final judgments. To examine such evidence, next we directly tested the hypothesized full model whereby the relationship between emotional ambivalence and accuracy is mediated by receptivity to alternative perspectives.

Mediation effects

We used bias-corrected bootstrapping for estimating indirect effects (Preacher & Hayes, 2008). We performed this analysis by drawing

[4] Participant's emotion was dummy coded for this and further relevant analyses as 1 for ambivalent and 0 for happy and sad.

[5] An alternative explanation for these results could be that individuals in different conditions may have had access to significantly different alternative perspectives (i.e., information), thus influencing these individuals differently and leading to the differences in accuracy we found. To test this explicitly, we conducted supplemental analyses for Experiment 3b to examine if individuals in one condition had, by chance, seen more diverse information than individuals in another condition, in terms of how much the peer estimates they saw differed from their own estimates. We examined the covariate Avg_AdviceDistance—the average distance in dollars from participants' initial estimates to the peer advice they saw—by condition. Individuals in the ambivalent condition did not differ in this average distance ($M=4169.54$, $SD=23{,}170.69$) compared to individuals in the happy condition ($M=2631.98$, $SD=16{,}881.34$), $t(417)=-0.73$, $p=0.47$, or individuals in the sad condition ($M=3443.17$, $SD=23{,}849.52$), $t(419)=-0.35$, $p=0.73$, who also did not differ from each other, $t(419)=-0.39$, $p=0.70$. The omnibus ANOVA was also not significant, $F(2, 626)=0.27$, $p=0.77$. Thus, we find no evidence for the argument that differences in the alternative perspectives available to participants led to differences in accuracy, and do not include this variable in further analyses. Instead, we find that, as hypothesized, ambivalent individuals' receptivity to alternative perspectives benefits.

5000 random samples with replacement from the full sample (Efron & Tibshirani, 1993). The indirect effect (i.e., the effect of emotional ambivalence condition on accuracy *via* receptivity) was computed to determine whether the indirect effect differed significantly from zero, thus supporting mediation.

Receptivity to alternative perspectives mediates the effect of ambivalence on accuracy

The results show that emotional ambivalence significantly decreased error (see Table 1, Model 1) and significantly increased receptivity to alternative perspectives (see Table 1, Model 3). With both emotional ambivalence and receptivity to alternative perspectives simultaneously entered into the regression, the effect of receptivity to alternative perspectives on error remained significant ($B = -6{,}114.45$, $SE = 721.63$, $p < 0.01$, 95% confidence interval −7531.5319 to −4697.3588), but the effect of emotional ambivalence on error was reduced to non-significance ($B = 616.82$, $SE = 348.94$, $p = 0.08$, 95% confidence interval −1302.0500 to 68.4013). These results are consistent with full mediation. A bootstrap estimation of the 95% confidence interval around the indirect effect of emotional ambivalence on accuracy via receptivity to alternative perspectives (−751.5735 to −172.6797), further supports full mediation.

In sum, although contrary to expectations, we do not find evidence in this study that participants in the ambivalent condition have significantly lower final error scores than participants in the sad condition, we do find a marginal difference in the expected direction. More importantly, the results of Experiment 3b provides supportive evidence for the proposed underlying mechanism explaining why emotional ambivalence leads to increased accuracy in judgment compared with single-affect states: Emotional ambivalence increases receptivity to alternative perspectives, and thereby increases accuracy.

General discussion

The four experiments described in this article integrate and advance research on emotional ambivalence (Larsen et al., 2001), dialectical bootstrapping (e.g., Herzog & Hertwig, 2009; Larrick, Mannes, & Soll, 2011), and advice taking (e.g., See et al., 2011), providing causal evidence that emotional ambivalence can increase accuracy in judgment compared to single-affect states. Across divergent forecasting and estimation tasks (future weather temperatures, general knowledge questions, and tuition estimates), these experiments are the first, to our knowledge, to show the benefits of emotional ambivalence for improving accuracy in judgments and help shed light on an underlying psychological process through which ambivalence aids individuals in decision making. In particular, our findings support the notion that the benefits of emotional ambivalence for accuracy result from the differential effects of ambivalence relative to single emotions on cognitive processing. The results show that emotional ambivalence increases receptivity to alternative perspectives, which in turn increases accuracy.

Our findings open new avenues for research on the psychological experience and consequences of ambivalence, including the exploration of boundary conditions. Though our experiments focused on the manifestation of ambivalence as the simultaneous experience of happiness and sadness, other manifestations of emotional ambivalence (e.g., happiness and fear) may reveal interesting additional insights (Rothman, 2011). The ambivalent graduating college student, often the exemplar *par excellence* of feeling happiness and sadness simultaneously, may be just as likely to simultaneously feel happiness and fear—happiness at successfully completing an important life milestone and fear about the uncertainty that lies ahead. The concerned parent whose child just returned from a late evening out may feel anger at the child for breaking curfew as well as gratefulness that the child arrived safely. Whether other combinations of mixed emotional states yield similar benefits in judgment accuracy as we have shown in the present research should be examined in future research.

The present research focused on how ambivalence influences subsequent judgments. However, an interesting direction for future research is to explore whether and how the experience of ambivalence influences the revision of judgments made in the past while experiencing different affective states (e.g., non-ambivalent states). That ambivalence appears to open up individuals to considering new information, suggests it may also decrease anchoring to a prior judgment relative to those experiencing a single affective state. Future research might also fruitfully explore whether some individuals, such as those who have a proclivity for emotional experiences that are broad in range as well as differentiated (e.g., those high in emotional complexity, Kang & Shaver, 2004), may show greater accuracy in judgments. It may be that individuals high in emotional complexity could be reliably more accurate to the extent that this emotional trait leads them to be receptive to a broader set of information before making decisions.

Our findings also raise provocative questions about collective-level estimation and forecasting scenarios, such as the popular Iowa Electronic Markets (IEM) and Intrade websites in which individuals can participate in stock exchange-like markets about future events such as elections and Oscar awards. How mixed affective states within an individual improve individual judgments may very well have parallels for processes that occur for collective judgments. Thus, a collective comprised of affectively heterogeneous individuals might also be more likely to reflect alternative perspectives and therefore be more accurate than a collective of affectively homogeneous individuals (c.f., Le Bon, 1896). Indeed, recent empirical work provides initial evidence that collectives comprised of more diverse individuals are more accurate in judgments than those comprised of similar individuals (Jain, Bearden, & Filipowicz,

Table 1
Study 3b: Regression analyses examining mediation of emotional ambivalence on error by receptivity to alternative perspectives.

	Error						Receptivity to alternative perspectives		
	Model 1			Model 2			Model 3		
	B	SE B	β	B	SE B	β	B	SE B	β
Initial Error	0.21	0.01	0.55***	0.23	0.01	0.62***			
Student status (yes = 1)	655.53	351.95	0.06	727.86	333.88	0.07*			
Education level	−26.16	139.13	−0.01	−153.13	132.80	−0.04			
University familiarity	−284.96	155.57	−0.06	−362.67	147.83	−0.08*			
Ambivalent condition	−1033.46	364.27	−0.09**	−616.82	348.94	−0.06	0.07	0.02	0.14***
Receptivity to alternative perspectives		–		−6114.45	721.63	−0.28***		–	
Adj R^2		0.324			0.392			0.017	

Note. For Ambivalent condition variable, Ambivalent condition = 1, Happy & sad condition = 0.
$n = 639$.
* $p \leq .05$.
** $p \leq .01$.
*** $p \leq .001$.

2012). Future research could complement this work by exploring how the affective composition of collectives—whether diverse or homogeneous across individuals—influences the accuracy of the collective.

In sum, countering the lay notion that emotionally ambivalent individuals have difficulty making good decisions (Rothman & Wiesenfeld, 2007), our data suggest otherwise. Indeed, wisdom (e.g., judgment accuracy) appears to increase when individuals experience such complex and internally conflicted emotions. In this way, the ambivalent mind can be a wise mind.

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References

Ambady, N., & Gray, H. (2002). On being sad and mistaken: Mood effects on the accuracy of thin-slice judgments. *Journal of Personality and Social Psychology*, *83*, 947–961.

Ashton-James, C. E., Maddux, W. W., Galinsky, A. D., & Chartrand, T. L. (2009). Who I am depends on how I feel: The role of affect in the expression of culture. *Psychological Science*, *20*(3), 340–346.

Buhrmester, M. D., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A znew source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, *6*, 3–5.

Damasio, A. R. (1995). *Descartes' error: Emotion, reason, and the human brain*. New York: Harper Perennial.

DeDreu, C., Baas, M., & Nijstad, B. (2008). Hedonic tone and activation level in the mood-creativity link: Toward a dual pathway to creativity model. *Journal of Personality and Social Psychology*, *94*, 739–756.

Efron, B., & Tibshirani, R. J. (1993). *An introduction to the bootstrap*. Boca Raton, FL: Chapman & Hall.

Fong, C. (2006). The effects of emotional ambivalence on creativity. *Academy of Management Journal*, *49*, 1016–1030.

Forgas, J. (Ed.). (2000). *Feeling and thinking: The role of affect in social cognition*. Paris: Cambridge University Press.

Fredrickson, B. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, *56*, 218–226.

Gasper, K., & Clore, G. (2002). Attending to the big picture: Mood and global versus local processing of visual information. *Psychological Science*, *13*, 34–40.

George, J., & Zhou, J. (2002). Understanding when bad moods foster creativity and good ones don't: The role of context and clarity of feelings. *Journal of Applied Psychology*, *87*, 687–697.

Gino, F., Brooks, A., & Schweitzer, M. (2012). Anxiety, advice, and the ability to discern: Feeling anxious motivates individuals to seek and use advice. *Journal of Personality and Social Psychology*, *102*, 497–512.

Gino, F., & Moore, D. A. (2007). Effects of task difficulty on use of advice. *Journal of Behavioral Decision Making*, *20*, 21–35.

Gino, F., & Schweitzer, M. (2008). Blinded by anger or feeling the love: How emotions influence advice taking. *Journal of Applied Psychology*, *93*, 1165–1173.

Harvey, N., & Fischer, I. (1997). Taking advice: Accepting help, improving judgment, and sharing responsibility. *Organizational Behavior and Human Decision Processes*, *70*, 117–133.

Herzog, S. M., & Hertwig, R. (2009). The wisdom of many in one mind: Improving individual judgments with dialectical bootstrapping. *Psychological Science*, *20*(2), 231–237.

Huang, L., & Galinsky, A. (2011). Mind–body dissonance: Conflict between the senses expands the mind's horizons. *Social Psychological and Personality Science*, *2*(4), 351–359.

Izard, C., & Tomkins, S. (1966). Affect and behavior: Anxiety as a negative affect. In C. Spielberger (Ed.), *Anxiety and Behavior*. New York: Academic Press.

Jain, K., Bearden, J., & Filipowicz, A. (2012). Diverse personalities make for wiser crowds: How personality can affect the accuracy of aggregated judgments. Under revision at *Psychological Science*.

Kang, S., & Shaver, P. R. (2004). Individual differences in emotional complexity: Their possible psychological implications. *Journal of Personality*, *72*, 687–726.

Larrick, R. P., Mannes, A. E., & Soll, J. B. (2011). The social psychology of the wisdom of crowds. In J. I. Krueger (Ed.), *Frontiers in social psychology: Social judgment and decision making*. New York: Psychology Press.

Larrick, R. P., & Soll, J. B. (2006). Intuitions about combining opinions: Misappreciation of the averaging principle. *Management Science*, *52*(1), 111–127.

Larsen, J., McGraw, A., & Cacioppo, J. (2001). Can people feel happy and sad at the same time? *Journal of Personality and Social Psychology*, *81*(4), 684–696.

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology*, *81*(1), 146–159.

Le Bon, G. (1896). *The crowd: A study of the popular mind*. London: T. Fisher Unwin.

Lord, C. G., Lepper, M. R., & Preston, E. (1984). Considering the opposite: A corrective strategy for social judgment. *Journal of Personality and Social Psychology*, *47*(6), 1231–1243.

Mannes, A. E. (2009). Are we wise about the wisdom of crowds? The use of group judgments in belief revision. *Management Science*, *55*, 1267–1279.

Martin, L. L., Ward, D. W., Achee, J. W., & Wyer, R. S. (1993). Mood as input: People have to interpret the motivational implications of their moods. *Journal of Personality and Social Psychology*, *64*, 317–326.

Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*, *69*, 220–232.

Mowrer, O. (1960). *Learning theory and behavior*. New York: Wiley.

Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review*, *108*, 291–310.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*, 879–891.

Roseman, I. (1984). Cognitive determinants of emotions: A structural theory. In P. Shaver (Ed.), *Review of Personality and Social Psychology*, *vol. 5*. (pp. 11–36)Beverly Hills, CA: Sage Publications.

Rothman, N. (2011). Steering sheep: How expressed emotional ambivalence elicits dominance in interdependent decision making contexts. *Organizational Behavior and Human Decision Processes*, *116*, 66–82.

Rothman, N., & Wiesenfeld, B. (2007). The social consequences of expressing emotional ambivalence in groups and teams. In E. Mannix, M. Neale, & C. Anderson (Eds.), *Research on managing groups and teams: Affect & groups*. London: Elsevier.

Schwarz, N. (2002). Situated cognition and the wisdom of feelings: Cognitive tuning. In L. Feldman Barrett, & P. Salovey (Eds.), *The wisdom in feelings* (pp. 144–166). New York: Guilford.

Schwarz, N., & Clore, G. (2007). Feelings and phenomenal experiences. In A. Kruglanski, & E. Higgins (Eds.), *Social psychology handbook of basic principles* (pp. 385–407) (2nd ed.). New York: Guilford.

Schwarz, N., & Clore, G. L. (1988). How do I feel about it? Informative functions of affective states. In K. Fiedler, & J. Forgas (Eds.), *Affect, cognition, and social behavior* (pp. 44–62). Toronto: Hogrefe International.

Schwarz, N., & Clore, G. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology*, *45*, 513–523.

See, K., Morrison, E., Rothman, N., & Soll, J. (2011). The detrimental effects of power on confidence, advice taking, and accuracy. *Organizational Behavior and Human Decision Processes*, *116*, 272–285.

Sinclair, R., & Mark, M. (1995). The effects of mood state on judgemental accuracy: Processing strategy as a mechanism. *Cognition & Emotion*, *9*(5), 417–438.

Smith, C., & Lazarus, R. (1990). Emotion and adaptation. In L. Pervin (Ed.), *Handbook of personality theory and research* (pp. 609–637). New York: Guilford.

Soll, J., & Klayman, J. (2004). Overconfidence in interval estimates. *Journal of Experimental Psychology: Learning, Memory, and Cognitions*, *30*, 299–314.

Soll, J., & Larrick, R. (2009). Strategies for revising judgment: How (and how well) people use others' opinions. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *35*, 780–805.

Storbeck, J., & Clore, G. (2005). With sadness comes accuracy; with happiness, false memory: Mood and the false memory effect. *Psychological Science*, *16*, 785–791.

Vul, E., & Pashler, H. (2008). Measuring the crowd within: Probabilistic representations within individuals. *Psychological Science*, *19*(7), 645–647.

Williams, P., & Aaker, J. (2002). Can mixed emotions peacefully coexist? *Journal of Consumer Research*, *28*, 636–649.

Yaniv, I. (2004). Receiving other people's advice: Influence and benefit. *Organizational Behavior and Human Decision Processes*, *93*, 1–13.

Yaniv, I., & Foster, D. P. (1997). Precision and accuracy of judgmental estimation. *Journal of Behavioral Decision Making*, *10*, 21–32.

Yaniv, I., & Milyavsky, M. (2007). Using advice from multiple sources to revise and improve judgment. *Organizational Behavior and Human Decision Processes*, *103*, 104–120.