

# Affective and Cognitive Validation of Thoughts: An Appraisal Perspective on Anger, Disgust, Surprise, and Awe

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Anger, disgust, surprise, and awe are multifaceted emotions. Both anger and disgust are associated with feeling unpleasant as well as experiencing a sense of confidence, whereas surprise and awe tend to be more pleasant emotions that are associated with doubt. Most prior work has examined how appraisals (confidence, pleasantness) lead people to experience different emotions or to experience different levels of intensity within the same emotion. Instead, the current research focused on the consequences (rather than the antecedents) of appraisals of emotion, and it focuses specifically on the consequences for thought usage rather than the consequences for generating many or few thoughts. We show that when these four emotions are induced following thought generation, thoughts can be used either more or less with each emotion depending on whether the pleasantness/unpleasantness or confidence/doubt appraisal is made salient. In five experiments, it was predicted and found that anger and disgust following thought generation led to more thought use than surprise and awe when a confidence appraisal for the emotion was encouraged, but led to less thought use than surprise and awe when a pleasantness appraisal was made salient. The current studies are the first to reveal that different appraisals can lead to different (even opposite) outcomes on thought usage within the same experimental design.

*Keywords:* anger, awe, disgust, surprise, validation

Scholars of emotion have noted that emotional states are typically associated with a diversity of appraisals (e.g., Keltner, Ellsworth, & Edwards, 1993; Lerner & Keltner, 2000). For example, happiness is a pleasant emotion that is also associated with confidence, both generally positive states, whereas sadness is an unpleasant emotion that is associated with doubt, both generally negative states (Clore, Gasper, & Garvin, 2001). Importantly, the pleasantness and confidence appraisals associated with emotions do not always correspond in valence. For example, anger and disgust are both negative, unpleasant emotions, but they both are

associated with feelings of confidence, a more positive appraisal (Humrichouse & Watson, 2010; Tiedens & Linton, 2001).<sup>1</sup> In contrast, surprise and awe induce a relatively more pleasant state than anger and disgust, but are associated with doubt rather than confidence (Smith & Ellsworth, 1985).<sup>2</sup>

In the present research we use a multiple appraisals perspective on emotion to predict and show how the same emotion induced after generating thoughts in response to an emotion irrelevant task can lead to very different evaluative judgments by either increasing or decreasing reliance on those thoughts. As explained further shortly, whether thought use is increased or decreased depends on the particular appraisal of the emotion that is salient—pleasantness or confidence. This multiple appraisals perspective has the potential to help explain

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<sup>1</sup> Anger and disgust share unpleasantness and confidence, but differ in other aspects such as their behavioral appraisals of approach vs. avoidance, respectively (Harmon-Jones, Harmon-Jones, & Summerell, 2017; Keltner & Lerner, 2010).

<sup>2</sup> We use the terms confidence and certainty interchangeably. This equivalence is common in the literatures on attitude strength (Krosnick & Petty, 1995) and self-validation (Briñol & Petty, 2009) where the key issue is how confident, certain, or sure people are in the validity of their thoughts and attitudes.

some of the divergent effects that have been observed in the literature on emotion and judgment, and also explain why null effects could be observed if different participants are invoking different appraisals. For illustrative purposes, in the present research we focus on the emotions of anger and disgust and compare them to surprise and awe. These emotions make for a good comparison in that as just explained, they have opposite meanings on the two key appraisals most studied with respect to evaluative judgment—pleasantness/unpleasantness and confidence/doubt. Before turning to our specific hypotheses with respect to the impact of emotions on judgment, we briefly review the multiple appraisals of emotion idea.

### Multiple Appraisals of Anger, Disgust, Surprise, and Awe

According to popular appraisal theories, emotions can be differentiated along several dimensions, two of which are pleasantness versus unpleasantness and confidence versus doubt (Moors, Ellsworth, Scherer, & Frijda, 2013; Parkinson & Manstead, 2015).<sup>3</sup> That is, appraisal theorists have argued and shown that whereas some emotions induce relatively pleasant experiences (e.g., happiness, awe, surprise), other emotions lead to relatively unpleasant states (e.g., anger, disgust, sadness). Furthermore, emotions can also be categorized as to whether they are associated with feelings of confidence or doubt. Specifically, the experience of some pleasant emotions (e.g., happiness) as well as unpleasant ones (e.g., anger) are accompanied by feeling certain, having a sense of understanding of what is happening in the current situation, and feeling able to predict what will happen next. In contrast, other relatively pleasant emotions (e.g., surprise, awe) as well as unpleasant ones (e.g., fear) are characterized by feeling uncertain, not understanding what is happening, and feeling unsure about what will happen next (Ellsworth & Smith, 1988; Roseman, 1984).

This multiple appraisals framework is compatible with the hierarchical structure approach to emotions (Tellegen, Watson, & Clark, 1999). For example, with respect to anger, this perspective holds that when the nonspecific aspects of anger (i.e., unpleasantness) are controlled, anger is associated with self-assurance and confidence (Blanchenship, Nesbit, & Murray, 2013; Humrichouse & Watson, 2010; Motro & Sullivan, 2017; see also Veling, Ruys, & Aarts, 2012). The idea that anger can be associated with confidence is also consistent with the relationship found for anger and preparation for action (Carver & Harmon-Jones, 2009). Indeed, anger prepares people for action with increased autonomic arousal and activation of the fight versus flight response (Huber, Van Boven, Park, & Pizzi, 2015; Lench, Tibbett, & Bench, 2016). In most cases, to act effectively, people must not have any doubt (Gollwitzer & Moskowitz, 1996; see also, Inbar & Gilovich, 2011).

We also note that people associate anger with confidence because of their prior experiences with angry others. Specifically, just as angry individuals can think and act *as if* they are confident, so too might one's own experiences of anger activate confidence. In line with this reasoning, recent research has shown that angry people are perceived by others as more determined (Harmon-Jones, Schmeichel, Mennitt, & Harmon-Jones, 2011; Pettersson & Turkheimer, 2013) and committed (Reed, DeScioli, & Pinker, 2014). In observing this determination and readiness to act, people might naturally conclude that angry individuals are confident. Previous research has also shown that people with angry facial expressions are perceived as powerful (Keat-

ing, 1985) and that high social status is attributed to them (Tiedens, 2001; van Kleef, DeDreu, & Manstead, 2004). Because power is associated with confidence (Briñol, Petty, Valle, Rucker, & Becerra, 2007), individuals might infer that angry people (including themselves) are confident. Thus, based on these learned associations, one's own experience of anger, though unpleasant, can also activate confidence.

Anger is not the only emotion that is associated with multiple appraisals. Though less studied than anger, the emotion of disgust provides another example. Like anger, disgust has an appraisal of valence (unpleasantness) but as shown by Tiedens and Linton (2001) it is also accompanied by increased confidence relative to other negative but uncertain emotions such as sadness.

Surprise provides a third example of an emotion with divergent appraisals. In contrast to anger and disgust, surprise is a relatively positive emotion that makes people feel uncertain about what is happening or what is going to happen. Several studies have provided support for the proposition that surprise is a relatively positive emotion that is also associated with doubt. For example, Watson and Tellegen (1985) placed surprise in the top right quartile of their two-factor Positive Affect and Negative Affect model, supporting the idea that surprise has high loadings on positive affect (Valenzuela, Mellers, & Strebel, 2010; Wilson, Centerbar, Kermer, & Gilbert, 2005).<sup>4</sup> At the same time, in accord with appraisal theories, Tiedens and Linton (2001) demonstrated that surprise is an emotion that is associated with uncertainty and produces effects associated with doubt, such as enhanced information processing when it precedes a message and reduced reliance on simple heuristics. The uncertainty associated with surprise can emerge from a violation of expectations. In fact, it has been found that the degree of unexpectedness determines the intensity of felt surprise (Reisenzein & Studtmann, 2007).

A fourth example of an emotion with divergent appraisals is awe. Like surprise, awe is a relatively positive emotion that makes people feel uncertain. Several studies have provided support for the proposition that awe is a relatively positive emotion that is also associated with doubt. For example, Rudd, Vohs, and Aaker (2012) found that awe was associated with positive feelings, life satisfaction, and well-being. Similarly, Shiota, Keltner, and Mossman (2007) found that participants induced to feel awe experienced that emotion as high in pleasantness and they did not want the experience to end. At the same time, awe led people to report greater tolerance for uncertainty. Furthermore, awe inductions often involve the presence of contemplating something greater than the self making people think they are relatively small, insignificant, and humble (Keltner & Haidt, 2003; Valdesolo & Graham, 2014). Moreover, Stellar and colleagues (2018)

<sup>3</sup> Although there are other dimensions along which emotional experiences can vary (e.g., control, attention, responsibility, anticipated effort; see Frijda, 1993; Keltner et al., 1993; Lerner & Keltner, 2000; Smith & Ellsworth, 1985), in the present research we highlight the pleasantness and confidence dimensions because not only are they the most studied appraisals of emotion but they are also of longstanding importance in the domain of attitudes and social cognition. Furthermore, these particular dimensions have been argued to provide the two most fundamental criteria by which people judge their own beliefs (see Boden, Berenbaum, & Gross, 2016, for a recent review).

<sup>4</sup> Of course, surprise can sometimes be relatively unpleasant (e.g., Russell, 1994) and anger can sometimes be relatively pleasant (e.g., Netzer, Igra, Bar Anan, & Tamir, 2015). However, surprise is typically a more positive emotion than anger or disgust.

demonstrated that awe is an emotion that can challenge world-views leading to a self-diminishing perception and decreased egotism (for another example, see Bai et al., 2017). Therefore, although pleasant, we argue that awe can make people doubt their self-generated thoughts making them look relatively insignificant and invalid. Consistent with the idea that awe decreases certainty, Griskevicius, Shiota, and Neufeld (2010) found that an awe induction (vs. control) introduced before receiving a persuasive proposal increased information processing (as illustrated by a greater argument quality effect). When induced before processing, the uncertainty that comes from awe would be likely to increase elaboration (as shown by Griskevicius et al., 2010) but when induced after processing (as in the present research) the same uncertainty would be expected to undermine thought usage. As we describe shortly, our research focuses on the consequences (rather the antecedents) of appraisals of emotion, and it focuses on the consequences for thought usage in particular rather than the consequences for the experience of emotion, or the consequences for generating more or less thoughts, topics that have been explored in prior research.

### Emotion and Metacognition

In the current research we focus on the implications of the different appraisals along the pleasantness and confidence dimensions just outlined for understanding the impact of emotions on thought use and judgment. Although much prior research has examined how emotions can affect the amount of thinking that takes place (Moons & Mackie, 2007; Tiedens & Linton, 2001) or how emotions can influence specific judgments by producing a bias to one's thinking (DeSteno, Petty, Rucker, Wegener, & Braverman, 2004; Lerner, Goldberg, & Tetlock, 1998; Lerner, Gonzalez, Small, & Fischhoff, 2003), issues to which we return in the general discussion, our focus here is on how different appraisals of emotion can impact second-order cognition or metacognition.

Primary cognition involves thoughts that occur at a direct level and involve initial associations of some object with some attribute (e.g., ice-cream is sweet). However, following a primary thought, people can also generate other thoughts, which occur at a second level and involve reflection on the first thoughts (e.g., I am sure that ice-cream is sweet). Metacognition refers to these second-order thoughts, or thoughts about other thoughts (Briñol & DeMarree, 2012; Dunlosky & Metcalfe, 2009; Jost, Kruglanski, & Nelson, 1998; Petty, Briñol, Tormala, & Wegener, 2007). In sum, this research is not about the influence of appraisals on number of thoughts nor about the impact of appraisals on emotion. It is about how appraisals associated with emotion (certainty or pleasantness) can affect the use of thoughts or reliance on thoughts and ultimately the judgments that follow from these thoughts. In other words, the present research is not about how appraisals affect the amount of thinking. Rather, the present studies examine how appraisals affect the use of previously generated emotion-irrelevant thoughts. Thus, the focus of our contribution deals with the impact of the appraisals of emotions following (rather than preceding) the generation of thoughts.

In the present research, we report five studies examining whether two different appraisals of the emotions of anger, disgust, surprise, and awe can be primed, and if so, how these different appraisals influence the impact of the emotional state on judgment. To investigate this issue, we use an established metacognitive paradigm called *self-validation* in which experiences following thoughts can deter-

mine whether or not these thoughts are used in forming judgments (Petty, Briñol, & Tormala, 2002). For example, in prior research, when people were made to feel powerful (Briñol, Petty, & Barden, 2007) or affirmed (Briñol, Petty, Gallardo, & DeMarree, 2007) following thought generation, they relied on their thoughts more in forming their judgments than when they were made to feel powerless or were not affirmed. According to the self-validation perspective, to understand judgment, it is not only important to understand how variables influence the amount and valence of thoughts that people generate (Petty & Cacioppo, 1986), but also what factors lead people to rely on their thoughts or not.

First, we propose that when the emotions of anger, disgust, surprise, and awe occur after thinking, these emotions can affect whether or not people rely on the thoughts they have just generated. Second, and more uniquely, we hypothesize that whether anger and disgust lead people to use their thoughts more or less than surprise and awe depends on whether the emotion is appraised along the pleasantness/unpleasantness or confidence/doubt dimension. These two appraisal dimensions of emotions are relevant to self-validation processes because of the two kinds of validation that are possible (Petty, Briñol, & DeMarree, 2007). One type of validation, called *affective validation*, occurs when people use their thoughts because they feel good about them or like them (Bless et al., 1996; Briñol et al., 2007; Huntsinger, 2013; Huntsinger, Clore, & Bar-Anan, 2010; Isen & Daubman, 1984; Wyer, Clore, & Isbell, 1999; see Boden & Berenbaum, 2010; Clore & Huntsinger, 2007; Huntsinger, Isbell, & Clore, 2014; Livet, 2016, for reviews). A second kind of validation, called *cognitive validation*, occurs when people use their thoughts because they have confidence in them and believe they are valid or correct (e.g., Briñol & Petty, 2003; see Briñol & Petty, 2009, for a review). Therefore, cognition and affect are tags that we use to refer to different types of validation.

Synthesizing the essence of our rationale, we propose that people can be induced to appraise emotions along either a pleasantness or confidence dimension, and then those appraisals of the emotions (e.g., the emotion is pleasant or the emotion makes me feel confident) are misattributed to the thoughts (I feel good about my thoughts or I feel confident with my thoughts). Thoughts that are associated with pleasantness are liked (vs. disliked) and are more impactful in guiding judgment. If an individual is focused on the appraisal of pleasantness/unpleasantness, then feeling angry or disgusted is expected to lead to less thought use than surprise or awe because the former emotions would enhance perceptions of feeling bad about or disliking one's thoughts compared with the latter emotions. We call this type of thought reliance *affective validation* because the pleasantness/unpleasantness appraisal is an affective one, typically associated with emotionality. Thoughts held with confidence (vs. doubt) are also more consequential in determining judgments. We call this type of thought reliance *cognitive validation* because the confidence/doubt appraisal is a cognitive one, typically associated with rationality. If an individual is focused on the appraisal of confidence/doubt, then experiencing anger or disgust are expected to lead to more thought use than surprise or awe because the former emotions are more associated with confidence than the latter ones and would enhance the perception of the validity of one's thoughts.

In the present research, we examine for the first time whether a given emotion can have opposite effects on the use of one's thoughts, depending on whether the emotion is appraised along a confidence/doubt or pleasantness/unpleasantness dimension. Prior self-validation research examining emotions has only compared

the emotion of happiness with sadness and found that happiness experienced after thinking increased thought use compared with sadness (Briñol et al., 2007; Huntsinger, 2013; Paredes, Stavrakı, Briñol, & Petty, 2013). However, because happiness is associated with appraisals of both more pleasantness and more confidence than sadness, it is not clear whether the enhanced use of thoughts was attributable to affective or cognitive validation. That is, either the feelings of confidence or pleasantness that followed happiness relative to sadness could have made people rely on their thoughts more, as people would rely more on thoughts that they like (affective validation) as well as those held with confidence (cognitive validation). Thus, it is not yet clear whether both affective and cognitive validation can both occur because even though prior research has been interpreted to favor one type of validation over the other, in every single prior study on variables influencing thought use, the key variable of interest could plausibly have produced its effects by either mechanism.

That is, as explained earlier, unlike the emotions of happiness and sadness for which the pleasantness and confidence dimensions co-occur and therefore predict the same judgmental outcome, anger and disgust are unpleasant emotions that are associated with confidence, whereas surprise and awe are more pleasant emotions that are associated with doubt (Shiota et al., 2007; Tiedens & Linton, 2001). Thus, according to appraisal theories and the possibility of both affective and cognitive validation of thoughts, these emotions should be capable of inducing either more or less thought use depending on which appraisal is dominant for the emotion in a given situation.<sup>5</sup>

To examine the differential appraisals idea, in each of five studies we used an emotion induction and then also employed a manipulation designed to focus participants on appraising their emotion along either a confidence/doubt or the pleasantness/unpleasantness dimension. Prior work on emotional appraisals has focused on how different appraisals can lead people to experience different emotions (e.g., Roseman & Evdokas, 2004). There is also work on how different emotions can lead people to feel different levels of intensity/quality within the same emotion (e.g., Reisenzein, 2017). In fact, most of the prior work on emotional appraisals has emphasized this particular side of the relationship in which appraisals are viewed as antecedents of emotion (Lerner & Keltner, 2000; Moors et al., 2013; Smith & Ellsworth, 1985). In contrast, in the current research, instead of different appraisals leading to different emotional experiences, appraisals are predicted to change whether the very same emotion is associated with reliance on emotion-irrelevant thoughts or not. Across several studies in which appraisals are varied in different ways, we will illustrate how different appraisals of the same emotion can affect thought use in opposite ways. In some studies we will use a rather direct induction of the pleasantness/unpleasantness appraisal dimension (e.g., by asking participants questions about pleasantness or confidence). In other studies, we use a more indirect method (e.g., by focusing people on general cognition which should be more associated with confidence than pleasantness vs. affect which should be more associated with pleasantness than confidence).

Our first hypothesis was that if an individual was focused on the confidence/doubt appraisal of the emotion, then feeling anger and disgust should lead to more thought use than surprise and awe because experiencing anger/disgust would induce an appraisal of confidence that could be misattributed to feeling sure about the

accuracy or correctness of one's thoughts relative to surprise/awe (cognitive validation). In contrast, if an individual was focused on the pleasantness/unpleasantness appraisal of emotion, then experiencing anger and disgust would lead to less thought use than surprise/awe because experiencing anger/disgust would induce an appraisal of unpleasantness that could be misattributed to feeling bad about or disliking one's thoughts relative to surprise/awe (affective invalidation).

### Experiment 1: Anger Compared With Surprise Can Validate or Invalidate Thoughts About the Self Depending on the Appraisal

Experiment 1 was designed to examine whether anger that is introduced following a thought generation task can influence evaluative judgments by validating or invalidating one's thoughts relative to surprise depending on the appraisal of emotion made salient. Participants were first asked to think about their best or worst qualities as job candidates to produce positive or negative self-related thoughts. Following this thought valence manipulation, participants were assigned to write about personal episodes in which they felt anger or surprise. After completing both inductions, we introduced the critical manipulation that was designed to facilitate participants' likelihood of making the pleasantness/unpleasantness or the confidence/doubt appraisal of their emotion.

<sup>5</sup> Our hypothesis that emotions could have opposite effects depending on the appraisal that was salient was based on two initial studies we conducted in this line of research prior to the studies reported in this article. These two studies compared anger with surprise and showed opposite patterns of results for the same emotion across the two studies. Our differential appraisals hypothesis was developed to account for these discrepant findings. In one study, participants were randomly assigned to the cells comprising a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Emotion: Anger vs. Surprise) between-subjects factorial design. Participants first were asked to think about their best or worst qualities as job candidates. Although we did not realize the importance of emotional appraisal at the time, the cover story of this study explicitly stated that the research was being conducted for the cognitive psychology department. In retrospect, we believe that this information may have made the confidence appraisal more likely than the pleasantness appraisal. In this study, we found that angry participants showed a greater impact of their thoughts on self-evaluations than surprised individuals. In a second study, participants were assigned to the same 2  $\times$  2 between-subjects design. The participants were first asked to list three positive or negative personal attributes that they believed they possessed as potential professionals. Then, they were asked to describe personal episodes where they felt either angry or surprised. Next, participants were asked to engage in a word completion task using affective words that was designed at the time to serve as a manipulation check for the emotion induction. In hindsight, we reasoned that this emotion manipulation check (absent from the first study) might have led participants to focus on the pleasantness or unpleasantness appraisal of the emotions they were experiencing. In this study, the pattern was opposite to that of Study 1. That is, reliance on thoughts was lower when angry than surprised. When taken together, these two initial data sets suggested that very same emotions could have different effects on the use of thoughts. Importantly, this pattern of opposite results, although not significant, also emerged in two additional studies comparing disgust and surprise that had similarly confounded procedures potentially inducing confidence versus pleasantness appraisals of the emotions. Thus, we set out on the current set of studies to more formally test the differential appraisals hypothesis by explicitly manipulating the likelihood of confidence versus pleasantness appraisals within each study.

The impact of emotions on thought validation in this study was examined with regard to a topic that was especially relevant to the participants (i.e., students at a Greek business university). Specifically, participants in this study indicated their attitudes toward themselves as future professionals. We expected that when in the confidence appraisal condition, participants feeling angry would use their thoughts more than those feeling surprised. This means that the valenced thoughts generated in the thought listing task (positive vs. negative) would have a greater impact on self-attitudes for individuals feeling angry rather than surprised. Furthermore, we expected that when in the pleasantness appraisal condition, the opposite would occur. That is, participants feeling surprised would use their thoughts more than those feeling angry. This means that the valenced thoughts generated would have a greater impact on self-attitudes for individuals feeling surprised rather than angry. In short, we expected a three-way interaction of Thought Valence, Emotion, and Appraisal Type on attitudes toward the self as a future professional. Another way to examine thought use commonly employed in persuasion studies is to examine the correlation between valenced thoughts and attitudes (Briñol & Petty, 2009). Specifically, the more people are relying on their thoughts, the larger the correlation should be between valenced thoughts and attitudes. Thus, we examine the valenced thought-attitude relationship across the predicted validation and invalidation conditions.

## Method

**Participants and design.** Participants were 140 undergraduate students at Athens University of Economics and Business (Greece). Students were randomly assigned to the cells of a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Emotion: Anger vs. Surprise)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) between subjects factorial design. Sample size was determined based on the number of participants who could be collected from the start of the study until the end of the academic semester. We thus had little control over the final sample size, but by administering the study at the beginning of the semester we anticipated that the final sample would contain at least 20 people per condition, though we fell about 3 participants per condition short of this estimate.

**Procedure.** Upon arrival, participants were told that they were going to be involved in two separate projects. Specifically, they were told that the first study was about professional performance and job satisfaction, whereas the second was about the way people remember past personal episodes. For the first part of the session, participants were asked to list three positive or negative characteristics they believed they possessed as potential professionals. For the next part of the session (i.e., the 'second study'), participants were asked to write about two occasions in which they felt either surprised or angry. After writing the emotion-induction essays, participants were told that to bring all participants back to the same baseline, they would have to engage in a word-completion task.<sup>6</sup> The word-completion task served as the appraisal type manipulation. Participants in the pleasantness appraisal condition were asked to fill in the missing letters in words related to feelings, whereas those in the confidence appraisal condition filled in the missing letters in words related to cognition.

Finally, participants completed the dependent measure, and were debriefed, thanked, and dismissed.

### Independent variables.

**Thought valence.** Participants were first asked to list either three positive or three negative personal traits relating to their future professional performance. Participants were told that this was an important task and, therefore, they were asked to think carefully as they listed their traits. Participants could take as long as they needed and stop whenever they wanted. In general, however, the thought listing inductions took between 2 and 5 min per participant. Asking participants to write their positive or negative traits is a reliable way to bias the valence of the participants' thoughts and subsequent attitudes toward themselves (Briñol & Petty, 2003; Briñol & Petty, 2009; Killeya & Johnson, 1998). This manipulation came before the emotion and appraisal inductions, so it was expected to produce equivalent thoughts across levels of random assignment to experimental conditions.

**Emotion.** After listing their self-attributes, in an ostensibly unrelated study participants were asked to think about two recent occasions in which they felt either angry or surprised. Specifically, participants were asked to write brief essays summarizing these anger- or surprise-inducing events. This induction is similar to that used in much prior research manipulating emotions (e.g., DeSteno, Petty, Wegener, & Rucker, 2000; Keltner et al., 1993; Schwarz & Clore, 1983; Strack, Schwarz, & Schneidinger, 1985). As in the previous task, participants could take as long as they needed and stop whenever they wanted when writing about emotions.

**Appraisal type.** An important aim of the present study was to manipulate participants' appraisal of their emotion to examine the conditions under which thought-validation by emotions occurs due to the pleasantness/unpleasantness appraisal (i.e., affective validation of thoughts) as opposed to the confidence/doubt appraisal (i.e., cognitive validation of thoughts). To achieve this goal, participants were asked to fill in the missing letters in a word-completion task. Participants in the pleasantness appraisal condition had to fill in the letters of 24 words that were directly related to pleasantness (pleasant, unpleasant) and related to affect and feelings in general (e.g., feel, emotion). These participants also completed 16 neutral words (e.g., table, chair). On the other hand, participants in the confidence appraisal condition filled in the letters of 24 words that were directly related to confidence (e.g., certainty, doubt) and related to cognition and thinking in general (e.g., thought, brain). These participants also completed the same neutral words presented to participants in the pleasantness appraisal condition (see the Appendix).

There was no time restriction for participants to complete this word-completion task, and it took an average of 2 to 3 min per participant. This induction was designed to influence the aspect of the emotions that participants would attend to and focus on (for conceptually similar paradigms highlighting different aspects of experience, see MacInnis & DeMello, 2005; MacInnis & Hae, 2007; Okada, 2005; Scarabis, Florack, & Gosejohann, 2006; Shiv & Fedorikhin, 1999, 2002). In the pleasantness appraisal condi-

<sup>6</sup> One possible concern about placing the word completion task after the emotion induction is that it would attenuate the emotions experienced. To the extent that it did this to a great extent, however, the predicted effects should not emerge.

tion, participants were expected to focus primarily on the pleasantness or unpleasantness accompanying their emotion, whereas in the confidence appraisal condition, participants were expected to focus primarily on the confidence or doubt accompanying their emotion.

#### Dependent measures.

**Attitudes.** The primary dependent measure was participants' attitude toward the self as future professionals. Specifically, participants were asked to indicate their attitude toward themselves as future professionals, on a 9-point scale (1 = *bad*, 9 = *good*). This single item was selected because it is perhaps the best global index of evaluation. That is, it has been shown to incorporate both cognitive (e.g., wise-foolish) and affective (e.g., love-hate) aspects of evaluation (Crites, Fabrigar, & Petty, 1994).

**Trait favorability.** Because all participants did not comply with the instructions to write three positive or three negative traits (e.g., some just wrote two and a neutral trait), one independent judge, unaware of the experimental conditions, coded each trait participants' wrote with respect to whether it was positive or negative using a 3-point scale (-1 = *negative*, 0 = *neutral*, 1 = *positive*). An index of the valence of traits was created for each participant by subtracting the total number of negative traits generated from the number of positive traits that the participant had listed. To control for verbal skill, this difference score was then divided by the total number of traits (Cacioppo & Petty, 1981). This measure served as a Thought Valence manipulation check.

## Results

**Attitudes.** Results of a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Emotion: Anger vs. Surprise)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA on self-attitudes revealed a significant three-way interaction among the independent variables,  $F(1, 132) = 9.77, p = .002, \eta_p^2 = .069$ .<sup>7</sup> To simplify and facilitate conceptual interpretation of these results, we grouped the predicted validation conditions (i.e., angry in the confidence appraisal condition and surprised in the pleasantness appraisal condition) and the predicted invalidation conditions (i.e., angry in the pleasantness appraisal condition and surprised in the confidence appraisal condition) into a Validation independent variable. We then ran a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA. This was followed by a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Emotion: Anger vs. Surprise) ANOVA. An advantage of this analysis strategy is that it more directly maps onto our conceptual hypothesis and allows examining directly whether type of appraisal or type of emotion moderate the key validation effect.

Results revealed an effect of Thought Valence on attitudes, such that positive thoughts resulted in more favorable attitudes ( $M = 6.19, SD = 1.99$ ) than negative thoughts ( $M = 5.58, SD = 2.30, F(1, 132) = 4.09, p = .044, \eta_p^2 = .03$ ). Importantly the predicted two-way interaction between Thought Valence and Thought Validation was significant and qualified the main effect,  $F(1, 132) = 9.73, p = .002, \eta_p^2 = .07$ . This interaction was not further qualified by Appraisal Type,  $F(1, 132) = .634, p = .43, \eta_p^2 = .005$ , and was also not further qualified by Emotion,  $F(1, 132) = .19, p = .66, \eta_p^2 = .001$ .

As illustrated in the top panel of Figure 1, the Thought Valence  $\times$  Thought Validation interaction indicated that the attitudes toward the self were more consistent with the valence of thoughts in the validation than in the invalidation conditions. That is, for the validation conditions, participants' self-attitudes were more positive when they had previously described positive personal characteristics ( $M = 6.64, SD = 1.71$ ) than when they described negative characteristics ( $M = 4.91, SD = 2.32, F(1, 132) = 11.16, p < .001, \eta_p^2 = .09$ ). In contrast, for the invalidation conditions, participants did not rely on the direction of their thoughts when they evaluated themselves as future professionals,  $F(1, 132) = .64, p = .43, \eta_p^2 = .005$ .

In addition, an unexpected interaction between Thought Validation and Appraisal Type emerged,  $F(1, 132) = 4.85, p = .029, \eta_p^2 = .035$ . This interaction indicated that in the Pleasantness Appraisal condition people formed lower evaluations in the Validation ( $M = 5.13, SD = 2.29$ ) than in the Invalidation ( $M = 6.10, SD = 2.19$ ) condition,  $F(1, 132) = 4.11, p = .044, \eta_p^2 = .03$ . In the Confidence Appraisal condition there was no difference in evaluations,  $F(1, 132) = 1.81, p = .28, \eta_p^2 = .009$ .

**Trait favorability.** External ratings of the positivity of the traits listed by participants were also submitted to the same ANOVAs as attitudes. Results showed a significant main effect of thought valence on trait favorability, such that participants' traits were perceived as more positive in the positive ( $M = .92, SD = .35$ ) than in the negative ( $M = -.88, SD = .37$ ) trait condition,  $F(1, 131) = 835.83, p < .001, \eta_p^2 = .87$ . This finding shows that the manipulation of thought valence was successful. As expected, there were no main effects of validation or appraisal, and no additional interactions among the variables,  $ps > .114$ .

**Thought-attitude linkage.** Finally, we predicted that participants in the validation conditions (i.e., angry in the confidence appraisal condition and surprised in the pleasantness appraisal

<sup>7</sup> As expected, decomposition of the 3-way interaction showed that the pattern of results varied as a function of the appraisal type manipulation. In the confidence appraisal condition, a significant Thought Valence  $\times$  Emotion interaction emerged,  $F(1, 66) = 7.32, p = .041, \eta_p^2 = .062$ , indicating that attitudes were more consistent with the direction of thoughts for angry than for surprised participants. That is, participants in the anger condition tended to have more favorable attitudes toward themselves when they had described positive personal traits ( $M = 6.91, SD = 1.1$ ) than when they had described negative personal traits ( $M = 5.94, SD = 1.5$ ),  $F(1, 66) = 3.17, p = .08, \eta_p^2 = .05$ . On the other hand, among participants in the surprise condition, there was no difference in attitudes between those who listed positive personal traits ( $M = 5.82, SD = 2.01$ ) and those listing negative personal traits ( $M = 6.45, SD = 1.64$ ),  $F(1, 66) = 1.37, p = .25, \eta_p^2 = .02$ . In the pleasantness appraisal condition, a significant Thought Valence  $\times$  Emotion interaction also emerged,  $F(1, 66) = 7.32, p = .009, \eta_p^2 = .10$ . However, this interaction pattern was opposite to that in the confidence appraisal mode condition in that attitudes were more consistent with the direction of thoughts for surprised than for angry participants. This interaction demonstrated that among participants in the surprise condition, those listing positive personal characteristics reported more favorable attitudes toward themselves ( $M = 6.53, SD = 1.45$ ) than did those listing negative personal traits ( $M = 4.97, SD = 1.87$ ),  $F(1, 66) = 6.37, p = .014, \eta_p^2 = .09$ . On the other hand, in the anger condition there was no significant difference in participants' attitudes between those listing positive personal traits ( $M = 5.87, SD = 1.75$ ) and those listing negative characteristics ( $M = 6.55, SD = 1.78$ ),  $F(1, 66) = 1.52, p = .22, \eta_p^2 = .02$ . Finally, the Emotion  $\times$  Appraisal Type interaction was not significant,  $p = .50, \eta_p^2 = .003$ .

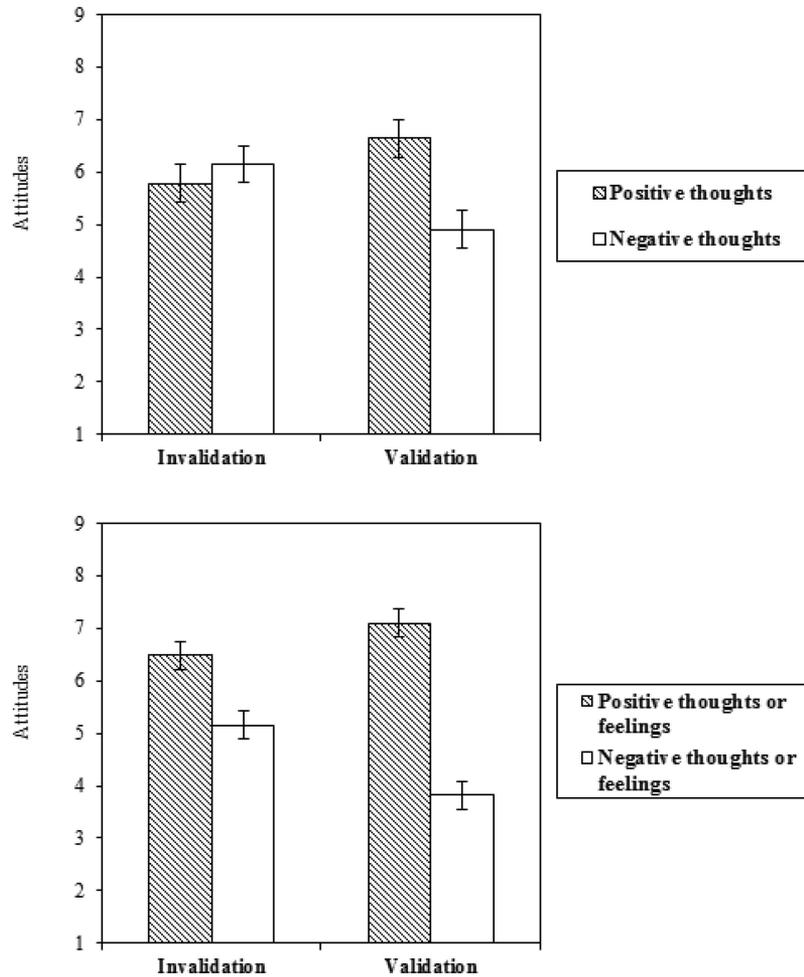


Figure 1. Top panel: Attitudes as a function of thought valence and validation condition in Study 1. Bottom panel: Attitudes as a function of thought or feeling valence and validation condition in Study 2. Error bars represent the standard errors associated with each mean.

condition) would rely more on their thoughts in expressing their attitudes than participants in the invalidation conditions (i.e., angry in the pleasantness appraisal condition and surprised in the confidence appraisal condition). Regressing attitudes onto the relevant variables, a significant interaction emerged between the trait-favorability index and the validation condition,  $B = .36$ ,  $t(135) = 3.15$ ,  $p = .002$ . Consistent with the self-validation prediction, this interaction revealed that participants' thoughts were more closely associated with attitudes when participants were in a validation condition ( $B = .36$ ,  $t(63) = 3.1$ ,  $p = .002$ ) than when they were in an invalidation one ( $B = -.078$ ,  $t(72) = -.660$ ,  $p = .51$ ).

## Discussion

The results of Experiment 1 support our hypothesis that the very same emotions can have different (and opposite) effects on the use of thoughts and, thus, attitudes toward the self depending on whether the confidence or the pleasantness appraisal of emotions is made salient. That is, the same emotional inductions were shown

to increase or decrease people's reliance on their thoughts across the different appraisal conditions. The fact that our appraisal manipulation moderated the impact of emotions on judgment in precisely the manner predicted by our self-validation hypothesis provides support for our underlying conceptualization (Petty, 1997; Spencer, Zanna, & Fong, 2005). Specifically, when people were placed in a confidence appraisal condition, anger increased the impact of the valence of the thoughts on attitudes relative to surprise consistent with our hypothesis that anger is associated with more confidence than surprise. In contrast, when people focused on the pleasantness appraisal of their emotion, anger decreased the impact of thought valence on attitudes relative to surprise consistent with the view that anger is a less pleasant emotion than surprise. In short, anger and surprise led to an opposite pattern of results (i.e., more or less reliance of thoughts) depending on whether people focused on the confidence or pleasantness appraisal of their emotion. This provides support for the notion that appraisals are important for understanding the impact of emotions on judgment and the same emotions can have dramat-

ically different consequences for judgment depending on the appraisal of emotion that is made salient.

In sum, the first experiment revealed that the emotions of anger and surprise can influence reliance on self-relevant thoughts and can subsequently impact self-related judgments. Notably, this study examined thoughts that were highly self-relevant. It might be possible that when thinking about oneself, people are more likely to look to how they feel or how confident they are to assess whether or not to rely on their own thoughts. To enhance the generality of our conceptualization, the second study examined whether our hypothesis relating emotion, thought valence, and appraisal will hold when people are making judgments about other people.

### Experiment 2: Anger Compared With Surprise Can Validate or Invalidate Thoughts About Others Depending on the Appraisal

In this experiment we aimed to replicate the moderating role of appraisal found in the previous study but move from a self-relevant domain to a person perception paradigm. In Experiment 2, rather than writing about positive or negative qualities of themselves as job candidates, participants were asked to read a story about an employee's positive or negative day at work. This manipulation was designed to vary the valence of the thoughts that participants generated toward the protagonist of the story. Second, after reading the story, we introduced a manipulation of appraisal to make pleasantness versus confidence salient. The induction consisted of an indirect manipulation in which participants were primed with either cognition or emotion. Specifically, half of the participants were asked to write about their *feelings* in response to the story, and the other half were asked to record their *thoughts* about the story. Though applied directly to the story, we expected this focus to influence the interpretation of the subsequently induced emotion. Thus, instead of having a word completion task introduced after the emotion induction, as in Experiment 1, this study used a relatively more ecologically valid induction in which participants focused on their thoughts or feelings regarding the story they read. Next, similar to Experiment 1, participants' emotional state was manipulated by asking them to remember and to write about two personal episodes in which they felt angry or surprised. Finally, participants reported their attitudes toward the person described in the story.

In line with Experiment 1, we expected that when people were in the confidence appraisal condition, their attitudes would be influenced by the confidence or doubt that accompanies their emotion. Thus, in the confidence appraisal conditions, we expected that anger would lead people to show greater reliance on their thoughts than surprise when evaluating the person in the story, conceptually replicating the confidence appraisal condition of Experiment 1. In contrast, we hypothesized that when people focused on the pleasantness appraisal, attitudes would be influenced by the pleasantness or unpleasantness associated with their emotion. In this case, we predicted that surprise would lead people to show greater reliance on their thoughts than anger when evaluating the person in the story, conceptually replicating the pleasantness appraisal condition of Experiment 1. Thus, as in the first study, we expected the attitude measure to reveal a three-way Thought Valence  $\times$  Appraisal Type  $\times$  Emotion interaction. As in Study 1,

this three way interaction would be comparable to more conceptually direct two-way interaction between Thought Valence and Thought Validation showing a greater impact of thought valence (more thought usage) in the validation conditions (i.e., angry in the confidence appraisal condition and surprised in the pleasantness appraisal condition) than in the invalidation conditions (i.e., angry in the pleasantness appraisal condition and surprised in the confidence appraisal condition). Neither Appraisal Type nor Emotion were expected to moderate this two-way interaction.

### Method

**Participants and design.** Participants were 159 undergraduate students at the Universidad Autónoma de Madrid (Spain). These students were randomly assigned to the cells of a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness)  $\times$  2 (Emotion: Anger vs. Surprise) between-subjects factorial design. As in Study 1, sample size was determined based on the number of participants who were collected from the start of the study until the end of the academic semester. We anticipated that the final sample would contain at least 20 participants per condition.

**Procedure.** Participants were told that they were going to be involved in two unrelated research projects in which the first study was about prototypical reactions to certain types of situations. They were given a story designed to elicit mostly positive or negative thoughts. Next, they were asked to write either their feelings or their thoughts about the story. Then, participants were asked to write about two times that they were surprised or angry. As in the previous experiment, this manipulation of emotion was described as being part of a separate, unrelated study on memory for personal events. Finally, participants reported their attitudes toward the person described in the story. Before leaving, participants completed the dependent measure and were then debriefed, thanked, and dismissed.

#### Independent variables.

**Thought or feeling valence.** The story participants read either described a person's positive (receiving a promotion) or negative (getting fired) day at work. The stories were designed to provoke either positive or negative thoughts and/or feelings about the protagonist, and were successfully pretested in previous research (Paredes et al., 2013). The goal was to vary the overall valence of the thoughts or feelings that were elicited (as in Experiment 1), but this time without explicitly instructing participants to generate material of a particular valence and for an object that was not related to the self, but to another person.

**Appraisal type.** The manipulation was aimed at making confidence or pleasantness appraisals of emotions salient by indirectly activating frames of mind relevant to cognition or to affect, respectively. Participants were asked to write about their cognitions (confidence appraisal) or their feelings (pleasantness appraisal) regarding a story involving a person at work. Ten boxes were provided to list up to 10 individual entries (Cacioppo & Petty, 1981). Manipulations in which participants are asked to focus on writing or thinking about feelings versus thoughts have been used previously with success in the domain of attitudes (Batra, & Ahtola, 1990; Breckler, 1984; Edwards, 1990; Haddock, & Zanna, 1998; Millar & Tesser, 1986; See, Petty, & Fabrigar, 2008), and also in other areas (e.g., Epstein, 2003; MacInnis, & DeMello,

2005; Shiv & Fedorikhin, 1999, 2002; Simpson, Oriña, & Ickes, 2003).

**Emotion.** As in Experiment 1, participants' emotional state was manipulated by asking them to write about past personal episodes related to anger or surprise.

#### Dependent measures.

**Attitudes.** Participants were asked to report their attitude toward the person in the story they read using a 9-point (1–9) semantic differential scale whose anchors were *good* and *bad*. As in the first study, this item was selected because it is a global index of evaluation that taps into both cognitive and affective aspects of attitudes.

**Thought favorability.** After writing their thoughts or feelings toward the protagonists of the story, participants were asked to rate each of them with respect to their degree of favorability toward the person. Favorability of each thought or feeling was rated on a 3-point scale ( $-1 = unfavorable$ ,  $1 = favorable$ ,  $0 = neutral$ ). As in Experiment 1, an index of the valence of message-related thoughts or feelings was created for each participant by subtracting the total number of unfavorable thoughts or feelings generated from the number of favorable thoughts or feelings that the participant had listed. To control for verbal skill, this difference score was then divided by the total number of message-related thoughts or feelings (e.g., Cacioppo & Petty, 1981).<sup>8</sup> Similar to the first study, this measure served as a manipulation check for the valence of the initial thoughts.

## Results

**Attitudes.** Results of the 2 (Thought Valence)  $\times$  2 (Appraisal Type)  $\times$  2 (Emotion) ANOVA on attitudes revealed a significant main effect of thought valence on attitudes,  $F(1, 151) = 72.74$ ,  $p < .001$ ,  $\eta_p^2 = .33$ , such that participants reported more favorable attitudes toward the target person in the positive ( $M = 6.79$ ,  $SD = 1.61$ ) than in the negative ( $M = 4.51$ ,  $SD = 1.91$ ) story condition. Of more importance, a significant three-way interaction between thought valence, appraisal type, and emotion condition emerged,  $F(1, 151) = 13.53$ ,  $p < .001$ ,  $\eta_p^2 = .08$ , replicating Experiment 1.<sup>9</sup>

To examine the extent of thought usage in the validation conditions (i.e., angry in the confidence appraisal condition and surprised in the pleasantness appraisal condition) versus the in the invalidation conditions (i.e., angry in the pleasantness appraisal condition and surprised in the confidence appraisal condition), we again conducted a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA and then a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Emotion: Surprise vs. Anger) ANOVA. Results revealed the predicted two-way interaction between Thought Valence and Validation,  $F(1, 151) = 13.53$ ,  $p < .001$ ,  $\eta_p^2 = .08$ . Importantly, this interaction was not further qualified by Appraisal Type,  $F(1, 151) = 1.21$ ,  $p = .27$ ,  $\eta_p^2 = .008$  or emotion,  $F(1, 151) = .00$ ,  $p = .98$ ,  $\eta_p^2 < .001$ .

As illustrated in the bottom panel of Figure 1, this interaction indicated that attitudes toward the protagonist of the story were more consistent with the valence of thoughts in the validation than in the invalidation conditions. That is, for the validation conditions, attitudes were more favorable for participants who read the positive story ( $M = 7.10$ ,  $SD = 1.32$ ) than for those who read the

negative one ( $M = 3.82$ ,  $SD = 1.72$ ),  $F(1, 151) = 72.94$ ,  $p < .001$ ,  $\eta_p^2 = .33$ . In the invalidation conditions, attitudes were also more favorable after reading the positive story ( $M = 6.48$ ,  $SD = 1.81$ ) than after reading the negative one ( $M = 5.15$ ,  $SD = 1.89$ ),  $F(1, 151) = 12.02$ ,  $p < .001$ ,  $\eta_p^2 = .07$ , although as indicated by the significant Thought Valence  $\times$  Thought Validation interaction, this difference was smaller.

**Thought/feeling favorability.** Participants' ratings of thought or feeling positivity toward the protagonist were also submitted to the same ANOVAs as attitudes. Results showed a significant main effect of thought/feeling valence on positivity, such that those in the positive valence condition ( $M = .57$ ,  $SD = .55$ ) showed greater positivity in thought/feeling content toward the person than did those in the negative valence condition ( $M = -.65$ ,  $SD = .41$ ),  $F(1, 151) = 246.23$ ,  $p < .001$ ,  $\eta_p^2 = .62$ . This finding shows that the manipulation of thought/feeling valence was successful. As expected, there were no main effects of emotion or appraisal or any additional interactions,  $ps > .27$ .

**Thought/feeling linkage with attitudes.** We also predicted that participants in the validation conditions (i.e., angry in the confidence appraisal condition and surprised in the pleasantness appraisal condition) would rely more on their thoughts/feelings

<sup>8</sup> One independent judge, unaware of the experimental conditions, coded participants' writings with respect to whether they expressed a thought or a feeling using a 3-point scale ( $-1 = emotion$ ,  $0 = neutral$ ,  $1 = thought$ ). As one might expect, the  $2 \times 2 \times 2$  ANOVA conducted on these ratings revealed a significant main effect for Appraisal Type, such that participants were perceived to list more emotional content in the pleasantness ( $M = -.87$ ,  $SD = .38$ ) than in the confidence ( $M = .63$ ,  $SD = .51$ ) appraisal type,  $F(1, 78) = 261.50$ ,  $p < .001$ , condition. There was also a non-significant tendency for participants to write fewer feelings in the surprise ( $M = -.08$ ,  $SD = .89$ ) than in the anger condition ( $M = -.19$ ,  $SD = .86$ ),  $F(1, 78) = 3.35$ ,  $p = .07$ . Finally, although not predicted, a main effect for Valence of Thoughts appeared on this measure revealing that the listed content was seen as more emotional in the positive ( $M = -.27$ ,  $SD = .84$ ) than in the negative story condition ( $M = -.01$ ,  $SD = .90$ ),  $F(1, 78) = 8.41$ ,  $p < .05$ ). No other significant effects emerged ( $ps > .10$ ).

<sup>9</sup> Decomposition of this three-way interaction revealed that the pattern of results varied as a function of the appraisal type manipulation. Among participants in the confidence appraisal condition, the Thought Valence  $\times$  Emotion interaction was significant,  $F(1, 75) = 9.37$ ,  $p = .003$ ,  $\eta_p^2 = .11$ , and showed that participants' attitudes were more reflective of their thoughts when they were angry than when they were surprised. In the anger condition, participants reported more favorable attitudes toward the protagonist in the positive ( $M = 7.05$ ,  $SD = 1.46$ ) than in the negative story ( $M = 3.44$ ,  $SD = 1.50$ ),  $F(1, 75) = 36.50$ ,  $p < .001$ ,  $\eta_p^2 = .33$ . The surprise condition showed a similar pattern of results with participants reporting more favorable attitudes toward the protagonist in the positive ( $M = 6.98$ ,  $SD = 1.43$ ) than in the negative story ( $M = 5.23$ ,  $SD = 1.33$ ),  $F(1, 75) = 2.83$ ,  $p = .097$ ,  $\eta_p^2 = .04$ , but the significant interaction suggests that this difference was smaller than in the anger condition. In the pleasantness appraisal type condition, a significant Thought Valence  $\times$  Emotion interaction emerged revealing the opposite pattern of results,  $F(1, 76) = 4.22$ ,  $p = .04$ ,  $\eta_p^2 = .05$ , such that participants' attitudes were more reflective of their thoughts when they were surprised rather than angry. This interaction showed that participants in the surprise condition formed more favorable attitudes in the positive ( $M = 7.17$ ,  $SD = 1.15$ ) than in the negative story condition ( $M = 4.15$ ,  $SD = 1.87$ ),  $F(1, 76) = 37.41$ ,  $p < .001$ ,  $\eta_p^2 = .33$ . Among those in the anger condition, participants also formed more favorable attitudes in the positive ( $M = 6.71$ ,  $SD = 1.10$ ) than in the negative story condition, though as suggested by the significant interaction, it was to a reduced degree ( $M = 5.10$ ,  $SD = 1.76$ ),  $F(1, 76) = 11.94$ ,  $p = .001$ ,  $\eta_p^2 = .14$ . Finally, the Emotion  $\times$  Appraisal Type interaction was not significant,  $p = .19$ ,  $\eta_p^2 = .01$ .

than participants in the invalidation conditions (i.e., angry in the pleasantness appraisal condition and surprised in the confidence appraisal condition) when expressing their attitudes. Regressing attitudes onto the relevant variables, a significant interaction emerged between the thought/feeling-favorability index and the validation condition,  $B = .198$ ,  $t(155) = 2.14$ ,  $p = .03$ . This trend revealed that participants' thoughts and feelings tended to be more closely linked to attitudes when participants were in a validation condition ( $B = .621$ ,  $t(76) = 6.91$ ,  $p < .001$ ) than when they were in a nonvalidation one ( $B = .424$ ,  $t(79) = 4.17$ ,  $p < .001$ ).

## Discussion

The results of Experiment 2 provided a conceptual replication of Experiment 1, extending the contribution from self-attitudes to interpersonal attitudes and using a different appraisal induction. When participants were in the confidence appraisal condition, anger led attitudes to be more closely associated with participants' valenced thoughts and feelings than surprise, consistent with what would be expected from a confidence appraisal of the emotions elicited. In contrast, when participants were in the pleasantness appraisal condition, anger led attitudes to be less closely associated with participants' thoughts and feelings than surprise, consistent with a pleasantness appraisal of the emotions. These results are in accord with Study 1 suggesting that the same emotion can lead to more or less reliance on one's thoughts or feelings depending on the appraisal of the emotion that is salient. Finally, this study revealed that emotion enhanced (or decreased) the effect of thoughts on attitudes not only for a new object of evaluation, but also with a new induction of appraisal.

### Experiment 3: Anger Compared With Surprise Can Validate or Invalidate Thoughts About Health Behavior Depending on Appraisal

The primary aim in Experiment 3 was to examine whether a more direct manipulation of appraisal could lead to the predicted pattern of results obtained previously, providing another conceptual replication. In Experiment 1 we used a relatively subtle word completion task introduced after the emotion induction in order to manipulate the appraisal of the emotion that was salient. In this task participants completed general words both directly and indirectly related to either appraisal along with many neutral, filler words. In Experiment 2, we moved to a different induction of appraisals of emotion in which participants focused on their thoughts (as an indirect way to activate the confidence appraisal) or feelings (as an indirect way to activate the pleasantness appraisal) regarding the story they read. Because it is possible that these inductions varied something other than the confidence and pleasantness appraisals that we intended, in the present study we employ a more direct, proximal method that focuses on priming the two core appraisals of interest more directly. This approach should help to assuage any concerns about whether the more indirect inductions used in Studies 1 and 2 would produce the same results as a more specific Pleasantness/Confidence appraisal induction. Thus, in Experiment 3 after participants were induced to think about episodes of anger or surprise, we asked them questions about their feelings of pleasantness (pleasantness appraisal) or confidence (confidence appraisal). That is, we embedded the crit-

ical appraisal words in questions about how they felt about the emotional episodes they recalled. This new induction of appraisal was intended to isolate more specifically the different appraisals we have argued are responsible for the thought validation effects by focusing participants more directly and exclusively on the appraisal dimensions of interest.

Specifically, participants were exposed to either four confidence/doubt words in the confidence condition or to four pleasant/unpleasant words in the pleasantness condition embedded within questions they were to answer. To the extent that the results are the same as the prior two studies, it makes it even more plausible that our pleasantness versus confidence induction had the observed effects because of the intended appraisals. Furthermore, although we could not generate a plausible alternative explanation for the findings in Studies 1 and 2, triangulation on the core concepts with a new manipulation would make a more compelling case for our conceptual framework (Shadish, Cook, & Campbell, 2001).

In addition to using a more direct appraisal induction, this study also aimed to extend the previous results and generalize the effects to a totally different domain. So far, we examined the validation effects of anger and surprise on evaluations of the self (Experiment 1) and other people (Experiment 2). Thus, in our previous studies, participants were thinking about people (either themselves or others). To move from this social context to another domain with practical implications, in the present study we used a health-relevant topic. Specifically, in the present experiment, participants began by reading a message containing either strong or weak arguments advocating the consumption of more vegetables. The manipulation of argument quality was designed to vary the valence of the thoughts that participants generated toward the persuasive proposal. That is, when people are thinking about the message information, the strong arguments are expected to elicit mostly favorable thoughts toward the proposal. On the other hand, when thinking about weak arguments, participants are expected to generate mostly negative thoughts about the proposal (Petty & Cacioppo, 1986). Next, similar to the previous studies, emotion was manipulated by asking participants to recall prior episodes in which they felt either angry or surprised. After writing about their past experiences, the manipulation of appraisal was induced. As noted, half of the participants were exposed to confidence/doubt words in the confidence appraisal condition and the other half were exposed to four pleasant/unpleasant words in the pleasantness appraisal condition. Finally, participants completed the attitude measure about the proposal.

In line with the previous experiments, we expected the attitude measure to reveal a three-way Thought Valence  $\times$  Appraisal Type  $\times$  Emotion interaction which would be comparable to a two-way Thought Valence  $\times$  Thought Validation interaction showing more reliance on the valence of the thoughts in the validation conditions (i.e., angry in the confidence and surprised in the pleasantness condition) than in the invalidation conditions (i.e., angry in the pleasantness and surprised in the confidence condition).

## Method

**Participants and design.** Participants were 125 undergraduate students at the Universidad Autónoma de Madrid (Spain). Students were randomly assigned to the cells of a 2 (Argument

Quality: Strong vs. Weak)  $\times$  2 (Emotion: Surprise vs. Anger)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) between-subjects factorial design. As in the prior studies, sample size was determined based on the number of participants who could be collected from the start of the study until the end of the academic semester. Although we anticipated that about 20 participants per condition would be available, the procedure resulted in an average of 15 per cell. Nonetheless, we analyzed the data with the sample obtained.

**Procedure.** Participants were told that they were going to be involved in two unrelated research projects. The first study was about health habits. They were given a message containing strong or weak arguments about eating more vegetables. These messages were designed to produce either mostly positive or negative thoughts, respectively. Next, participants were asked to write their thoughts about the consumption of vegetables. Then, as part of a filler task, participants were asked to write about two times that they were surprised or angry. Following this induction of emotion, they responded to some questions using words either related to pleasantness/unpleasantness or to confidence/doubt. Finally, participants reported their attitudes toward vegetables and were then debriefed, thanked, and dismissed.

#### Independent variables.

**Argument quality.** The message about vegetable consumption contained either strong or weak arguments in favor of greater consumption. This manipulation was designed to influence the favorability of participants' cognitive responses if they were thinking about the message (Petty & Cacioppo, 1986). The gist of one of the strong arguments in favor of vegetable consumption was that vegetables have more vitamins than the majority of vitamin supplements on the market, making them especially appropriate during exams and workout periods. The gist of one of the weak arguments was that vegetables are becoming more popular for wedding celebrations because they are colorful and look beautiful on plates. The argument quality of the two messages was pretested and this induction has been used in previous research showing that the strong version of the message produces mostly favorable thoughts whereas the weak one produces mostly negative thoughts (e.g., Briñol, Petty, & Wheeler, 2006; Horcajo, Briñol, & Petty, 2010).

**Emotion.** The emotion induction was similar to the previous experiments. Participants were asked to write about past personal episodes related to anger or surprise.

**Appraisal type.** After participants listed their episodes of anger or surprise, they responded to questions containing words either related to pleasantness/unpleasantness (e.g., How pleasant did the emotional experience make you feel; pleasantness appraisal type) or words related to confidence/doubt (e.g., How confident did the emotional experience make you feel; confidence appraisal type). Specifically, in the pleasantness appraisal condition, participants received questions with the following four words included: good, pleasant, bad, and unpleasant. In contrast, for the confidence appraisal condition, the four words were: confident, sure, uncertain, and doubtful. Thus, instead of presenting the key priming words in the context of other words during a word-completion task as in Study 1, in this experiment we embedded the critical priming words in questions regarding the emotional experiences they had just recalled (for conceptually

similar procedures, see Smith & Ellsworth, 1985; Tiedens & Linton, 2001).

#### Dependent measures.

**Attitudes.** To assess overall evaluation of the message, participants were asked to rate the proposal about increasing vegetable consumption on a 9-point scale that ranged from *bad* to *good*, the same measure as in the prior studies.

**Thought favorability.** After reading the persuasive message, participants were asked to write their thoughts toward the consumption of vegetables, and to rate each of them with respect to their degree of favorability toward the proposal. As in the previous experiments, an index of the valence of message-related thoughts was created for each participant by subtracting the number of unfavorable thoughts generated from the number of favorable thoughts that the participant had listed, and this difference score was then divided by the total number of message-related thoughts. This measure served as a manipulation check for the Argument Quality induction since that induction was designed to produce either mostly favorable or unfavorable thoughts.

## Results

**Attitudes.** Results of a 2 (Argument Quality: Strong vs. Weak)  $\times$  2 (Emotion: Anger vs. Surprise)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA revealed the predicted three-way interaction between these three variables,  $F(1, 117) = 8.50, p = .004, \eta_p^2 = .068$ .<sup>10</sup> To examine the extent to which participants relied on their thoughts in the validation conditions (i.e., angry in the confidence appraisal condition and surprised in the pleasantness appraisal condition) compared with the invalidation conditions (i.e., angry in the pleasantness appraisal condition and surprised in the confidence appraisal

<sup>10</sup> As expected, decomposition of this interaction showed that the pattern of results varied as a function of the appraisal type manipulation. In the confidence appraisal condition, a significant Thought Valence  $\times$  Emotion interaction emerged,  $F(1, 59) = 8.77, p = .004, \eta_p^2 = .13$ . This interaction indicated that attitudes were consistent with the favorability of the thoughts for angry but not for surprised participants. That is, participants in the anger condition liked the idea of consuming vegetables more when they had read the strong message ( $M = 5.73, SD = 2.05$ ) than when they had read the weak one ( $M = 4.06, SD = 1.61$ ),  $F(1, 59) = 7.80, p = .007, \eta_p^2 = .12$ . In contrast, among participants in the surprise condition, the effect was in the opposite direction. Although not significant, surprised participants tended to show relatively more negative evaluations of the proposal in response to the strong ( $M = 5.69, SD = 1.54$ ) compared with the weak ( $M = 6.50, SD = 1.41$ ) message,  $F(1, 59) = 1.91, p = .72, \eta_p^2 = .03$ . In the pleasantness appraisal type condition, the Thought Valence  $\times$  Emotion interaction was not significant,  $F(1, 58) = 1.69, p = .20, \eta_p^2 = .03$ , though it was in the expected direction. That is, the pattern of means was opposite to the one obtained in the confidence appraisal condition. Specifically, angry participants tended to have more favorable attitudes after reading the weak ( $M = 5.53, SD = 1.92$ ) compared with the strong ( $M = 4.65, SD = 1.99$ ) message,  $F(1, 58) = 1.69, p = .19, \eta_p^2 = .03$ . In contrast, among participants in the surprise condition, those who read the strong message showed the opposite trend, reporting more favorable evaluations for the strong ( $M = 5.15, SD = 2.08$ ) than the weak ( $M = 4.76, SD = 1.72$ ), message,  $F(1, 58) = .30, p = .58, \eta_p^2 = .005$ , although these differences were not significant. Finally, the Emotion  $\times$  Appraisal interaction was significant,  $F(1, 117) = 4.23, p = .04, \eta_p^2 = .03$ , indicating that the effect was more prominent in the confidence appraisal,  $F(1, 117) = 6.97, p = .009, \eta_p^2 = .06$ , than in the pleasantness one,  $F(1, 117) = .08, p = .78, \eta_p^2 = .001$ .

condition), we conducted a 2 (Argument Quality: Strong vs. Weak)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA and a 2 (Argument Quality: Strong vs. Weak)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Emotion: Surprise vs. Anger) ANOVA. Results revealed the predicted two-way interaction between Argument Quality and Validation,  $F(1, 117) = 8.49, p = .004, \eta_p^2 = .07$ . As in the prior studies, this interaction was not further qualified by Appraisal Type,  $F(1, 117) = .88, p = .35, \eta_p^2 = .007$  or emotion,  $F(1, 117) = 1.10, p = .29, \eta_p^2 = .009$ .

As illustrated in the top panel of Figure 2, this interaction indicated that evaluations of the proposal were more consistent with the valence of thoughts in the validation than in the invalidation conditions. That is, for the validation conditions, evaluations were more favorable when participants read the strong arguments ( $M = 5.46, SD = 2.05$ ) than when they read the weak ones ( $M = 4.42, SD = 1.68$ ),  $F(1, 117) = 4.96, p = .03, \eta_p^2 = .04$ . In contrast, in the invalidation conditions, evaluations tended to be more favorable after reading the weak

arguments ( $M = 6.03, SD = 1.72$ ) than after reading the strong ones ( $M = 5.15, SD = 1.84$ ),  $F(1, 117) = 3.57, p = .06, \eta_p^2 = .03$ . Finally, there was a main effect of Thought Validation on evaluations, such that in the Validation condition, evaluations were less favorable ( $M = 4.90, SD = 1.91$ ) than in the Invalidation condition,  $M = 5.58, SD = 1.82, F(1, 117) = 4.23, p = .04, \eta_p^2 = .04$ .

**Thought favorability.** Participants' ratings of thought favorability toward vegetable consumption were also submitted to the same ANOVAs as attitudes. As expected, results showed a significant main effect of thought valence on thought favorability, with more favorable thoughts listed after reading the strong ( $M = .13, SD = .16$ ) rather than the weak ( $M = .05, SD = .11$ ) message,  $F(1, 109) = 12.5, p < .001, \eta_p^2 = .10$ . This finding shows that argument quality influenced thought valence as intended. There was also a marginal three-way interaction of Argument Quality  $\times$  Thought Validation  $\times$  Type of Appraisal,  $F(1, 109) = 3.64, p = .059, \eta_p^2 = .03$ , suggesting that this effect of argument quality on thought favorability tended to be greater for the validation conditions than for the invalidation ones in

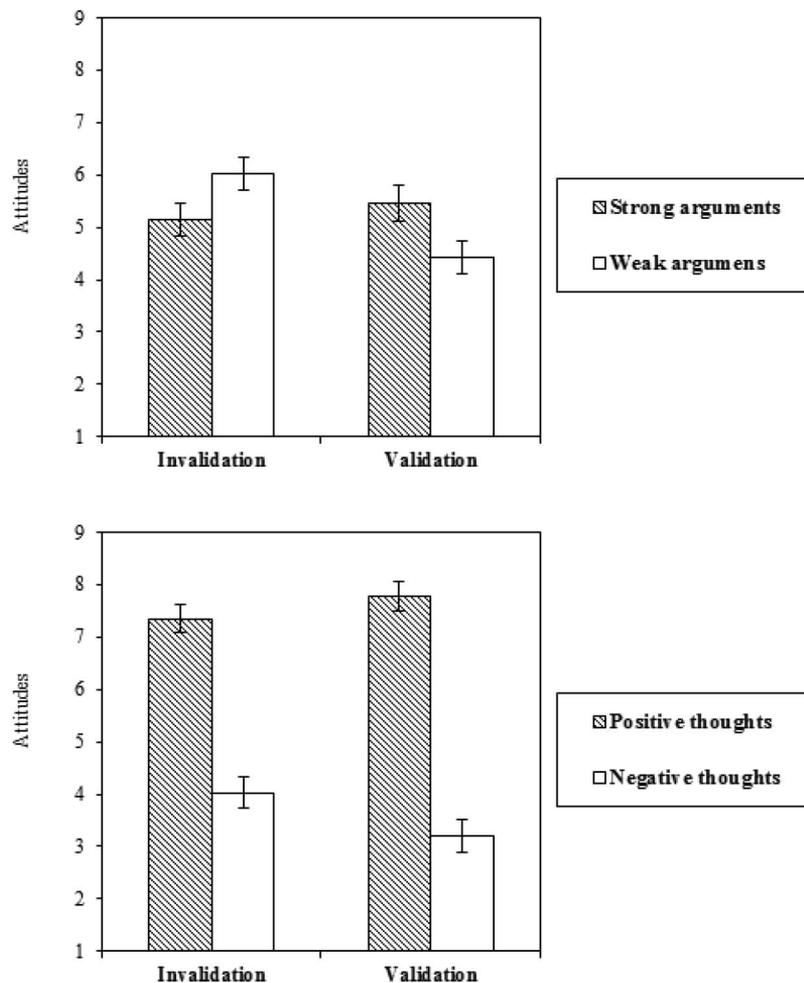


Figure 2. Top panel: Attitudes as a function of argument quality and validation condition in Study 3. Bottom panel: Attitudes as a function of thought valence and validation condition in Study 4. Error bars represent the standard errors associated with each mean.

the pleasantness appraisal condition,  $F(1, 109) = 3.27, p = .07, \eta_p^2 = .03$ , more than in the confidence appraisal one,  $F(1, 109) = .18, p = .68, \eta_p^2 = .002$ . As expected, there was no main effect of validation, appraisal or further interactions,  $ps > .11$ .

**Thought-attitude linkage.** As in the previous studies, we also predicted that participants in the validation conditions (i.e., angry in the confidence appraisal condition and surprised in the pleasantness appraisal condition) would rely more on their thoughts in expressing their attitudes than participants in the invalidation conditions (i.e., angry in the pleasantness appraisal condition and surprised in the confidence appraisal condition). Regressing attitudes onto the relevant variables did not produce a significant interaction between the thought-favorability index and the validation condition as was predicted,  $B = .138, t(113) = 1.03, p = .30$ . Although the interaction was not significant in this experiment, the direction of the effect was such that participants' thoughts were only correlated with evaluations of the proposal when they were in a validation condition ( $B = .31, t(53) = 2.39, p = .02$ ) but not when they were in an invalidation one ( $B = .093, t(60) = .722, p = .47$ ).

## Discussion

The results of Experiment 3 replicated the initial two studies, extending the contribution from self and others' evaluations to an object (vegetable consumption), a health-related topic. As in the previous experiments, when participants were in the confidence appraisal condition, anger led to greater use of thoughts than surprise, whereas when participants were in the pleasantness appraisal condition, anger led to less use of thoughts than surprise. Finally, in the present study, a more direct manipulation of appraisal was used, providing another conceptual replication. In the first study emotional appraisal was manipulated through a word completion task using words related to confidence and pleasantness as well as affect and cognition more generally. In the second study, participants were asked to focus on their thoughts or feelings as an indirect way to facilitate a confidence or pleasantness appraisal. In this study, after the emotion induction, participants were exposed to questions using either words such as pleasant/unpleasant (pleasantness appraisal condition) or words such as confidence/doubt (confidence appraisal condition). Across all of these variations in the procedure used to vary the salience of appraisals, the results were similar.

In the first three experiments, we focused on the emotions of anger and surprise because they made for a good comparison in that they have opposite meanings on the key appraisal dimensions of pleasantness and confidence. In the next experiment, our aim is to show that our results are not unique to anger so we focus on another multifaceted emotion for which the confidence and pleasantness appraisal is mismatched: disgust.

### Experiment 4: Disgust Compared With Surprise Can Validate or Invalidate Thoughts About a Persuasion Proposal

Our fourth experiment tested the extent to which we could generalize our results to another complex, multifaceted emotion—disgust. Disgust is relevant in this context because like

anger, disgust is an unpleasant emotional state that is associated with confidence. Because disgust has been shown in past research guided by appraisal theories of emotion (e.g., Smith & Ellsworth, 1985) to increase confidence relative to negative but uncertain emotions such as sadness (Tiedens & Linton, 2001), we reasoned that disgust would enhance the impact of accessible thoughts on social judgments, compared with a relatively positive but doubt-inducing emotion, surprise, but only if the confidence appraisal was salient. In contrast, if the pleasantness appraisal is salient, disgust as an unpleasant emotion, is expected to reduce thought reliance compared with surprise, a more pleasant emotion. Thus, disgust was expected to mimic the effects of anger in the first three studies.

Disgust is also an especially interesting emotion to examine in the context of our self-validation framework because some prior research has shown that disgust is capable of polarizing judgments, particularly in the domain of morality (e.g., Horberg, Oveis, & Keltner, 2011; Seidel & Prinz, 2013). For example, previous research has shown that disgust (vs. other negative emotions) fosters more negative judgments in terms of moral condemnation (e.g., Schnall, Haidt, Clore, & Jordan, 2008; Schnall, 2017; Wheatley & Haidt, 2005). Indeed, disgust has been observed to relate to negative judgments toward stigmatized social groups. For instance, disgust has been associated with increased negativity toward gay men (Inbar, Pizarro, Knobe, & Bloom, 2009) and obese individuals (Vartanian, 2010). Among the several accounts proposed, a common explanation for this effect is that disgust and moral reasoning are intimately related, such that disgust serves as a negative signal when judging the moral status of an action or person (Pizarro, Inbar, & Helion, 2011). We propose that another reason that this polarization of negative judgments with disgust could occur is because disgust is associated with feelings of confidence, and thus disgust (relative to low-confidence emotions such as surprise) can polarize judgments regardless of topic and the direction of one's thoughts. As a consequent, our self-validation approach predicts that disgust can make negative moral judgments more negative, but can also make positive moral judgments more positive, and that this polarization effect will be restricted to conditions where the certainty appraisal of the disgust emotion is salient (i.e., when disgust is most likely to induce feelings of confidence). In contrast, when the pleasantness appraisal of disgust is salient, polarization is not expected.

Interestingly, a recent meta-analysis of the impact of disgust on judgmental polarization (Landy & Goodwin, 2015) concluded that the impact of disgust on judgmental extremity was rather small and when publication bias was accounted for, the effect disappeared (see also Kayyal, Pochedly, McCarthy, & Russell, 2015). Our appraisals analysis suggests a possibly different interpretation of the weak (or overall null) effect observed in the literature on disgust and polarization. That is, we suggest that disgust is capable of both polarizing beliefs when the confidence appraisal is salient but also depolarizing beliefs when the pleasantness appraisal is salient. Because no prior research has manipulated or measured the confidence appraisal in their investigations of the impact of disgust on judgment, it could well be that in the studies finding a polarization effect, the situational context favored a confidence appraisal and in studies that found no effect, different appraisals

were operating for different people and the opposing effects canceled each other out. In any case, our Study 4 examines whether the polarization effect for disgust would occur when a confidence but not a pleasantness appraisal was salient.

To extend our results to yet another judgmental domain, in this experiment the persuasive message used was related to a fictitious animal target. That is, participants first read one of four separate brief descriptions of a fictitious animal—the “lemphur”—that varied in valence and in thought content. Half of the participants read a story describing the lemphurs positively, whereas the other half of participants read a story describing the lemphurs negatively. In addition to this manipulation of thought valence, an additional manipulation of appraisal was introduced. That is, half of stories contained factual information about lemphurs’ qualities that served as an indirect proxy to prime the confidence appraisal, whereas the other half of the stories contained emotional descriptions of lemphurs serving as a distal proxy to prime the pleasantness appraisal. After reading their assigned lemphur description, participants wrote the emotion-induction essay, which was similar to the ones used in previous experiments. That is, half of participants wrote about a recent occasion during which they felt disgusted, whereas the other half wrote about a recent occasion during which they felt surprised. Finally, participants reported their general evaluation (i.e., good vs. bad) of the lemphurs and were debriefed, thanked, and dismissed.

In line with all three prior studies, we expected the attitude measure to reveal a three-way Thought Valence  $\times$  Appraisal Type  $\times$  Emotion interaction and the comparable Thought Valence  $\times$  Thought Validation interaction showing more thought usage in the validation conditions (i.e., disgusted in the confidence appraisal condition and surprised in the pleasantness appraisal condition) than in the invalidation conditions (i.e., disgusted in the pleasantness appraisal condition and surprised in the confidence appraisal condition).

## Method

**Participants and design.** Participants were 132 undergraduates at Ohio State University who were enrolled in introductory psychology courses. The participants were randomly assigned to the 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Emotion: Disgust vs. Surprise)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) between-participants factorial design. As in the prior studies, sample size was determined based on the number of participants who were collected from the start of the study until the end of the academic semester. Although we anticipated that at least 20 participants per condition would be available, the final sample was about 17 per cell.

**Procedure.** Participants were first given a message describing a fictional marine animal species known as lemphurs that was described in a way to elicit predominantly favorable thoughts or unfavorable thoughts. Apart from favorable or unfavorable presentation of lemphurs, half of participants read a cognitive description designed to indirectly facilitate a confidence appraisal of the subsequently induced emotion and the other half read a story with an affective description of lemphurs designed to facilitate a pleasantness appraisal. Next, participants were asked to write their thoughts about the lemphurs.

Then, as part of a filler task, participants were asked to write about two times that they were disgusted or surprised. Following this induction of emotion, participants reported their attitudes toward the fictitious animal and were then debriefed, thanked, and dismissed.

### Independent variables.

**Thought valence.** Participants were randomly assigned to read a story describing a fictional marine animal species known as lemphurs in predominantly favorable or unfavorable terms. Prior research has demonstrated that the positive lemphur descriptions elicit predominantly favorable thoughts and that the negative descriptions elicit predominantly unfavorable thoughts (See et al., 2008).

**Appraisal type.** Apart from favorable or unfavorable presentation of lemphurs, half of participants read a story containing factual information about the attributes and cognitive qualities of lemphurs (confidence appraisal condition) whereas the other half read a story with an affective description of lemphurs (pleasantness appraisal condition). An example of cognitive information is “Lemphurs are extremely intelligent creatures.” An example of affect-focused information is “the delicateness of the motion of these creatures makes me feel amazed.” Prior research that developed these materials has demonstrated that these messages differ in the extent to which they are perceived to be cognitively versus affectively based (Crites et al., 1994; See, Petty, & Fabrigar, 2013; See et al., 2008). Our assumption was that an emphasis on the “facts” about lemphurs would be an indirect way to facilitate a confidence appraisal whereas an emphasis on the “feelings” about lemphurs would distal way to facilitate a pleasantness appraisal.

**Emotion.** After reading about the lemphurs, participants were asked to write a short essay describing a recent personal experience. Procedurally, this manipulation was similar to that used in our previous studies, with the exception that the emotions were disgust and surprise rather than anger and surprise.

**Dependent variable.** We assessed evaluations of lemphurs using the same single item used in the prior studies. That is, participants reported their attitudes toward lemphurs using a 9-point semantic differential scale whose anchors were *good* and *bad*.

## Results

A 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Emotion: Disgust vs. Surprise)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA on the attitude measure revealed a significant main effect of thought valence overall, such that evaluations were more favorable for those who received the positive description ( $M = 7.56$ ,  $SD = 1.56$ ) than for those who received the negative description ( $M = 3.65$ ,  $SD = 1.91$ ),  $F(1, 124) = 187.22$ ,  $p < .001$ ,  $\eta_p^2 = .60$  of the lemphur. Moreover, there was a nonsignificant main effect of emotion, such that evaluations tended to be more favorable in the surprise ( $M = 6.14$ ,  $SD = 2.58$ ) than in the disgust ( $M = 5.51$ ,  $SD = 2.23$ ) condition,  $F(1, 124) = 2.53$ ,  $p = .11$ ,  $\eta_p^2 = .02$ .

Most importantly, we observed a significant three-way interaction of Thought Valence, Emotion, and Appraisal Type for lem-

phur evaluations,  $F(1, 124) = 4.76, p = .03, \eta_p^2 = .04$ .<sup>11</sup> After collapsing validation conditions (i.e., disgusted in the confidence appraisal condition and surprised in the pleasantness appraisal condition) and invalidation conditions (i.e., disgusted in the pleasantness appraisal condition and surprised in the confidence appraisal condition), we ran a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA and then a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Emotion: Surprise vs. Disgust) ANOVA. Results revealed the predicted two-way interaction between Thought Valence and Validation,  $F(1, 124) = 4.76, p = .03, \eta_p^2 = .04$ . Importantly, this interaction was not further qualified by Appraisal Type,  $F(1, 124) = .04, p = .84, \eta_p^2 < .001$ , or Emotion,  $F(1, 124) = .28, p = .60, \eta_p^2 = .002$ .

As illustrated in the bottom panel of Figure 2, this interaction indicated that evaluations were more consistent with the valence of thoughts in the validation than in the invalidation conditions. That is, for the validation conditions, evaluations were more favorable when participants read the positive description ( $M = 7.77, SD = 1.37$ ) than when they read the negative one ( $M = 3.21, SD = 1.89$ ),  $F(1, 124) = 120.17, p < .001, \eta_p^2 = .49$ . In the invalidation conditions, attitudes were also more favorable after reading the positive description ( $M = 7.35, SD = 1.33$ ) than after reading the negative one ( $M = 4.03, SD = 1.87$ ), although the interaction suggests that this difference was smaller  $F(1, 124) = 69.44, p < .001, \eta_p^2 = .36$ .

## Discussion

In Experiment 4, we extended the effects we first observed for anger to another emotion—disgust. In particular, we demonstrated that the same emotions—namely, surprise and disgust—can either validate thoughts or invalidate thoughts as a function of the appraisals for the emotions that are salient at the time of judgment. Specifically, when participants read a cognitive passage prior to the emotional recall task, disgust validated thoughts relative to surprise, leading to more polarized evaluations. This finding is consistent with the elevated certainty that is proposed to accompany disgust and the relative doubt that is proposed to accompany surprise (Tiedens & Linton, 2001). But, this effect only emerged in the confidence appraisal condition. In contrast, when participants read an affective passage prior to the emotional recall task (pleasantness appraisal condition), disgust led to less thought use relative to surprise resulting in less extreme judgments. This finding is consistent with the elevated unpleasantness that is proposed to accompany disgust and the relative pleasantness that is proposed to accompany surprise (Lerner & Keltner, 2000) when the pleasantness appraisal of the emotion is made salient.

### Experiment 5: Awe (vs. Anger) Influences Perceived Validity of Thoughts

In the studies conducted so far we relied on a moderational approach to provide support for our conceptualization. We believe that the convergent experimental evidence provided across different manipulations, samples, issues, and measures makes a compelling case in favor of our differential appraisals hypothesis given the rather complex pattern of attitudinal outcomes that were ob-

served in these studies. Indeed, it is difficult to imagine alternative accounts for our predicted results. However, mediational evidence can help build the case that the same emotion can lead to more or less reliance on one's thoughts depending on the appraisal of the emotion that is highlighted. Therefore, in this final experiment we relied on a mediational approach to testing the proposed thought validation mechanism along with the moderation approach.

We also introduced five changes with respect to previous studies. First, participants were presented with a new topic—one of two articles advocating either the benefits or the risks related to the use of cell phones by children. This manipulation was designed to vary the valence of the thoughts that participants generated toward this proposal. Second, instead of surprise, this study examined a new positive but doubtful emotion: awe (e.g., Rudd et al., 2012; Shiota et al., 2007; Stellar et al., 2018). Third, after completing both inductions, we employed another novel manipulation that was designed to focus participants' attention on the pleasantness/unpleasantness or the confidence/doubt appraisal of their emotion. Finally, all participants reported their attitudes toward the topic of cell phones described in the initial article. The fourth variation of this study is that we used a combination of several items of general evaluation of the proposal to increase the reliability of the dependent measure. Most importantly, in this study, all participants rated the extent to which they relied on their thoughts (perceived validity) about the cell phone topic (i.e., we assessed the proposed mediator).<sup>12</sup>

We expected the same interaction of Thought Valence, Emotion, and Appraisal Type on attitudes observed in previous studies. That is, we predicted that when in the confidence appraisal condition, participants feeling angry would use their thoughts more than those feeling awed and the opposite would be true for the pleasantness appraisal conditions. As in the previous experiments, we also examined the thought-attitude relationship across the

<sup>11</sup> Decomposition of this interaction showed that the pattern of results varied as a function of the appraisal type manipulation. In the confidence appraisal condition, the interaction between Thought Valence and Emotion, although not significant,  $F(1, 59) = 2.34, p = .13, \eta_p^2 = .04$ , was in the predicted direction. That is, the pattern of results indicated that attitudes were consistent with the favorability of the thoughts more for disgusted than for surprised participants. Specifically, participants in the disgust condition had more favorable attitudes toward lemphurs after reading the positive ( $M = 7.50, SD = 1.50$ ) than after reading the negative description ( $M = 3.07, SD = 1.83$ ),  $F(1, 59) = 49.09, p < .001, \eta_p^2 = .45$ . In the surprise condition, attitudes were also more favorable after reading the positive description ( $M = 7.50, SD = 1.46$ ) than after reading the negative one ( $M = 4.43, SD = 2.24$ ), although this difference was less pronounced,  $F(1, 59) = 23.97, p < .001, \eta_p^2 = .29$ . In the pleasantness appraisal condition, the interaction between Thought Valence  $\times$  Emotion was also not significant,  $F(1, 65) = 2.41, p = .12, \eta_p^2 = .04$ , though again was in the predicted direction. Notably, the pattern of results for this interaction was opposite to the one obtained in the confidence appraisal condition indicating that thought valence influenced attitudes more in the surprise than in the disgust condition. That is, surprised participants had more favorable attitudes after reading the positive ( $M = 8.00, SD = 1.24$ ) compared with the negative ( $M = 3.38, SD = 2.02$ ) description,  $F(1, 65) = 74.30, p < .001, \eta_p^2 = .53$  and disgusted participants also had more favorable attitudes after reading the positive ( $M = 7.21, SD = 1.23$ ) than after reading the negative ( $M = 3.72, SD = 1.53$ ) description,  $F(1, 65) = 50.82, p < .001, \eta_p^2 = .44$ . However, the latter difference was smaller than the former.

<sup>12</sup> Study 5 was conducted in response to a request from the reviewers of the original manuscript submission and thus the key dependent measure was modified and an assessment of the presumed mediator was included.

predicted validation and invalidation conditions. Furthermore, we predicted that neither appraisal type nor emotion would moderate the Thought Validation  $\times$  Thought Valence interaction. Most importantly, we expected perceived validity of thoughts to mediate attitude change.

## Method

**Participants and design.** Participants were 258 undergraduate students at the Athens University of Economics and Business (Greece). These students were randomly assigned to the cells of a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Emotion: Anger vs. Awe)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) between-subjects factorial design. Sample size was determined based on the number of participants who were collected from the start of the study until the end of the academic semester. We anticipated that the final sample would contain at least 20 participants per condition and we obtained a final average of 32 participants per condition.

**Procedure.** Participants were told that they were going to be involved in three unrelated research projects. First, they were given an article designed to elicit mostly positive or negative thoughts about the use of cell phones by children. Next, participants were asked to remember events associated with seeing a panoramic view for the first time from a high place (awe induction) or to remember events associated with being insulted or treated unfairly (anger induction). After completing the first two inductions, participants were asked to point their index finger of their nondominant hand either to their head (confidence appraisal) or to the heart (pleasantness appraisal) and keep this position until the end of the study. Finally, participants reported the perceived validity of the thoughts that came to mind (proposed mediator), and provided attitude ratings toward the use of cell phones described in the article (dependent measure). Before leaving, they were then debriefed, thanked, and dismissed.

### Independent variables.

**Thought valence.** The article participants read either described the benefits of cell phone use by children or the risks. The articles were designed to provoke either positive or negative thoughts about cell phone use. The goal was to vary the overall valence of the thoughts or feelings that were elicited as in the prior studies.

**Emotion.** Participants were randomly assigned to the conditions of awe or anger. In the awe conditions, participants were asked to remember an event in their life when they saw a particular panoramic view for the first time. They were told that some examples might be seeing a sunset, seeing the view from a high place, or any other time that they were in a natural setting that they felt was really beautiful. This particular induction was taken from previous research on awe (Piff, Dietze, Feinberg, Stancato, & Keltner, 2015) and it is similar to other previously validated inductions in this domain (Bai et al., 2017; Griskevicius et al., 2010; Rudd et al., 2012; Shiota et al., 2007; Stellar et al., 2018). In the anger conditions, participants were asked to remember an event in their life when they were treated unfairly, they were accused of something they had not done, or they were insulted (Baumeister, Stillwell, & Wotman, 1990; Bremner, Koole, & Bushman, 2011; Dunn & Schweitzer, 2005; Harmon-Jones, Bastian, & Harmon-Jones, 2016; Kuppens, Van Mechelen, Smits, & De Boeck, 2003).

**Appraisal mode.** Participants were randomly assigned to one of the two metaphor-embodiment conditions relevant to facilitating confidence or pleasantness appraisals rather indirectly. Participants in the pleasantness/unpleasantness appraisal condition were asked to place the index finger of their nondominant hand on the upper left corner of their chest (where the heart is). Participants in the confidence appraisal condition were asked to place the same finger of their nondominant hand on their temple (where the brain is). Neither the words “head” nor “heart,” nor the words related to the key appraisals (confidence or pleasantness) were mentioned. The researcher and the researcher’s assistants made sure that the participants kept their fingers at the appropriate point until they had completed the dependent measures.

Evidence for the utility of this appraisal induction comes from a series of studies reported by Fetterman and Robinson (2013). These authors demonstrated that people led to focus on their heads (vs. hearts) perceived themselves as more rational and logical, and were actually found to be more accurate when responding to knowledge questions. Therefore, we thought that this induction was a good candidate to facilitate a confidence appraisal. On the other hand, these authors found that participants induced to focus on their heart perceived themselves as more affective, and were mostly concerned with how the experience made them feel rather than being concerned with how well-calibrated their knowledge was. Thus, we thought that this induction was a good candidate to facilitate a pleasantness appraisal.

### Dependent measures.

**Attitudes.** Participants were asked to report their attitudes toward cell phone use by children using three 9-point (1–9) semantic differential scales whose anchors were good/bad, like/dislike, and in favor/against. These items were highly correlated ( $\alpha = .728$ ) and they were aggregated to form a global index of evaluation.

**Thought favorability.** An independent judge, unaware of the experimental conditions, coded each thought participants wrote with respect to whether it was favorable or unfavorable toward the proposal using a 3-point scale (–1 = unfavorable, 0 = neutral, 1 = favorable). An index of the valence of thoughts was created for each participant as in previous studies, by subtracting the total number of negative thoughts generated from the number of positive thoughts that the participant had listed. This measure served as a Thought Valence manipulation check.

**Perceived validity.** Participants were asked to rate individually each of the thoughts they listed on a 9-point Likert scale for their perceived validity (1 = not at all valid, 9 = very valid). These items were averaged to create one measure of thought reliance. In addition to these individual ratings, participants were asked to provide an overall rating of the extent to which they relied on the thoughts they listed on a 9-point Likert scale (1 = not at all, 9 = totally). These two indicators (average individual ratings of perceived validity for each thought listed and one overall rating of thought reliance) were weakly but significantly correlated,  $r(256) = 0.26$ ,  $p < .001$ , and were averaged to make an overall perceived thought-validity index.

We chose this particular index of perceived validity to allow for both cognitive and affective validation to operate in conjunction rather than in isolation. That is, asking participants about the perceived validity of each thought and about the extent to which they relied on those thoughts is likely to include appraisals involving being sure that thoughts are right (cognitive validity) and using

thoughts because they feel good (affective validity). In sum, we used a general index of thought validity that included descriptors that could result from a reliance on thoughts due to either affective or cognitive validation. Among other things, this general validation measure of how much people relied on their thoughts was expected to be easier for participants to understand and to answer than asking them to estimate the pleasantness or the confidence separately for each thought. Furthermore, the fact that the two ways of assessing validation (i.e., individual thought ratings and general assessment) showed a low correlation may indicate that some participants found one method of assessment more appealing or understandable than the other. Because we had no a priori way of knowing which method was more appealing to which set of participants, we simply combined these measures as we intended initially. Doing this means that participants who scored high on both measures would have a higher thought validity score than those who scored low on both measures with those scoring high on one but low on the other being in the middle.<sup>13</sup>

## Results

**Attitudes.** Results of the 2 (Thought Valence) 2 (Emotion)  $\times$  2 (Appraisal Type) ANOVA on attitudes revealed a significant main effect of thought valence on attitudes,  $F(1, 250) = 56.90$ ,  $p < .001$ ,  $\eta_p^2 = .19$ , such that participants reported more favorable attitudes toward the cell phone use in the positive ( $M = 5.54$ ,  $SD = 1.62$ ) than in the negative ( $M = 4.06$ ,  $SD = 1.52$ ) thought valence condition. Most importantly, we also found the predicted three-way interaction between these variables,  $F(1, 250) = 11.49$ ,  $p = .001$ ,  $\eta_p^2 = .04$ , conceptually replicating the previous studies.<sup>14</sup>

To examine the extent of thought usage in the validation conditions (i.e., anger in the confidence appraisal condition and awe in the pleasantness appraisal condition) versus in the invalidation conditions (i.e., anger in the pleasantness appraisal condition and awe in the confidence appraisal condition), we conducted a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA followed by a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Emotion: Anger versus Awe) ANOVA. Results revealed the predicted two-way interaction between Thought Valence and Validation,  $F(1, 250) = 11.49$ ,  $p = .001$ ,  $\eta_p^2 = .04$ . Importantly, this interaction was not further qualified by Appraisal Type,  $F(1, 250) = .10$ ,  $p = .76$ ,  $\eta_p^2 < .001$ , or by Emotion,  $F(1, 250) = .65$ ,  $p = .79$ ,  $\eta_p^2 < .001$ .

The Thought Valence  $\times$  Thought Validation interaction indicated that attitudes toward cell phone use were more consistent with the valence of thoughts in the validation than in the invalidation conditions. That is, for the validation conditions, attitudes were more favorable for participants who read the in-favor arguments ( $M = 5.77$ ,  $SD = 1.68$ ) than for those who read the arguments against the proposal ( $M = 3.62$ ,  $SD = 1.51$ ),  $F(1, 250) = 58.68$ ,  $p < .001$ ,  $\eta_p^2 = .19$ . In the invalidation conditions, attitudes were also more favorable after reading the arguments in favor ( $M = 5.29$ ,  $SD = 1.53$ ) than after reading the arguments against cell phone use ( $M = 4.49$ ,  $SD = 1.42$ ),  $F(1, 250) = 8.79$ ,  $p = .003$ ,  $\eta_p^2 = .03$ , although as indicated by the significant interaction, this difference was smaller (see Figure 3, top panel).<sup>15</sup>

**Thought favorability.** External ratings of thought positivity toward cell phone use were also submitted to the same ANOVAs as attitudes. Results showed a significant main effect of thought valence on positivity, such that those in the favorable thought condition ( $M = -.02$ ,  $SD = 0.50$ ) showed greater positivity in thought content toward cell phone use than did those in the against thought condition ( $M = -.53$ ,  $SD = .38$ ),  $F(1, 250) = 81.02$ ,  $p < .001$ ,  $\eta_p^2 = .25$ . This finding shows that the manipulation of thought valence was successful. No other significant main or interaction effects emerged ( $ps > .113$ ).

<sup>13</sup> It is important to note that this measure is not a manipulation check for any of the manipulations because it is not a check for Thought Valence, Emotion, or Appraisal. That is, it does not track any of these manipulations. Rather, perceived validity is a judgment that emerges from a combination of these variables. In other words, the item used as mediator (perceived thought-reliance) is not the classic manipulation check because we did not have any direct manipulation of thought-reliance. Instead, greater thought reliance in the current research was inferred from a greater impact of the thought valence induction on attitudes, and the item used as a mediator was a subjective perception of that proposed process.

<sup>14</sup> Decomposition of this three-way interaction revealed that the pattern of results varied as a function of the Appraisal Type manipulation. Among participants in the confidence appraisal condition, the Thought Valence  $\times$  Emotion interaction was significant,  $F(1, 125) = 6.04$ ,  $p = .02$ ,  $\eta_p^2 = .05$ , indicating that participants' attitudes were more reflective of their thoughts when they felt anger than when they felt awe. As expected, in the anger condition, participants who read the in-favor arguments reported more favorable attitudes toward cell phone use ( $M = 5.75$ ,  $SD = 2.00$ ) than those who read the arguments against the proposal ( $M = 3.51$ ,  $SD = 1.64$ ),  $F(1, 125) = 28.67$ ,  $p < .001$ ,  $\eta_p^2 = .19$ . For the awe condition a similar pattern of results obtained with participants reporting more favorable attitudes toward cell phone use in the in-favor arguments ( $M = 5.28$ ,  $SD = 1.55$ ) than in the against arguments condition ( $M = 4.48$ ,  $SD = 1.42$ ),  $F(1, 125) = 3.77$ ,  $p = .05$ ,  $\eta_p^2 = .02$ , but the interaction suggests that this difference was smaller than in the anger condition. In the pleasantness appraisal condition, a significant Thought Valence  $\times$  Emotion interaction also emerged but revealed the opposite pattern of results,  $F(1, 125) = 5.49$ ,  $p = .02$ ,  $\eta_p^2 = .04$ , such that participants' attitudes were more reflective of their thoughts when they felt awe rather than when they felt anger. This interaction showed that participants in the awe condition formed more favorable attitudes after reading the in-favor arguments ( $M = 5.79$ ,  $SD = 1.44$ ) than in after reading the arguments against the proposal ( $M = 3.77$ ,  $SD = 1.32$ ),  $F(1, 125) = 30.49$ ,  $p < .001$ ,  $\eta_p^2 = .19$ . Among those in the anger condition, participants also formed more favorable attitudes towards the cell phone use when they were exposed to the in-favor arguments ( $M = 5.31$ ,  $SD = 1.54$ ) compared with the against arguments condition ( $M = 4.49$ ,  $SD = 1.43$ ), though as suggested by the significant interaction, it was to a reduced degree,  $F(1, 125) = 5.21$ ,  $p = .02$ ,  $\eta_p^2 = .04$ . Finally, the Emotion  $\times$  Appraisal Type interaction was not significant,  $p = .43$ ,  $\eta_p^2 = .005$ .

<sup>15</sup> When only the one general item (good-bad) was used as the global index of evaluation as we did in the previous studies, it revealed the same significant patterns of results obtained when the composite measure of evaluation was used. That is, results of the 2 (Thought Valence)  $\times$  2 (Emotion)  $\times$  2 (Appraisal Type) ANOVA on the good-bad item of attitudes revealed the predicted three-way interaction among these variables,  $F(1, 250) = 10.05$ ,  $p = .002$ ,  $\eta_p^2 = .04$ , conceptually replicating the previous studies. Also, when we conducted a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) and a 2 (Thought Valence: Positive vs. Negative)  $\times$  2 (Thought Validation: Validation vs. Invalidation)  $\times$  2 (Emotion: Awe vs. Anger) ANOVA, results revealed the predicted two-way interaction between Thought Valence and Validation,  $F(1, 250) = 10.05$ ,  $p = .002$ ,  $\eta_p^2 = .04$ . Importantly, this interaction was not further qualified by Appraisal Type,  $F(1, 250) = 2.14$ ,  $p = .15$ ,  $\eta_p^2 = .01$ , or Emotion,  $F(1, 250) = .13$ ,  $p = .72$ ,  $\eta_p^2 = .00$ .

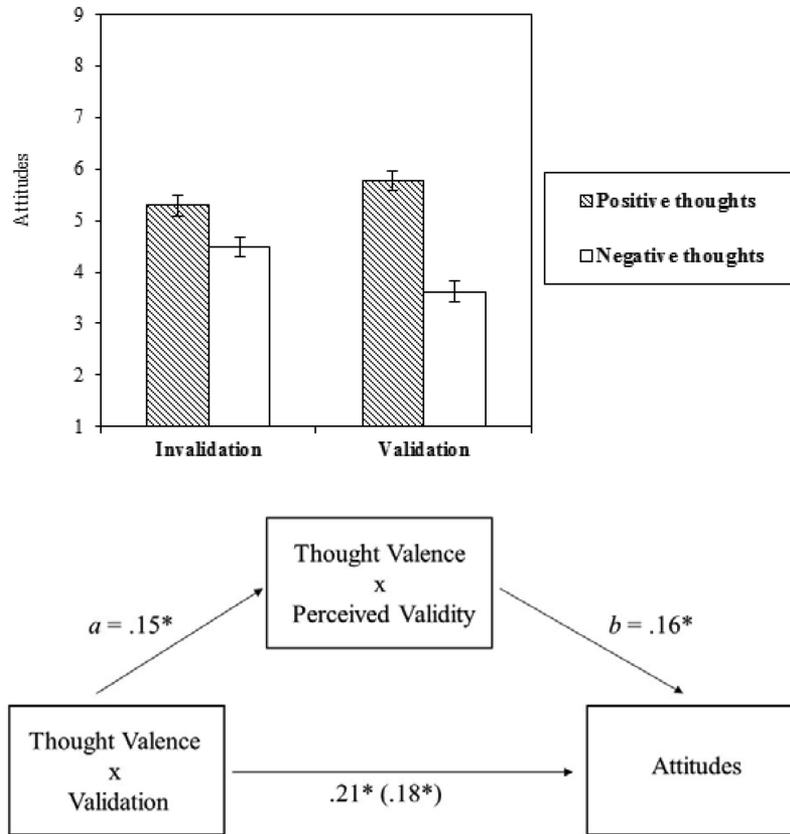


Figure 3. Top panel: Attitudes as a function of thought valence and validation condition in Study 5. Error bars represent the standard errors associated with each mean. Bottom panel: Mediation model showing the effect of Thought Valence  $\times$  Thought Validation, as mediated by Thought Valence  $\times$  Perceived Validity, on attitudes in Study 5. \*  $p < .05$ . Figure in the parenthesis (i.e., .18) is the direct effect of Thought Valence  $\times$  Validation on Attitudes while accounting for the effect through the indirect path.

**Thought-attitude linkage.** As in previous studies, we predicted that participants in the validation conditions would rely more on their thoughts in expressing their attitudes than participants in the invalidation conditions. Regressing attitudes onto the relevant variables, a significant interaction emerged between the trait-favorability index and the validation condition,  $B = .27$ ,  $t(254) = 4.19$ ,  $p < .001$ . Consistent with the self-validation prediction, this interaction revealed that participants' thoughts were more closely associated with attitudes when participants were in a validation condition ( $B = .62$ ,  $t(125) = 7.98$ ,  $p < .001$ ) than when they were in an invalidation one ( $B = .46$ ,  $t(127) = 5.81$ ,  $p < .001$ ).

**Perceived validity.** Participants' index of validity was also submitted to the same ANOVAs as attitudes. As expected, participants in the validation condition reported more perceived validity ( $M = 7.30$ ,  $SD = .92$ ) compared with participants in the invalidation ( $M = 6.98$ ,  $SD = 1.10$ ) condition,  $F(1, 250) = 8.06$ ,  $p = .005$ ,  $\eta_p^2 = .03$ . No other significant main effects or interactions emerged ( $p > .10$ ).

**Mediation analysis.** To examine whether the level of perceived thought validity mediated the effect of the key theorized interaction on attitudes, we conducted a mediated moderation test using bootstrapping methods (Muller, Judd, & Yzerbyt, 2005). In this procedure, both Thought Valence (i.e., *negative thoughts* =  $-1$ , *positive*

*thoughts* =  $1$ ) and Validation (*invalidation* =  $-1$ , *validation* =  $1$ ) were contrast coded, and perceived validity was mean-centered. To test the hypothesized mediation by perceived validity, we conducted a bias corrected bootstrapping procedure with 10,000 bootstrap resamples using Hayes process macro (Model 4; Preacher & Hayes, 2004; Shrout & Bolger, 2002). In this analysis, Thought Valence  $\times$  Validation was an independent variable, attitudes toward cell phone use was a dependent variable, and Thought Valence  $\times$  Perceived Validity was a mediating variable (see Figure 3, bottom panel). This approach includes procedures that compute a 95% confidence interval (CI) around the indirect effect and mediation is indicated if this CI does not include zero. As predicted, the result of this bootstrapping procedure revealed that the 95% confidence interval of the indirect effect (i.e., the path through the mediator) did not include zero (Indirect Effect  $a \times b = .03$ , 95% CI [.01, .06]; Figure 3, bottom panel). Therefore, the mediation by perceived validity is supported as plausible (Shrout & Bolger, 2002).

## Discussion

In this final study, we examined a new positive but doubtful emotion (awe). We also tested a new persuasive proposal, and used a more complete, reliable measure of attitudes toward it. Further-

more, in this study we relied on a new manipulation of appraisals that was selected because it was previously used in past research for a similar purpose. As noted, Fetterman and Robinson (2013) demonstrated that people led to focus on their heads (vs. hearts) perceived themselves as more rational and logical, and were also found to be more accurate when responding to knowledge questions. Although this manipulation was very different from the inductions tested in our previous studies, it was still capable of producing the predicted effect. When participants were in the confidence (brain) appraisal condition, anger led to greater use of thoughts than awe, whereas when participants were in the pleasantness (heart) appraisal condition, anger led to less use of thoughts than awe.

### General Discussion

Anger, disgust, surprise, and awe are complex (multifaceted) emotions that can lead to different judgments when different appraisals are salient. The present research provides an initial step in addressing how and when these emotions can lead to different judgmental outcomes, introducing a number of novel results in the domain of evaluation and metacognition. Following the development of the self-validation hypothesis and research paradigm (Briñol & Petty, 2009; Petty et al., 2002), the current research demonstrated that feeling angry or disgusted following thought generation can lead to either more or less reliance on those thoughts than surprise and awe. We argued and empirically demonstrated that which effect occurs depends on which appraisal of the induced emotions was made salient. Specifically, in all five studies we observed that in the validation conditions (experiencing anger and disgust in confidence appraisal conditions or surprise and awe in pleasantness appraisal conditions), participants relied on their thoughts more when forming their attitudes than when they were in the invalidation conditions (experiencing anger and disgust under pleasantness appraisal conditions or surprise and awe in confidence appraisal conditions).<sup>16</sup>

The same results occurred whether participants were forming evaluations about themselves (Study 1), another person (Study 2), about healthy eating habits (Study 3), about a fictitious animal (Study 4) or about cell phone use by children (Study 5). Moreover, these effects appeared regardless of whether appraisal was manipulated before (Experiments 2 and 4) or after (Experiments 1, 3 and 5) the emotion was induced. Furthermore, the obtained results emerged regardless of the nature of the procedure used in the appraisal induction. The inductions of appraisals were rather subtle in some studies (e.g., semantic priming, embodiment) but relatively blatant in other studies (e.g., asking participants explicitly to assess either their degree of pleasantness or their confidence associated with the emotion). Regardless of whether the appraisal manipulation was rather direct (explicitly mentioning confidence or pleasantness) or more indirect (relying on a more distal procedure in which confidence or pleasantness are made salient by priming the categories of cognition or affect), the impact on judgment remained constant. That is, all of the inductions tested in this research led to the same convergent results across studies. When confidence appraisals dominate, then anger and disgust (confident but unpleasant) are the validating emotions. However, when pleasantness appraisals dominate, surprise and awe (pleasant but doubtful) are the validating emotions.

To our knowledge, these studies provide the first demonstration that emotions, such as anger and disgust, can influence evaluations by affecting reliance on thoughts as a function of their different appraisals. Prior work has shown that positive emotions such as happiness can enhance thought use relative to a negative emotion such as sadness (Briñol et al., 2007; Huntsinger, 2013; Paredes et al., 2013; Sidi, Ackerman, & Erez, 2017), but in those studies, the pleasantness and confidence appraisals were confounded. In contrast, by unconfounding these appraisals, the present studies were able to show that both kinds of appraisals can be means by which emotions influence judgments. That is, we provided the first evidence that emotions can influence judgments by both cognitive and affective validation processes depending on the appraisal of the emotion made salient. In particular, the current studies suggest that negative emotions associated with confidence can enhance thought use relative to more positive emotions, but only if the confidence appraisal of the emotion is made salient and then misattributed to the thoughts currently in mind about the attitudinal object.

### Advances of the Current Research

The present findings have a number of implications for different domains. Most fundamentally, the results of this research revealed that the very same emotions can have different (even opposite) effects on attitudes depending on the appraisal of emotion invoked. That is, the same emotional inductions were shown to increase or decrease reliance on thoughts thereby increasing or decreasing the influence of one's own thoughts on one's attitudes as a function of the different appraisals that were made salient. To our knowledge, the current studies are the first ones revealing that different appraisals can lead to different outcomes on thought usage within the same experimental design.

Previous research has shown that a given emotion can operate at different levels of the same appraisal. For example, anger has been shown to be associated with more or less pleasantness depending on the circumstances (Aarts et al., 2010; Carver & Harmon-Jones, 2009; Ford et al., 2010; Humrichouse & Watson, 2010; Veling et

<sup>16</sup> Two additional studies were collected in developing materials for this line of research. These data sets included the full 2 (Thought Valence) × 2 (Emotion) × 2 (Appraisal) design in each case. One study had 136 participants and compared anger versus surprise and the other study had 194 participants and compared anger versus awe. These studies were not as statistically strong as those reported in this article, though they showed the same pattern of results on the attitude measure consistent with our differential appraisals hypothesis. Importantly, when we collapsed these two data sets together with the five studies reported in the main text (in a mini meta-analysis), all the key effects remained significant. Before aggregating the information from the seven data sets, we standardized the dependent measures, and included study as a factor. Notably, a 2 (Thought Valence: Positive vs. Negative) × 2 (Thought Validation: Validation vs. Invalidation) × 2 (Appraisal Type: Confidence vs. Pleasantness) × 7 (Study: 1, 2, 3, 4, 5, 6, 7) ANOVA revealed that the predicted two-way interaction between Thought Valence and Thought Validation was significant,  $F(1, 1087) = 54.49, p < .001, \eta_p^2 = .05$ , and this two-way interaction was not further moderated by Appraisal Type,  $F(1, 1087) = 2.02, p = .16, \eta_p^2 = .002$ , or by Experiment,  $F(6, 1087) = 1.08, p = .37, \eta_p^2 = .006$ . Finally, the 2 (Thought Valence) × 2 (Thought Validation) × 2 (Emotion) × 7 (Study) ANOVA revealed that the predicted two-way interaction between Thought Valence and Thought Validation was significant,  $F(1, 1087) = 57.60, p < .001, \eta_p^2 = .05$ , and this two-way interaction was not further moderated by Emotion,  $F(1, 1087) = .67, p = .41, \eta_p^2 = .001$ .

al., 2012). Furthermore, prior research has shown that different appraisals can influence the extent to which people experience the same emotion. For example, Winterich, Han, and Lerner (2010) showed that people experienced more or less anger depending on whether they were primed with a high agency appraisal (the self) or a relatively low agency appraisal (the situation), respectively (see also Keltner et al., 1993). In sum, prior work has focused on how appraisals lead people to experience different emotions, and to feel different levels of intensity within the same emotion. Thus, in most prior studies, appraisals are viewed as antecedents of emotion.

In contrast, in the current research, instead of different appraisals leading to different emotional experiences (as in Roseman & Evdokas, 2004), activated appraisals did not change emotions. Instead, appraisals were predicted and found to change whether the very same emotion was associated with reliance on recently generated thoughts or not. Specifically, the current research contributes to the literature on appraisal theories of emotion by showing that the same emotion can operate through different appraisals within the same experimental design leading to opposite judgmental consequences. When angry and disgusted (vs. surprised and awed) individuals were focused on an appraisal along the confidence dimension, we observed an increase in the use of their previously generated thoughts in forming an evaluation. In contrast, when angry and disgusted (vs. surprised and awed) individuals were led to focus on an appraisal of the same emotions along the pleasantness dimension, there was a reduction in the subsequent impact of their thoughts on attitudes. Thus, the current research is unique in varying the type of appraisal that is activated and then examining the consequences of those different appraisals for the use of the thoughts that people have in mind (thoughts unrelated to the emotion). We suggest that these findings advance previous research on appraisal theories of emotion, and contribute to opening the door to many other variations for other complex emotions such as fear.<sup>17</sup>

Second, the findings of the current research provide an important extension to prior work on self-validation processes and social judgment. Specifically, as noted earlier, all previous research on self-validation has used inductions (e.g., power, self-affirmation, etc.) in which the pleasantness and confidence implications were completely confounded so it was not possible to tell if cognitive or affective validation was taking place and indeed if both were possible. With respect to emotions, prior research has found that the emotion of happiness (vs. sadness) can influence attitude change by influencing people's use of their own thoughts (Briñol et al., 2007; Paredes et al., 2013) but as with the other self-validation variables studied, happiness has both a more pleasant and a more confident appraisal than sadness. The current studies extend prior work on self-validation by demonstrating that it is not only the emotions of happiness and sadness that are amenable to a self-validation analysis, but other emotions as well.

The present research provides the first demonstration that negative emotions such as anger and disgust can also validate what people think and affect attitude change under certain circumstances. Of most importance, however, the current research provides the first evidence for the outcomes predicted by both affective and cognitive validation processes. That is, anger and disgust were shown to increase the use of one's thoughts relative to surprise and awe when the confidence appraisal was activated whereas they were shown to decrease the use of thoughts relative to surprise awe when the pleasantness appraisal was made salient. Thus, we found evidence demonstrating that emotions other than happiness and sadness can have an impact on judgments by influencing thought use and we have shown that these

effects can occur via either affective or cognitive validation processes. This is important because it suggests that people might become more reliant on their thoughts even when the emotion experienced after thought-generation is negative.

Third, the present research not only has implications for understanding how complex emotions affect people's thought use, but it may also have implications for resolving past inconsistencies in the literature on emotion and judgment. Specifically, we noted in introducing Study 4 that the impact of disgust on judgment has produced weak results with some studies finding effects and others not finding anything. We speculated that a consideration of the differential appraisals that might be salient could help to resolve these inconsistencies in the disgust literature. Disgust can be expected to polarize judgments when a confidence appraisal of the emotion is salient but to depolarize when a pleasantness appraisal is salient following thought generation.

As another example, consider that past research has produced inconsistencies with respect to the impact of anger on information processing and judgment when the emotion precedes thought generation. That is, some research has suggested that anger can increase information processing and judgmental polarization whereas other research has shown the opposite. Consistent with the idea that anger can increase thinking when the anger precedes a message, Moons and Mackie (2007) found that people in an angry state processed information in a persuasive message more than those in a neutral state and thus, their attitudes were more influenced by the quality of the arguments in the message (see also, Berkowitz, 1990; Calanchini, Moons, & Mackie, 2016). However, consistent with the idea that anger can reduce thinking, Tiedens and Linton (2001) found the reverse. They observed that anger and disgust, compared with worry, were associated with a decrease in amount of thinking as revealed by a reduction in argument quality effects in a persuasion paradigm (see also, Bodenhausen, Sheppard, & Kramer, 1994; Gable, Poole, & Harmon-Jones, 2015; Lerner et al., 1998).

Although it seems clear from past research that anger can either increase or decrease information processing when the emotion is induced prior to the presentation of the message or information-processing task, it is not clear *when* these different effects occur. Our differential appraisals hypothesis provides one possible explanation for these conflicting results that has not been recognized in the literature previously and is worthy of future research. Specifically, the results from the present research suggest that whether anger and disgust lead to more or less elaboration could depend on the kind of appraisal that is highlighted. That is, if angry (and disgusted) individuals focus on the confidence that accompanies anger, they may feel confident about their own views and avoid processing new information. In these circumstances, anger (and disgust) would be associated with reduced information processing and reduced argument quality

<sup>17</sup> These implications holds regardless of whether emotions are conceptualized as *being* appraisals, or whether emotions are viewed as *having* appraisals, or whether emotions are theorized as *leading* to appraisals. Also, our logic also holds independent on whether the dominant appraisal of the emotion is experimentally highlighted *before, during, or after* the induction of the emotion. That is because the appraisals were not expected or found to change the emotion in this research. What matters for our research is what appraisal of the emotion dominates at the time participants look back at their previously generated thoughts (thoughts about an attitude object), and "ask themselves" whether they should use those thoughts in subsequently reporting their attitudes.

effects. On the other hand, if angry and disgusted individuals focus on the unpleasantness of the emotion and come to view their current opinions negatively (rather than more confidently) or come to feel that there is a problem to be solved (e.g., see Schwarz & Clore, 2007), angry and disgusted people would elaborate information more extensively. In these circumstances, anger and disgust (vs. surprise and awe) would lead to increased information processing and enhanced argument quality effects. Future research could vary anger and disgust prior to message exposure and vary the appraisal elicited (as in the current research) to test our speculations.

Following a similar logic, one could expect that the findings obtained by Griskevicius and colleagues (2010) showing that awe introduced before receiving a persuasive proposal increased information processing will be most likely to emerge when the confidence appraisal is particular salient. Based on the differential appraisal hypothesis introduced in the present research, one could expect the opposite pattern of results (awe reducing processing and argument quality effects) if the pleasantness (rather than the uncertainty) appraisal of the awe is made salient.

### Possible Limitations

One possible limitation of the current research is that we included no manipulation checks for emotion in the individual studies, so some might wonder whether our inductions affected emotion and perhaps even more importantly whether the appraisal induction modified the experience of the emotions. We did not include emotion manipulation checks in any of the reported studies because we feared that including them early in the procedure might have made the origin of the emotions so salient that this would have attenuated the expected misattribution effects (e.g., Schwarz & Clore, 1983). Additionally, we were concerned that including emotion manipulation checks at the end of the study might have assessed emotions after they had dissipated. Nevertheless, to ensure that asking participants to remember episodes of anger or surprise was an effective procedure to induce differential emotions as in past research (e.g., Keltner et al., 1993), and that the emotions were not influenced by the appraisal induction, we conducted a separate study varying emotions and appraisals and including manipulation checks for each induction.

In this study, 189 students from the same university as in studies 2 and 3 were asked to write about one personal episode that made them feel anger or surprise (emotion manipulation). After participants listed their episodes of anger or surprise, they responded to questions containing words either related to pleasantness/unpleasantness (e.g., How pleasant did the emotional experiences make you feel; pleasantness appraisal) or words related to confidence/doubt (e.g., How confident did the emotional experiences make you feel; confidence appraisal). This is the same induction of appraisal that we used in Experiment 3.

To assess emotion, participants were asked to report how angry and surprised they felt on two separate 9-point scales (1 = *not at all*, 9 = *completely*). With respect to the emotion measures, a 2 (Emotion: Anger vs. Surprise)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA revealed significant main effects of emotion on each of the expressed feelings measures. That is, participants reported feeling more anger after recalling past episodes of anger ( $M = 5.04$ ,  $SD = 2.47$ ) than after recalling past memories of surprise ( $M = 2.14$ ,  $SD = 2.06$ ;  $F(1, 184) = 76.36$ ,  $p < .001$ ,  $\eta_p^2 = .293$ ). On the other hand, participants reported feeling more surprise in the surprise con-

dition ( $M = 3.79$ ,  $SD = 2.74$ ) than in the anger condition ( $M = 2.99$ ,  $SD = 2.09$ );  $F(1, 184) = 4.66$ ,  $p = .032$ ,  $\eta_p^2 = .025$ ). Importantly, the appraisal type induction did not influence how people reported feeling, as indicated by the absence of a main effect of this manipulation on reported anger ( $p = .54$ ) or surprise ( $p = .47$ ). Also, there was no significant interaction between emotion and appraisal type for either anger ( $p = .18$ ) or surprise ( $p = .55$ ).

In addition to assessing emotion, we also examined the impact of the appraisal induction. Given that our direct induction of appraisal (consisting of asking questions about either confidence or pleasantness) was high in face validity (i.e., since the intended constructs were explicitly mentioned), we thought it would be unnecessary to ask the same question twice (i.e., the first one as a part of the induction and the second one as a manipulation check). Instead, participants were asked to rate how emotional and rational they were (see also Fetterman & Robinson, 2013). Perceived emotionality was measured using two items, "How emotional do you consider yourself to be?" and "How emotion-based do you consider your decisions to be?" Responses were made on 9-point scale (1 = *not at all*, 9 = *completely*). The items were highly correlated  $r(186) = .75$ ,  $p < .01$  and were aggregated to form a composite index of emotionality. Perceived rationality was also measured using two items: "How rational do you consider yourself to be?" and "How logic-based do you consider your decisions to be?" These items were also assessed using 9-point scales and the items were once again modestly correlated  $r(187) = .55$ ,  $p < .01$  and aggregated to form a composite index of rationality.

As expected, the results of a 2 (Emotion: Anger vs. Surprise)  $\times$  2 (Appraisal Type: Confidence vs. Pleasantness) ANOVA revealed a significant main effect of the appraisal induction on each of the self-view measures. That is, participants reported being more emotional after answering questions relevant to pleasantness ( $M = 7.22$ ,  $SD = 1.34$ ) than after answering questions about confidence ( $M = 6.73$ ,  $SD = 1.84$ ;  $F(1, 185) = 4.28$ ,  $p = .040$ ,  $\eta_p^2 = .023$ ).

Furthermore, participants reported being more rational in the confidence condition ( $M = 7.10$ ,  $SD = 1.22$ ) than in the pleasantness condition ( $M = 6.31$ ,  $SD = 1.44$ );  $F(1, 185) = 17.72$ ,  $p < .001$ ,  $\eta_p^2 = .09$ ). Importantly, the emotion induction did not influence how people responded to the self-view questions, as indicated by the absence of a main effect of the emotion manipulation on how emotional ( $p = .93$ ) or rational ( $p = .53$ ) they were. Also, there was no significant interaction between emotion and appraisal type for emotional ratings ( $p = .92$ ) or rational ratings ( $p = .28$ ).

A second possible concern is that given the impact that emotions can have on information processing, is it possible that the emotions we induced affected the amount of thinking in the current research and extent of thinking producing the effects we observed instead of validation processes? There are several factors that argue against this interpretation. First, the emotional inductions of anger, disgust, surprise, awe followed rather than preceded thought generation, reducing the potential for differences in elaboration between the emotion conditions. That is, participants had already generated their thoughts (Experiment 1) or processed the message (Experiments 2, 3, 4, and 5) at the time the emotion was induced. Prior research varying the order in which the emotions of happiness and sadness were manipulated (i.e., before or after a message) showed that these emotions affected the extent of thinking when induced prior to the message but influenced thought reliance when induced after message processing (Huntsinger, 2013). Second, to guard against a failure of random assignment or differential recall of thoughts,

we coded the thoughts participants generated in the anger studies and confirmed that the number and quality of the thoughts did not vary across emotion conditions. Importantly, this does not imply that complex emotions such as anger, disgust, surprise, and awe cannot influence judgments by affecting the amount of thinking under some circumstances such as when the emotional induction precedes thought generation (see Petty & Briñol, 2015, for a review of multiple processes by which emotions can influence judgment). However, in the present experiments, participants generated their thoughts before emotions were induced, reducing the possibility that there were differences in processing the information presented.

Given that in this research participants were induced to experience emotions after thinking, one might wonder to what extent it adequately reflects real-life situations. We suspect that there are many situations in which emotional reactions occur or are salient after (rather than before) thinking. For example, consider a situation in which someone makes you feel angry after you discussed a given proposal in a meeting, or consider a situation in which following the expression of some ideas, you relate them to a recent surprising event, or reach an overwhelming panoramic view. In these circumstances, emotion follows thought generation and, according to the present research, its effect on judgment can be understood in terms of thought validation processes. Indeed, there may be many life circumstances in which thinking takes place only to be followed in short order by an angering incident or a surprising event which itself precedes the judgment to be made. The current research suggests that these irrelevant life events could affect the use of one's thoughts. Furthermore, it is possible for individuals to selectively and strategically validate or invalidate the thoughts of others by doing something that would make them feel angry/disgusted or surprised/awed following their comments but before rendering a judgment.

Of course, to determine the direction of the effects expected, it would also be necessary to control whether a pleasantness or confidence appraisal is salient. Appraisals are likely to vary among individuals and situations in real life. For example, those high in need for cognition (Cacioppo & Petty, 1982) might tend to favor confidence appraisals whereas those high in need for affect (Maio & Esses, 2001) might tend to favor pleasantness appraisals. Or, it may be that one appraisal is the dominant one across some situations or for some attitude objects whereas another appraisal is more salient in other cases. In fact, these variations might explain why opposite effects are sometimes found for the same emotions (or even no effects for emotions can emerge). Understanding how one appraisal or the other is activated and specifying which appraisal dominates in a given real-world situation was not as important a goal for the current research as demonstrating the conceptual point that appraisals matter for what outcome occurs. We argue that it is not the emotion alone, but it is the emotion as a function of which appraisal is salient that can influence whether people rely on their thoughts when making judgments. That is, a key contribution of this research was showing that appraisals are important for understanding the effects of emotion on thought reliance regardless of how these appraisals are activated in real world situations.

In closing, we note that some scholars might wonder whether the effects obtained in this research are attributable mostly to the manner in which anger and disgust affect thought reliance or to how surprise and awe influence the extent to which people use their thoughts for judgments, or a combination of both. Having a

control group with a neutral emotion would contribute to making more precise statements, but ultimately this is not critical for our conceptual contribution. Whether anger, disgust, surprise, or awe would always have greater impact over a neutral emotion group would likely depend on many factors such as the relative intensity of each emotion induced, how confident or pleasant people are feeling prior to the emotion induction, and others. Most importantly, identifying what emotion is relatively more likely to be responsible for the validation effects is not as critical as showing that complex emotions can indeed have multiple meanings and, as revealed by the present studies for the first time, they also can have opposite effects on evaluation depending on the appraisals that are made salient.

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## Appendix

### Appraisal Type Induction in Experiment 1

Word completed in the Confidence appraisal condition, translated from Greek		
TABLE	THOUGHT	PROCESS
ARGUMENT	AMBIVALENCE	CONSIDER
CONFIDENCE	GLASSES	REASONING
EXAMINE	UNCERTAINTY	POT
WINDOW	THINKING	HAT
INSECURITY	SHOES	SCIENTIST
BRAIN	KNOWLEDGE	ROOM
PENCIL	BELT	MIND
UNDOUBTEDLY	ELABORATE	TRUST
REFLECTION	NEWSPAPER	DOUBT
SELF-ASSURANCE	CERTAINTY	CHAIR
DRAWER	DISTRUST	STREET
CAR	WALLET	THINKING
LOGIC		

Word completed in the Pleasantness appraisal condition, translated from Greek		
TABLE	SMILE	FEEL
EMOTION	GLOOMY	HAPPINESS
CONTENT	GLASSES	TENDERNESS
LAUGH	DELIGHT	POT
WINDOW	SADNESS	HAT
AFFECTION	SHOES	NEGATIVELY
SAD	JOYOUS	ROOM
PENCIL	BELT	FEELINGS
UNHAPPY	AFFECTION	EMOTIONAL
LOVE	NEWSPAPER	MELANCHOLY
BLUE	SMILEY	CHAIR
DRAWER	POSITIVELY	STREET
CAR	WALLET	FEELING
HAPPY		

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