

Influence of Different Positive Emotions on Persuasion Processing: A Functional Evolutionary Approach

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Much research has found that positive affect facilitates increased reliance on heuristics in cognition. However, theories proposing distinct evolutionary fitness-enhancing functions for specific positive emotions also predict important differences among the consequences of different positive emotion states. Two experiments investigated how six positive emotions influenced the processing of persuasive messages. Using different methods to induce emotions and assess processing, we showed that the positive emotions of anticipatory enthusiasm, amusement, and attachment love tended to facilitate greater acceptance of weak persuasive messages (consistent with previous research), whereas the positive emotions of awe and nurturant love reduced persuasion by weak messages. In addition, a series of mediation analyses suggested that the effects distinguishing different positive emotions from a neutral control condition were best accounted for by different mediators rather than by one common mediator. These findings build upon approaches that link affective valence to certain types of processing, documenting emotion-specific effects on cognition that are consistent with functional evolutionary accounts of discrete positive emotions.

Keywords: emotion, positive affect, evolutionary approaches, cognitive processing, persuasion

Imagine that you are watching a pleasant TV program. The program may be a travel show featuring awe-inspiring natural wonders or an animal program about a litter of puppies; it may be a sitcom that makes you laugh or an exciting sporting event. At some point during the program, you are likely to encounter a commercial message intended to persuade you. Given that any of these programs will elicit positive feelings, are you likely to process the persuasive message more carefully or more carelessly than if you felt no emotion at all?

The answer to this question might initially appear simple: Much research already finds that positive affect leads people to process messages in a more heuristic or careless manner (e.g., Mackie & Worth, 1989; Schwarz & Bless, 1991; see Schwarz & Clore, 2007). In the present research, we demonstrate the complexity layered upon this general effect and address some of the mechanisms behind this complexity. Whereas traditional approaches have examined the influence of affective valence on cognition, our approach emphasizes differences among the likely evolutionary, fitness-enhancing functions of discrete emotions of the same valence and suggests that emotions of the same valence can have different consequences (Keltner, Ellsworth, & Edwards, 1994; Lerner & Keltner, 2000). Indeed, recent research has demonstrated that distinct negative emotions have emotion-specific influences on cognition (e.g., DeSteno, Petty, Rucker, Wegener, & Braverman, 2004; Lerner & Keltner, 2001; Mackie, Devos, & Smith,

2000). However, the question of how specific positive emotions might influence cognition has received far less attention (for notable exceptions, see Bartlett & DeSteno, 2006, and Tiedens & Linton, 2001). The current research aims to redress this imbalance by investigating systematically the effects of six positive emotions on the processing of persuasive messages, as well as examining the possible mechanisms behind these effects. In particular, we ask whether certainty appraisals successfully account for the observed differences among positive emotions (e.g., Tiedens & Linton, 2001), or whether the effect of each positive emotion differs from that of a neutral condition for a different reason.

The Traditional Approach: Affect Valence and Cognition

An extensive body of research has examined the influence of incidental mood, affect, and emotion on cognition (for reviews, see Clore & Schnall, 2005; Cohen, Pham, & Andrade, 2007; Schwarz & Clore, 2007). Much of this work emphasizes the distinction between positive affect (e.g., happiness) and negative affect (e.g., sadness), typically showing that feelings of opposing valence have opposing effects on cognition (e.g., Clore, Schwarz, & Conway, 1994; Forgas, 1995; Ottati, Terkildsen, & Hubbard, 1997; Schwarz & Bless, 1991). Perhaps the topic that has received the most attention in this area is the influence of affect valence on the complexity of cognitive processing. In general, *positive affect* has been found to facilitate peripheral, heuristic, or simple processing; people in this state are less likely to scrutinize incoming information carefully, and more likely to base their judgments on simplifying heuristics. For example, positive affect increases people's reliance on simplifying knowledge structures such as scripts (Bless, Schwarz, Clore, Golisano, & Rabe, 1996), stereotypes (Bodenhausen, Kramer, & Susser, 1994), and judgment heuristics

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(Ruder & Bless, 2003) when encoding new information. In contrast, *negative affect* appears to facilitate central, systematic, or deep processing; people in this state are more likely to scrutinize incoming information, and less likely to base their judgments on simplifying heuristics. Sad moods, for example, lead people to be less reliant on scripts and stereotypes (e.g., Bless et al., 1996; Edwards & Weary, 1993), less likely to commit the fundamental attribution error (Forgas, 1998), and less susceptible to halo effects (Sinclair, 1988).¹

One area of particular interest is the influence of positive versus negative affect on the processing of persuasive messages. According to dual-process models of persuasion (Chaiken, 1987; Petty & Cacioppo, 1986), recipients of a persuasive communication may arrive at an evaluative judgment in one of two ways: They may carefully consider the merits of the message, paying close attention to the quality of the arguments (systematic processing); alternatively, they may not engage in a thorough consideration of the message's merits, but instead rely on heuristic cues such as the communicator's expertise or the sheer length of the message (heuristic processing; e.g., Goldstein, Cialdini, & Griskevicius, 2008). In a typical study examining affect and processing in persuasion (e.g., Bless, Bohner, Schwarz, & Strack, 1990), participants are first induced to feel happy or sad. They are then exposed to multiple strong or weak arguments in favor of a given issue. A sad mood leads people to have favorable attitudes toward the issue after exposure to the strong arguments, but not after the weak arguments, because careful analysis exposes the inadequacy of the weak arguments. A happy mood, however, leads people to be relatively persuaded by both strong and weak arguments because happy participants use a simple heuristic to arrive at a judgment: the large number of arguments in favor of the issue. Thus, people in a good mood tend to be relatively persuaded regardless of whether the arguments themselves are strong or weak, as long as there are enough arguments. This pattern of findings has been replicated in a number of studies with a range of messages about various attitudinal issues (e.g., Bless, Mackie, & Schwarz, 1992; Bohner, Crow, Erb, & Schwarz, 1992; Innes & Ahrens, 1991; Mackie & Worth, 1989; Sinclair, Mark, & Clore, 1994; Worth & Mackie, 1987).

Recent Advances: Discrete Emotions and Cognition

Affect valence-induced processing differences typically have been explained in terms of the signaling function of positive versus negative affect (Schwarz, 1990; Schwarz & Bless, 1991). According to this perspective, negative affect signals that the current environment poses a problem and must be fixed, whereas positive affect signals that the current environment is benign. As a result, individuals in a negative state are motivated to engage in detail-oriented, systematic processing, gathering information to figure out how to improve their situation. In contrast, individuals in a positive state have little reason to invest energy in effortful processing.

Although most psychologists studying emotion and social cognition emphasize affect valence as the critical aspect of emotional experience, a growing body of research suggests that different emotions of the same valence may influence cognition in quite different ways (e.g., Bodenhausen, Kramer, & Susser, 1994; DeSteno, Petty, Wegener, & Rucker, 2000; DeSteno et al., 2004; Keltner et al.,

1994; Griskevicius, Goldstein, Mortensen, Cialdini, & Kenrick, 2006; Griskevicius, Goldstein, Mortensen, Sundie, Cialdini, & Kenrick, 2009; Lerner, Gonzalez, Small, & Fischhoff, 2003; Lerner, Small, Loewenstein, 2004; Mackie et al., 2000; Tiedens & Linton, 2001). For example, fear leads people to perceive greater risk in the environment and to be more risk averse, whereas anger appears to inhibit risk perception and to facilitate risk seeking (Lerner & Keltner, 2001). Different negative emotions also appear to have different effects on processing style. Sadness and fear appear to facilitate systematic processing (consistent with traditional studies emphasizing affective valence), whereas anger and disgust can actually produce increased reliance on heuristics (e.g., Bodenhausen, Sheppard, & Kramer, 1994; Moons & Mackie, 2007; Tiedens & Linton, 2001).

These emotion-specific effects on cognition and behavior have been explained in a number of different ways. One approach emphasizes the importance of appraisal dimensions, meaning that specific emotion-eliciting situations are appraised on dimensions such as pleasantness, arousal, novelty, certainty, and control, which have been shown to distinguish the elicitors of several specific emotions (e.g., Scherer, 1997). Several researchers have suggested that appraisals of an emotion-eliciting situation are carried over to subsequent stimuli, leading to a bias in interpreting new information. In particular, some have argued that appraisals of certainty (about the outcome of a situation) may be the driving force behind the effects of emotions on cognition. For example, low certainty may lead the fearful to be less confident about the outcome of a new situation, and thus to be more risk averse, whereas high-certainty anger may enhance confidence that the future can be predicted and managed (Lerner & Keltner, 2001). In particular, Tiedens and Linton (2001) have challenged the valence-focused approach to predicting heuristic versus systematic cognition in favor of a certainty-focused approach. Across multiple studies, they demonstrated that affective states selected to represent high certainty facilitated heuristic processing, in relation to affective states selected to represent low certainty.

In the present research, we adopted a different theoretical perspective. Although profiles across several appraisal dimensions do distinguish among discrete emotions (Scherer, 1997; Smith & Ellsworth, 1985), we did not define our positive emotion constructs on the basis of appraisal profiles, nor did we emphasize a particular appraisal dimension as the basis for hypothesized effects on cognition. Instead, our approach emphasized the proposed evolutionary function of each emotion—the way in which it is thought to enhance inclusive fitness (i.e., survival, reproduction, and kin care). Evolutionary function plays a prominent role in several theorists' definitions of emotion (Cosmides & Tooby, 2000; Ekman, 1992; Fredrickson, 1998, 2001; Frijda, 1986; Izard, 1992; Keltner, Haidt, & Shiota, 2006; Lazarus, 1991; Plutchik,

¹ For a notable exception on how general positive versus negative affect can influence information processing, see Wegener, Petty, and Smith (1995). This perspective suggests that the effect of positive and negative mood depends on whether the message that one is processing is positive or negative. Because the current research focused on examining a variety of discrete positive emotions, rather than positive and negative affect, we examined the influence of different positive emotions on messages that did not vary in their hedonic consequences.

1980), and this theoretical approach helps avoid the problem of defining, eliciting, and measuring emotions purely on the basis of English-language vocabulary. From an evolutionary perspective, emotions are conceived as superordinate neural programs that call upon a series of existing “subroutines” and coordinate their effects. That is, emotions exist to facilitate functional behavior in the face of a prototypical, fitness-relevant opportunity or threat. Appraisals and cognitive biases such as risk sensitization and certainty are among the tools an emotion program can call upon to get the job done, and different emotions are expected to rely upon somewhat overlapping, yet somewhat different, tool kits (Cosmides & Tooby, 2000). As a result, emotion-specific effects on cognition may be mediated by different biases and processes, rather than a single mediator (Fredrickson, 1998, 2001).

The results of previous studies do not allow comparison of the appraisal-focused and function-focused approaches. The Bodenhausen, Kramer, & Susser (1994) and Tiedens and Linton (2001) studies were critical first steps in demonstrating that emotions of the same valence can have different effects on processing style. They were not designed, however, to assess the individual effects of several emotions on processing or the mechanisms behind such effects. An evolutionary perspective can account for the effects of anger and sadness observed by Bodenhausen, Sheppard, & Kramer (1994). For example, if the function of sadness is to regroup and reevaluate one’s strategy after a significant loss, then risk aversion, careful scrutiny of the environment, and behavioral inhibition are all appropriate components of the sad response. If the function of anger is to reclaim threatened resources and status, then risk seeking, self-confidence, and disinhibition are appropriate. Tiedens and Linton (2001) examined how processing style was influenced by several emotions (anger, disgust, worry, fear, sad-certain, sad-uncertain, contentment, and surprise). These emotions were selected to represent different conditions in a 2 (valence) \times 2 (certainty) design, not to offer broad coverage of positive and negative emotions. A neutral control was only included in one study, so analyses emphasized the main effects of valence versus certainty in predicting processing, rather than asking which emotions produced different effects from a neutral state.

We do not dispute that certainty appraisals (or other appraisals) substantially influence subsequent processing, and it may be that affect valence also exerts an independent effect. We do propose, however, that neither valence nor certainty can account for all of the variability in the effects of different discrete emotions on processing, and that different emotions may influence processing through quite different mechanisms.

A New Approach: Functional Definitions of Discrete Positive Emotions

Although positive emotion was long considered a single construct, researchers have begun to offer functional definitions of specific varieties of positive emotion, whereby different positive emotions facilitate fitness-enhancing responses to distinct types of opportunities (e.g., Fredrickson, 1998, 2001; Griskevicius, Shiota, & Nowlis, 2009; Keltner & Haidt, 2003; Shiota, Campos, Keltner, & Hertenstein, 2004; Tracy & Robins, 2008). In the broaden-and-build theory of positive emotions, for example, Fredrickson (1998, 2001) argued persuasively that while discrete positive emotions share some components, different positive emotions have some-

what different, emotion-specific effects on cognition and behavior relevant to the evolved adaptive significance of each emotion (Fredrickson & Branigan, 2005). For example, discrete positive emotions such as joy, contentment, and pride all broaden people’s momentary thought-action repertoires and build people’s enduring personal resources, but each emotion motivates individuals to broaden-and-build in different emotion-specific domains (Griskevicius, Shiota, et al., 2009).

In the current research, we assessed the impact on persuasive message processing of six functionally distinct positive emotions described in previous literature (e.g., Keltner et al., 2006; Shiota et al., 2004): anticipatory enthusiasm, contentment, attachment love, nurturant love, amusement, and awe.² By using the theorized function of each emotion as a starting point, we derived hypotheses regarding whether a specific positive emotion, in relation to a neutral control state, should lead a persuasive message to be processed in a more heuristic or a more systematic manner. We discuss each of the six positive emotions we examined in more detail below.

Anticipatory enthusiasm serves primarily to facilitate the acquisition of material resources, with food as the prototypical reward (Depue & Collins, 1999; Young & Wang, 2004). The critical feature of this emotion is *anticipation*, and its elicitation by “unconditional distal incentive cues of reward” (Panksepp, 1998, p. 147). For example, consider the feeling experienced when smelling the preparation of a delicious dinner, or the feeling of excitement after overhearing that you might be getting a raise. Anticipatory enthusiasm leads people to feel “wanting” (Berridge & Robinson, 1995), and promotes rapid action to acquire and consume the reward. A rich body of research associates anticipatory enthusiasm with activation in a lateral hypothalamic pathway, including the nucleus accumbens shell (Depue & Collins, 1999; Knutson, Taylor, Kaufman, Peterson, & Glover, 2005), a structure that appears to “learn” conditioned cues of reward efficiently (Ghitza, Fabbriatore, Prokopenko, Pawlak, & West, 2003), but emphasizes magnitude of reward over probability (Knutson et al., 2005). Thus, anticipatory enthusiasm draws attention to predictable associations among cues of reward, the experience of reward, and behavioral strategies for acquiring rewards. Because anticipatory enthusiasm enhances one’s attention to potential benefits in the environment, and increases use of internal knowledge structures (learned cues of reward, acquisition strategies), we hypothesized that this emotion would decrease careful scrutiny of a general incoming persuasive message and increase reliance on heuristics.

Contentment is the feeling of satiety and satisfaction experienced after the fulfillment of basic physical needs, such as food and warmth (Berenbaum, 2002). Theories of the function of contentment suggest that this emotion prompts individuals to reduce behavioral activation and “savor and integrate” their recent successes (Fredrickson, 1998, p. 306). Recent research with rodents supports the proposal that memory encoding of the pathway that led to a just-consumed reward takes place during postconsummatory satiety behavior (Foster & Wilson, 2006). In this sense, contentment may facilitate both physiological and informational

² This list is not intended as a comprehensive taxonomy of positive emotions, but rather as a broad sample of such states.

“digestion,” with the latter leading to the cementing of memory about the process of reward acquisition (Depue & Morrone-Strupinsky, 2005). Because contentment turns one’s attention inward to recent experiences rather than outward to new information in the environment, we hypothesized that contentment would reduce persuasive message scrutiny and increase reliance on heuristics.

Attachment love is the surge of love for a trusted caregiver (Bowlby, 1980; Shaver, Morgan, & Wu, 1996). The prototypical elicitor of this positive emotion is the provision of care by an attachment figure, such as a parent, romantic partner, or close friend (Ainsworth, 1989; Shiota, Keltner, & John, 2006). The presence of—and especially physical contact with—attachment figures facilitates the reduction of physiological arousal, and helps alleviate hypothalamic–pituitary–adrenal (HPA) axis activation in times of stress (Carter, 1998; Hennessy, 1997). Attachment love is thus associated with feelings of safety and a lack of responsibility, and facilitates the passive acceptance of a caregiver’s attentions (Shiota et al., 2006). Because attachment love is associated with feeling trust and acceptance, we predicted that attachment love should reduce systematic processing of new information and increase reliance on heuristics.

Nurturant love (sometimes referred to as *compassion*) is the feeling of love and concern for another’s well-being, typified by one’s emotions when seeing an infant, small child, or baby animal (Shiota et al., 2006). Prototypical elicitors of nurturant love include physical cues of infancy and behavioral cues of vulnerability or “cuteness” (Hildebrandt & Fitzgerald, 1979; Lorenz, 1971). This positive emotion serves to motivate nurturant and caregiving behavior, especially toward one’s offspring and young kin (Shaver et al., 1996). Effective caregiving requires both attending closely to the target’s needs, and vigilance against threats to protect the target from possible harm (Hrdy, 1999). In contrast with attachment love, we hypothesized that the responsibility and vigilance associated with nurturant love should increase systematic processing of the environment.

Amusement is the positive emotion experienced during social or cognitive play, including humor (Pellegrini & Smith, 2005; Shiota et al., 2004). Theories of play emphasize that these behaviors allow one to practice risky or high-investment skills (such as fighting or complex problem-solving) under safe circumstances, without real time pressure or risk of harm (Smith, 1982). Consistent with this theory, play behavior and the experience of humor are both associated with a distinctive “drop-jaw” smile, laughter, or both (Sarra & Otta, 2001; Shiota, Campos, & Keltner, 2003), expressions that promote social bonding by letting down one’s guard and signaling social support (Devereux & Ginsburg, 2001; Provine, 2000). We hypothesized that the “not serious,” low-responsibility aspect of amusement would lead to less-careful scrutiny of incoming persuasive messages.

Awe is the feeling of wonder and astonishment experienced in the presence of something novel and difficult to grasp—a stimulus that cannot be accounted for by one’s current understanding of the world (Keltner & Haidt, 1999). Prototypical elicitors of awe include panoramic views, works of great art, and others’ remarkable accomplishments (Shiota, Keltner, & Mossman, 2007). This positive emotion serves to facilitate new schema formation in unexpected, information-rich environments (Keltner & Haidt, 1999). Accordingly, the state experience of awe leads people to shift their

awareness away from day-to-day concerns and toward current incoming information, and dispositional awe proneness is negatively correlated with need for cognitive closure (Shiota et al., 2007). Because the theorized function of awe is to increase systematic, accommodative processing, we hypothesized that awe should lead to more careful scrutiny of persuasive messages.

Research Overview

The first goal of the current research was to investigate the effects of six positive emotions on the processing of persuasive messages. This question was addressed by developing and validating two different methods to elicit the positive emotions, and by assessing the emotions’ influence on persuasive message processing using two well-established methods. In Study 1, emotions were elicited by having participants write about a personal emotional experience with a prototypical elicitor of a specific positive emotion; processing was assessed via the classic Petty and Cacioppo (1986) “comprehensive exams” paradigm. In Study 2, emotions were elicited by reading a short story depicting prototypical elicitors of a specific positive emotion (e.g., Griskevicius, Tybur, et al., 2009; Griskevicius, Cialdini, & Kenrick, 2006), and processing was assessed via another method involving a different attitude topic and a different kind of heuristic cue (see Tiedens & Linton, 2001).

The second goal of this research was to ask whether the effects of different positive emotions on processing were accounted for by a common mediator or by different mediators. To address this goal, Study 2 investigated whether several of the positive emotions were associated with cognitive appraisals of certainty and responsibility (Lerner & Keltner, 2001; Tiedens & Linton, 2001), or with different patterns of thoughts about the persuasive message that might explain their effects on processing.

Study 1: How Six Different Positive Emotions Influence Cognitive Processing

The first study examined the effects of six positive emotions on cognitive processing using a classic persuasion paradigm to distinguish between systematic and heuristic processing (e.g., Cacioppo & Petty, 1989; Petty, Cacioppo, & Goldman, 1981). In this paradigm, college students are told that their university is considering instituting comprehensive exams as part of a graduation requirement. Although students are initially wary about this proposal, they are then presented with a long list of detailed arguments in favor of the proposed exam. Importantly, participants are presented with a list of either “strong” or “weak” arguments for the exam. In the absence of any additional manipulation, the strong arguments are by definition fairly persuasive.

The information needed to distinguish whether people are processing the arguments in a systematic or heuristic manner is inferred from what happens in the weak arguments condition. Traditionally, negative affect causes the weak arguments to be even less persuasive than in a neutral-affect condition (Petty & Cacioppo, 1986). In contrast, positive affect causes the same weak arguments to be more persuasive than in the neutral-affect condition; this increased persuasiveness is attributed to participants in a positive state not processing very deeply, and instead basing their attitudes on a simple heuristic: Given the large

number of proexam arguments, the exam must be a pretty good idea (Petty & Cacioppo, 1986).

In Study 1 we investigated the persuasiveness of both weak and strong arguments as a function of whether participants were in a neutral (control) emotional state, or in a positive emotional state of anticipatory enthusiasm, contentment, attachment love, nurturant love, amusement, or awe. Consistent with previous findings, the emotion manipulation was expected to have little influence on the persuasiveness of the strong arguments; the inclusion of strong arguments served primarily to confirm the validity of the current experiment. The hypotheses of the current study were tested in the seven weak argument conditions, which were predicted to differ from the neutral condition. Specifically, we predicted that participants in the anticipatory enthusiasm, contentment, attachment love, and amusement conditions would report higher endorsement of a weak persuasive message than those in a neutral control, which would be indicative of heuristic processing. In contrast, we predicted that participants in the nurturant love and awe conditions would report lower endorsement of the weak message than those in a neutral control, which would be indicative of systematic processing.

Method

Participants. Three hundred ninety-eight participants (149 men and 249 women) from a large public university participated in the study as partial fulfillment of their course requirement. Approximately 70% of participants were European American. All participants came to the lab in groups of 2 to 8 and were each seated between partitions at a computer.

Design and procedure. The overall design of the experiment was a 7 (emotion: anticipatory enthusiasm, amusement, attachment love, contentment, nurturant love, awe, and neutral/control) \times 2 (argument strength: weak vs. strong) between-participants design. At the beginning of the study, specific emotions were elicited by having participants write about their feelings when they were in a situation that is a prototypical elicitor of a specific emotion (see below). Participants then viewed either weak or strong arguments about a proposal to institute comprehensive exams at their university. Afterward, participants indicated their attitudes toward this proposal.

To minimize potential demand characteristics, we used a cover story. Participants were informed that they were going to complete several unrelated studies. The first study was about memory and would involve having everyone write about a personal experience; participants were told that this memory study was examining the kinds of details people remember when asked to recall an experience. Participants were told that there were several other surveys in the study session, including one about student opinion on some current educational issues. Poststudy interviews with participants did not reveal any indication of suspiciousness.

Emotion inductions. Specific emotions were induced by having participants recall and write about a personal experience involving the theoretically defined, prototypical elicitor of each emotion. Unlike previous studies using seemingly similar methods, we intentionally did not ask participants to write about a time when they felt “English-language emotion word,” and the instructions did not include the target emotion word or any other emotion word. Instead, participants were asked to write only about a

theoretically relevant experience, for two reasons. First, a functional approach to specific emotions defines an emotion by the function it serves in a particular kind of eliciting situation. Thus, to elicit a specific emotion, a person should be presented with a prototypical situation in which that emotion is functionally appropriate. Second, asking participants to write about an emotion label (e.g., “contentment”) relies heavily on the assumption that the participant defines this term in the same way as the researcher, and also presumes that the resulting memory will elicit only the target emotion and not other, confounding emotions. Below are the specific instructions that participants received in each emotion condition.

Anticipatory enthusiasm. Please try to recall a specific time in your life when you knew something good was going to happen to you soon, and you were looking forward to that event. The event can be anything that you were looking forward to, but focus on the feeling of anticipating that event, rather than the event itself. Please recall a specific time when you had the feeling of anticipating a positive event, not a general period of time.³

Contentment. Please try to recall an event in your life when you had just eaten a delicious meal and your body felt full and comfortable. Please recall a specific event in which you felt full and comfortable after a delicious meal, rather than a general period of time.

Attachment love. Please try to recall an event in your life when another person really took care of you and made you feel better. This other person might be a parent, family member, romantic partner, friend, or some other person who nurtured and cared for you. Please recall a specific event when a person took care of you, rather than a general period of time.

Amusement. Please try to recall an event in your life when you heard a funny joke or when something funny happened. Please recall a specific event that was funny, rather than a general period of time.

Awe. Please try to recall an event in your life when you saw a particular panoramic view for the first time. Some examples might be seeing the Grand Canyon, seeing the view from high up on a mountain, or seeing the skyline of a big city for the first time. Please recall a specific event when you saw this view for the first time, rather than a general period of time.

Nurturant love. Please try to recall an event in your life when you took care of an animal or another person. The one you cared for might have been a pet, a baby or child, a friend, or anyone else you nurtured and made feel better. Please recall a specific event in which you took care of this animal or person, rather than a general period of time.

Neutral control. Please try to recall the last time you did the laundry.

All participants were then instructed as follows: “When you have recalled such an event, please take a minute to remember that event as vividly as you can. Then, please write about this event, and your feelings during the event, in as much detail as you can.”

³ The original task developed to elicit anticipatory enthusiasm asked participants to write about a time when they unexpectedly came into some money. However, early pretesting indicated that this task led participants to feel mostly surprise, which is a mixed emotional state blending shock, fear, awe, and anticipatory enthusiasm. The task was subsequently changed to elicit primarily the positive emotion of anticipatory enthusiasm.

If participants finished before the total allowed time (12 min), they could advance to the next part of the study.

Emotion induction pretesting. To ensure that the emotion manipulations elicited the intended emotional states, the seven manipulations were pretested with a separate sample of 197 participants. Each participant underwent one of the seven writing tasks (presented as a memory recall task). Participants then indicated the extent to which the task led them to feel a variety of different emotions.

To ensure that the specific emotion labels rated by participants corresponded to the same psychological constructs for both the participants and the researchers, the emotion labels were pre-defined for participants in the following manner:

Contentment: Feeling relaxed, satisfied, and comfortable, like all of your needs have been fulfilled; the kind of feeling that makes you want to lay around and do nothing for a while. *Awe:* Feeling amazed, as though your mind is stretching and your understanding of the universe is expanding; the kind of feeling that freezes you in one spot and makes you want to memorize everything about your experience. *Nurturance:* Feeling kindly, warm, and affectionate; the kind of feeling that makes you want to go to someone and cuddle them and take care of them. *Love:* Feeling loved and cared for by other people; the kind of feeling that makes you want to stay close to those people, giving up control and letting them handle everything for you. *Enthusiasm:* Feeling like you really want something to happen, and are so excited you can barely wait; the kind of feeling that makes you willing to do anything to get the thing you want. *Amusement:* Feeling playful, bubbly, and giggly, like you are having a lot of fun; makes you want to laugh and joke around.

Participants were also provided with definitions of four negative emotions (sadness, anger, disgust, and fear),⁴ and participants also indicated whether the recall task made them feel “happiness,” which was used as a measure of general positive affect. Participants indicated their responses on a 7-point scale anchored at 0 (*not at all*) and 6 (*very much*). In summary, participants indicated whether the memory they had recalled led them to feel (a) happiness, (b) enthusiasm, (c) contentment, (d) love, (e) amusement, (f) nurturance, (g) awe, (h) sadness, (i) fear, (j) anger, and (k) disgust. To minimize potential demand characteristics, we had participants see and rate the emotion labels one at a time, and the labels were presented in random order.

The pretest results indicated that all six positive emotion manipulations elicited feelings of happiness, meaning that all six manipulations elicited positive affect. However, each of the six manipulations elicited a different specific positive emotion (see Table 1 for all means). Specifically, for each emotion manipulation, the target emotion was always rated the highest and was always above the midpoint. Additionally, none of the positive emotion manipulations elicited negative emotion, and the neutral control condition was rated low on all of the positive and negative emotions.

Persuasion task and measures. After the emotion induction, participants moved to a different task (consistent with the cover story). Participants were informed that the university administration was considering instituting a senior comprehensive exam in each major as a requirement for graduation. Although it was ambiguous when this policy would take effect if approved, participants were told that the Board of Regents was currently considering student opinion about the issue. Before providing their opin-

ions, participants were asked to familiarize themselves with the proposal by looking at a report. The report was about 1000 words in length and consisted of nine clearly labeled arguments in favor of the exam that were either strong or weak (for specific text, see Petty & Cacioppo, 1986). For example, one of the strong arguments indicated the following:

Data from the University of Virginia, where comprehensive exams were recently instituted, indicate that the average starting salary of graduates increased over \$6,000 over the 2-year period in which the exams were begun. At comparable universities without comprehensive exams, salaried increases by only \$850 over the same period. As Saul Siegel, a vice-president of Disney put it in *Business Week* recently, “We are much quicker to offer larger salaries and executive positions to these kids because by passing their area exam, they have proven to us that they have expertise in their area rather than being people who may or may not be dependable and reliable.” Another benefit is that universities with the exams attract more well-known corporations to campus to recruit students for their open positions. The end result is that students at schools with comprehensive exams have a 55% greater chance of landing a good job than students at school without the exams.

In contrast, the corresponding weak argument indicated the following:

Data from the University of Virginia show that some students favor the senior comprehensive exam policy. For example, one faculty member asked his son to survey his fellow students at the school since it recently instituted the exams. Over 55% of his son’s friends agreed that in principle, the exams would be beneficial. Of course, they didn’t all agree but that fact that most did proves that undergraduates want the exams. As Saul Siegel, a student whose father is a vice-president at Disney, wrote in the school newspaper, “The history of the exams can be traced to the ancient Greeks. If comprehensive exams were to be instituted, we could feel pleasure at following the same traditions begun by Plato and Aristotle. Even if there were no other benefits of the exams, it would be worth it just to follow the tradition.

Participants then indicated their attitudes toward the exam proposal by responding to five items. Specifically, participants rated how they felt about the comprehensive exams on five 9-point semantic differential items (ranging from -4 to +4) anchored at bad-good, unfavorable-favorable, foolish-wise, negative-positive, and harmful-beneficial (see Petty & Cacioppo, 1986). These five items were combined to create a single index of persuasion ($\alpha = .95$).

Results

An omnibus two-way analysis of variance (ANOVA) indicated the predicted interaction of emotion and argument strength on the

⁴ *Sadness:* Feeling unhappy, hopeless, full of sorrow, like something awful has happened and there’s nothing you can do; makes you want to give up, withdraw, and cry. *Anger:* Feeling furious, offended, personally or morally outraged; makes you want to get back at whoever hurt you and make them suffer or get them to apologize. *Disgust:* Feeling grossed out by something, like it makes you sick to your stomach; makes you want to get away from whatever is causing your disgust. *Fear:* Feeling frightened, terrified, like you’re in danger and something might try to hurt you; makes you want to run away or do whatever you can to protect yourself.

Table 1
Emotions Elicited via Writing Task (Study 1) and Reading Task (Study 2)

Emotion felt	Specific emotion condition (writing task/reading task)						
	Neutral (control) N = 28/28	Anticipatory enthusiasm N = 28/27	Contentment N = 27/n.a.	Attachment love N = 27/n.a.	Amusement N = 27/29	Nurturant love N = 32/34	Awe N = 28/31
Enthusiasm	1.26/1.50	5.11/4.84	2.56/n.a.	1.07/n.a.	1.92/2.98	2.06/2.82	3.51/3.04
Contentment	3.81/2.58	3.60/3.41	5.22/n.a.	2.81/n.a.	2.68/1.19	3.13/3.08	3.86/3.54
Love	0.48/0.54	2.68/1.04	2.99/n.a.	4.01/n.a.	1.56/0.65	2.97/2.67	2.18/1.84
Amusement	1.22/1.12	2.89/1.93	2.93/n.a.	1.37/n.a.	5.48/4.35	1.84/3.09	2.07/2.19
Nurturance	0.74/1.08	2.14/1.56	3.19/n.a.	2.85/n.a.	1.80/0.39	4.19/4.44	2.18/2.42
Awe	0.81/0.88	2.89/1.41	2.52/n.a.	1.52/n.a.	2.16/1.61	1.56/2.44	5.21/4.77
Happiness	2.12/2.11	5.50/3.63	5.00/n.a.	3.26/n.a.	4.20/3.91	3.36/3.94	5.11/4.41
Sadness	0.37/0.77	0.46/0.48	0.11/n.a.	1.93/n.a.	0.24/0.65	1.84/0.97	0.11/0.42
Fear	0.29/0.23	0.68/0.41	0.19/n.a.	1.18/n.a.	0.64/1.13	1.19/0.76	0.75/0.38
Anger	0.68/0.85	0.36/0.63	0.26/n.a.	1.33/n.a.	0.04/1.50	1.34/0.85	0.18/0.36
Disgust	0.71/0.70	0.26/0.48	0.26/n.a.	0.93/n.a.	0.32/3.23	1.03/0.53	0.07/0.23

Note. Means are on a 0–6 scale, whereby higher means indicate a more intense feeling of a specific emotion. Boldface type indicates the key cells for a given emotion manipulation condition; n.a. = not applicable.

persuasiveness of the message, $F(6, 384) = 2.85, p = .01, \eta^2 = .043$. As was expected, emotion did not influence the persuasiveness of the strong arguments. However, emotion had a predicted significant influence on the persuasiveness of the weak arguments, $F(6, 231) = 7.86, p < .001, \eta^2 = .17$ (see Figure 1). To test for how different positive emotions influenced the persuasiveness of the weak message, a series of planned contrasts was performed. We first tested whether the weak arguments differed in persuasiveness in each positive emotion condition in relation to the neutral condition. We then did a more stringent test of our hypotheses by examining whether the persuasiveness of the strong versus weak arguments differed within each emotion condition.

To examine the influence of specific positive emotions, we compared the persuasiveness of the weak arguments in each positive emotion condition to the persuasiveness of weak arguments in the neutral control condition. Consistent with previous research,

the weak arguments in the first three emotion conditions (amusement, anticipatory enthusiasm, and attachment love) were all generally more persuasive in comparison with the neutral control (see Figure 1). Specifically, endorsement of the comprehensive exams after reading the weak persuasive arguments was significantly greater in the amusement than in the neutral condition, $F(1, 384) = 5.66, p = .018, \eta^2 = .015$; and the difference was marginally significant for enthusiasm, $F(1, 384) = 3.73, p = .055, \eta^2 = .010$, and for attachment love, $F(1, 384) = 3.50, p = .062, \eta^2 = .009$. Although contentment trended in the hypothesized direction, it was not significantly different from the neutral condition, $F(1, 384) = 1.44, p = .23, \eta^2 = .004$. In contrast, awe led the weak arguments to be significantly less persuasive in comparison with control, $F(1, 384) = 4.54, p = .034, \eta^2 = .012$. Similarly, nurturant love also led the weak arguments to be significantly less persuasive in comparison with control, $F(1, 384) = 4.62, p = .032, \eta^2 = .012$

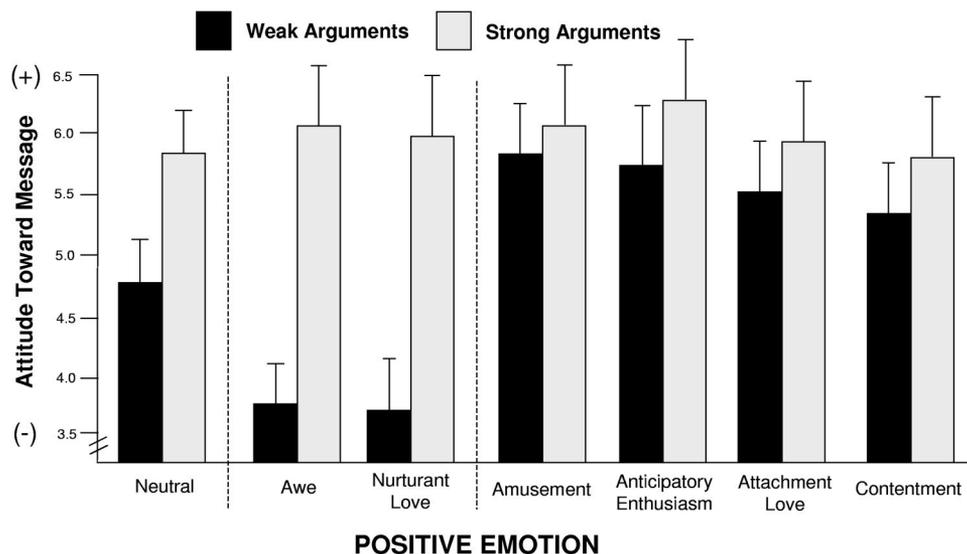


Figure 1. Emotion and persuasiveness of weak versus strong arguments (Study 1).

(see Figure 1). Thus, despite the fact that awe and nurturant love are positive states, both emotions produced results consistent with increased systematic processing.

Although the findings above are consistent with our predictions, we additionally tested our predictions in another way, which is sometimes used to determine whether participants are processing a message in a systematic or heuristic manner. Specifically, we examined whether the persuasiveness of the weak and strong arguments was similar or different in each emotion condition. In the neutral control condition, as would be expected by the definition of “strong” and “weak” arguments, the strong arguments were more persuasive than were the weak arguments, $t(76) = 2.63, p = .01$. As is seen in Figure 1, however, the strong and weak arguments did not differ significantly in their persuasiveness when people were feeling amusement ($p = .66$), attachment love ($p = .46$), contentment ($p = .29$), and anticipatory enthusiasm ($p = .29$). Thus, these four positive emotions produced effects consistent with increased heuristic processing. In contrast, the strong arguments were substantially more persuasive than the weak arguments when people were feeling awe, $t(57) = 4.82, p < .001$, and nurturant love, $t(54) = 4.01, p < .001$. Overall, the emotions of awe and nurturant love led the weak arguments to be not only significantly less persuasive than were the strong arguments, but also significantly less persuasive than the same weak arguments in the control condition, providing strong evidence that awe and nurturant love led to increased systematic processing.

Discussion

Study 1 examined the effects of six different positive emotions on message processing, finding that positive affect can lead to heuristic or to systematic processing, depending on the specific positive emotion that is elicited. The positive emotions of anticipatory enthusiasm, amusement, and attachment love appeared to facilitate heuristic processing in relation to a neutral control condition. It is notable that these three emotions are precisely those elicited by the most common experimental manipulations of positive affect: watching a funny video clip (amusement); receiving a gift such as candy (anticipatory enthusiasm); and writing about a time one felt “happy.” For the latter, the few content analyses reported for such manipulations suggest that when college students are given this prompt, they write about intimate social interactions such as a reunion with loved ones or a party with close friends (Smith & Ellsworth, 1985)—memories likely to elicit a blend of attachment love and amusement. In contrast, the positive emotions of awe and nurturant love—almost never elicited by traditional manipulations of positive affect—led to more systematic processing.

Study 1 documented the differing effects of several positive emotions on processing of a persuasive message. A question remains, however: Can the varying effects of different positive emotions be explained by certainty appraisals or by some other single mediator? Or are the effects of different positive emotions best accounted for by different mediators? This question was addressed in Study 2.

Study 2: Testing Mechanisms by Which Different Positive Emotions Influence Cognition

In Study 2, we sought first to replicate the key findings of Study 1 by using a different method of emotion induction and a different method to distinguish between heuristic and systematic processing. In addition, we examined potential mechanisms that might explain how the different positive emotions influence cognitive processing. To facilitate careful mediation analyses for both the “systematic” and the “heuristic” positive emotions, the current study was limited to the two emotions of each type whose effects differed most from those of a neutral control in Study 1: awe and nurturant love (the two systematic emotions), and anticipatory enthusiasm and amusement (the two heuristic emotions). Consistent with the findings from our first study, we predicted that participants would be less persuaded by weak messages in the awe and nurturant love conditions in comparison with a neutral control condition, indicating more systematic processing. Conversely, we again predicted that participants would be more persuaded by weak messages in the anticipatory enthusiasm and amusement conditions than in a neutral control condition, indicating more heuristic processing.

In addition to conceptually replicating the persuasion findings from Study 1, the current study also examined potential mechanisms by which the different positive emotions might lead to differences in persuasive message processing. Our approach involved performing a series of mediation analyses examining the factors that might account for each positive emotion’s distinct effects in relation to the neutral control. As is discussed below, we focused on two types of mediating factors: (a) cognitive appraisals, especially the appraisal of certainty, and (b) thought-listing profiles.

Cognitive Appraisals

Studies examining different emotions of the same valence have typically contrasted two emotions of the same valence selected to differ on some key appraisal dimension (e.g., novelty and expectedness; Scherer, 1997; Smith & Ellsworth, 1985), and then shown that the cognitive effects of these emotions differ in ways consistent with appraisal-based hypotheses, rather than testing mediation outright (see Tiedens & Linton, 2001, Study 3, for a notable exception). In this work, appraisals of an emotion-eliciting situation are thought to “carry over” to bias information processing in subsequent situations. Study 2 asked explicitly whether appraisals on a single dimension mediated all four positive emotions’ differences from a neutral control. One particular candidate for this role is the appraisal of certainty about a situation’s outcome (Tiedens & Linton, 2001). High certainty might lead to reduced care in evaluating the environment, whereas low certainty might trigger more cautious attention. If nurturant love and awe were rated low on certainty in relation to a neutral situation, and anticipatory enthusiasm and amusement were rated high on certainty, this could account for the differences in their observed effects on persuasive message processing. In Study 2, participants thus rated their appraisals of certainty regarding the outcome of the target emotion-eliciting situation, as well as rating all four emotions on several other commonly used appraisal dimensions.

Thought-Listing Profiles

Another possible mechanism behind the effects of different positive emotions in Study 1 is that different emotions encourage different global biases in evaluating a persuasive message. In studies of persuasion, for example, researchers often ask participants to list the thoughts that they were having as they processed the message. The total number of thoughts is often used as an overall measure of message elaboration. In addition to counting the total number of listed thoughts, each thought can be categorized as favorable, unfavorable, or irrelevant to the message, thereby creating a *thought-listing profile* (Petty & Cacioppo, 1986). On the whole, more favorable thoughts about the message should predict greater endorsement, whereas more unfavorable thoughts should predict weaker endorsement. Perhaps our Study 1 findings can be explained in this manner, with nurturant love and awe facilitating a bias toward unfavorable thoughts in comparison with a neutral state, and anticipatory enthusiasm and amusement facilitating a bias toward favorable thoughts. In Study 2, we thus examined the thought-listing profiles associated with each of the four positive emotions, asking whether thought listings accounted for the differing effects on persuasive message processing.

Evolutionary Perspective on Emotion Mechanisms

Each of the two approaches described above suggests that a single factor can account for all of the differences among the positive emotions observed in Study 1. As was noted earlier, however, an evolutionary perspective on positive emotions suggests that different emotions may alter persuasive message processing through different mechanisms. For example, the mechanism by which awe facilitates systematic processing may not be the same as the mechanism by which nurturant love facilitates systematic processing, even though both emotions end up having the same effect. As was noted earlier, awe is felt in response to a stimulus that cannot be accounted for by one's current understanding of the world, and is thought to promote information gathering and new schema formation (Keltner & Haidt, 1999; Shiota et al., 2007). If this is correct, it may well be that uncertainty or an overall increase in processing or both leads to more critical evaluation of persuasive messages. Thus, we would expect the effects of awe on weak persuasive message endorsement (in relation to a neutral control) to be mediated by certainty appraisals or total number of thoughts about the persuasive message, or both. In contrast, nurturant love is thought to promote caregiving and protectiveness (Hrdy, 1999). If this is true, then individuals feeling nurturant love may approach persuasive messages with an increased sense of responsibility and aversion to risk. If this is the case, then appraisals of responsibility and a bias toward unfavorable over favorable thoughts about the persuasive message should mediate the effects of nurturant love on message processing.

Similarly, the mechanism by which anticipatory enthusiasm facilitates heuristic processing may differ from the mechanism by which amusement produces the same effect. Anticipatory enthusiasm, which facilitates attention to and acquisition of rewards in the environment, often despite low probabilities or attendant risks, may promote a bias toward favorable rather than unfavorable thoughts about a persuasive message, leading to increased endorsement. In contrast, amusement may encourage one to approach

tasks in a playful, nonserious manner, reducing one's appraisal of responsibility and increasing heuristic processing. If this is the case, then the effects of amusement on message processing should be mediated by appraisals of responsibility rather than the ratio of favorable to unfavorable thoughts about the message itself.

Overall, we approached Study 2 with multiple hypotheses regarding the appraisal-based and thought listing-based mechanisms that might be mediating the effect of each emotion on message processing. Specifically, we hypothesized that the following: (a) the effects of anticipatory enthusiasm would be mediated by a bias toward favorable versus unfavorable thoughts about the message; (b) the effects of amusement would be mediated by low responsibility appraisals; (c) the effects of awe would be mediated by low certainty appraisals or high total number of thoughts about the persuasive message; and (d) the effects of nurturant love would be mediated by high responsibility appraisals or a bias toward unfavorable versus favorable thoughts about the message.

Method

Participants. Three hundred thirty-seven participants (162 men and 175 women) from a large public university participated in the study as partial fulfillment of their course requirement. Mean age was 19.4 years ($SD = 2.7$), and approximately 70% of participants were European American. Participants came to the lab in groups of 2 to 8 and were each seated at a partitioned computer.

Design and procedure. The experiment consisted of five between-participants emotion conditions: neutral, awe, nurturant love, amusement, and anticipatory enthusiasm. Emotions were elicited by having participants read short stories (e.g., Griskevicius, Shiota, et al., 2009; see below). Participants then read an essay about a proposal to institute a normal grading curve at the university and indicated their attitudes toward the exam. Participants also provided ratings of the target emotion situation along several appraisal dimensions, and listed the thoughts they had while reading the persuasive message.

To minimize potential demand characteristics, we used a cover story similar to that in Study 1. Poststudy interviews with participants did not reveal any indication of suspiciousness.

Emotion inductions. The four positive emotions and neutral affect were elicited by having participants read a short story of about 500 words. Participants were told that because we were interested in memory (consistent with the cover story), we wanted them to try a particular memory technique: They should read a story carefully and try to feel the way the main character is feeling. Below are brief summaries of the stories used to elicit each of the four emotions.

Nurturant love. Participants imagine sitting and relaxing on a bench that happens to be by a preschool playground. As they watch children play, readers notice that they know one of the children, who is a neighbor's daughter. The story ends as readers are looking at her pink little face and bubbly cheeks, while she tries slowly and clumsily to climb up a single large step.

Awe. Participants imagine going to Paris for the first time. Upon seeing the city and the grandiose architecture, they head to the Eiffel Tower. After taking the elevator to the top of the tower, the story ends as the person is slowly scanning the panorama of Paris from atop the tower.

Anticipatory enthusiasm. Participants imagine being hungry at the end of the day and going to their favorite restaurant to order food. While waiting in line, they salivate over the wonderful aromas and imagine how great it would be to eat the hot and tasty meal. The story ends as participants are at home, with all of the dishes placed on the table right in front of them, about to take their first highly anticipated bite.

Amusement. Participants imagine overhearing a funny story, in which a person accidentally finds himself in a comedic situation at a social gathering.⁵

Neutral control. Participants imagine doing their laundry. The story methodically goes through the steps of doing laundry, including measuring detergent, finding the correct setting on the washing machine, and switching clothes from the washer to the dryer. The story ends as the person gets ready to fold dry clothes.

The short stories were pretested with a different sample of participants in the same manner as the writing tasks used to elicit emotions in Study 1 (see Table 1 for means). Consistent with the writing task manipulations from Study 1, the nurturant love, awe, amusement, and anticipatory enthusiasm stories all elicited general positive affect (“Happiness”). However, each of the four manipulations did so by eliciting the intended specific positive emotion.

Persuasion task and measures. After reading one of the four emotion-inducing stories or the control story, participants worked on the persuasion task (consistent with the cover story). Participants were told that the university believes that there is a large problem on campus regarding grade inflation, and that the administration is interested in student thoughts about a proposed solution to this problem (see Tiedens & Linton, 2001, Study 2). Participants then read an essay about grade inflation. The essay asserted that grade inflation is a big problem at universities, and that to combat this problem, students should be graded more harshly. The essay argued that grades should be normally distributed, with the mean grade being a C. The arguments in the essay were intentionally weak. For example, the essay argued that one of the main reasons why students should endorse a stricter grading policy is that they would feel better about themselves. Although the arguments were weak, the essay contained a persuasive heuristic cue: It was written by a distinguished professor of education from Harvard University, and the essay was presented in a professional-looking format, implying that it was from the *Chronicle of Higher Education*.

The grade inflation essay used in this study is conceptually analogous to the weak arguments condition in Study 1: The arguments in the essay are weak and unpersuasive, but the essay contains a powerful heuristic cue that could lead individuals to deem the essay persuasive. Thus, systematic processing of this essay should lead it to be unpersuasive because of the low merits of the arguments. But heuristic processing of the essay should lead it to be more persuasive because of the expertise heuristic. Note that we eliminated the “strong arguments” condition for Study 2, because the strong arguments were equally persuasive across all conditions in Study 1, as would be expected (see Figure 1). Considering that the different positive emotions did not influence strong arguments in Study 1, we examined our research question by comparing the persuasiveness of the “weak” essay in the control condition to each of the other emotion conditions. If a positive emotion leads the weak essay to be even less persuasive than is the same weak essay in the control condition, it can be validly presumed that the weak essay in this positive emotion

condition would be much less persuasive than would a strong essay in the same positive emotion condition.

To assess attitudes about the proposal, participants indicated how they feel about the proposal on five 9-point semantic differential items (ranging from -4 to $+4$). The items were anchored at bad–good, unfavorable–favorable, foolish–wise, negative–positive, and harmful–beneficial. These five items were combined to create a single index of persuasion ($\alpha = .94$).

Appraisal dimension ratings. Participants rated their appraisals of the situations described in the emotion induction stories along seven dimensions often used in emotion research (e.g., Scherer, 1997; Smith & Ellsworth, 1985). Specifically, on 9-point scales, participants responded to pairs of items assessing whether the emotion-eliciting situation was (a) unarousing–arousing, (b) uncertain–certain, (c) uncontrollable–controllable, (d) required low or high anticipated effort, (e) low or high novelty of the situation, (f) whether they felt low or high responsibility for creating the situation, and (g) whether the situation was unsafe–safe.⁶ Items within each pair were averaged prior to further analysis.

Thought listings. After participants indicated their attitude toward the proposal, they underwent a thought-listing procedure to assess the extent to which they elaborated on the message. In line with previous persuasion research, participants could list up to 12 thoughts that were going through their mind as they read the essay. After participants listed their thoughts, they classified each thought as favorable, unfavorable, or irrelevant toward the proposal (Petty & Cacioppo, 1986). These classifications served an important function: Although the examination of the total number of thoughts might offer some broad-level insight, examination of particular kinds of thoughts provides emotion-specific insight into how the persuasive message was processed. In order to capture potential bias toward favorable versus unfavorable thoughts about the persuasive message, we subtracted the number of unfavorable thoughts from the number of favorable thoughts for each participant.

Analysis strategy. Our analyses aimed first to replicate the persuasion effects documented in Study 1. We then examined whether there might be a single mediator, such as certainty appraisals, that might account for how the four positive emotions influenced message processing. We also aimed to assess the potential mediating mechanism of each positive emotion in relation to a neutral control condition by examining the significance of two cognitive appraisals (certainty and responsibility), and examining the significance of two types of thought listings (total thoughts and favorable–unfavorable thought bias).

⁵ The amusement story involved humor that elicited moderate amounts of disgust for some individuals (see Table 1). However, pretesting revealed that the humorous aspects of the story strongly outweighed the disgust aspect.

⁶ Exploratory analyses also considered the cognitive appraisals of novelty, arousal, control, effort, and safety as potential mediators of the effects of the four target positive emotions. Although the four positive emotions examined in the study did differ significantly from the neutral control on several of these appraisals, none of the appraisals were found to significantly account for the effects of specific emotions, and they are not discussed further here.

Our overall analysis strategy first used one-way omnibus ANOVAs to assess the overall effect of emotion condition on persuasiveness, certainty, responsibility, total thoughts about the persuasive message, favorable thoughts, unfavorable thoughts, and favorable–unfavorable thoughts bias. To examine mediation, we then performed a series of regression analyses applying the steps described by Baron and Kenny (1986) for assessing mediation: (a) regressing the dependent variable, persuasion, on the independent variable, the target positive emotion versus neutral contrast; (b) regressing the potential mediator on the target positive emotion versus neutral contrast; and (c) regressing persuasion on both (c) the potential mediator and (d) the target positive emotion versus neutral contrast simultaneously. Finally, a Sobel test was conducted to assess the significance of each potential mediation effect (Sobel, 1982). The mediation analyses were conducted separately for each target positive emotion, comparing it with the neutral control condition.

Results

Overall effects of emotion condition. A one-way omnibus ANOVA indicated a significant effect of emotion on persuasiveness, $F(4, 332) = 8.13, p < .001$. Consistent with the findings of the first study, nurturant love and awe produced relatively negative attitudes toward the topic, whereas anticipatory enthusiasm and amusement produced relatively positive attitudes toward the topic (see Figure 2; also see subsequent analyses for the test of each emotion condition vs. the neutral control). A series of one-way omnibus ANOVAs also indicated significant differences among the emotion conditions on the appraisals of certainty and responsibility, as well as on total thoughts and favorable thoughts (see Table 2 for means and F statistics). The omnibus effects of emotion condition on unfavorable thoughts and on the favorable–unfavorable thoughts difference scores were not significant.

Examining the one-mediator hypothesis. We next examined whether one mediator, such as certainty appraisals, might be able to

account for how all of the positive emotions influenced persuasion. However, analyses examining all possible mediators (all of the cognitive appraisals and thought listings) indicated clearly that the emotion condition effects on persuasion do not support a single-mediator hypothesis (see Table 2 for all means). For example, nurturant love and awe—the two “systematic” emotions—were associated with less certainty than was the neutral control, which might reasonably trigger more systematic processing, but amusement—a “heuristic” positive emotion—was also associated with lower certainty. Similarly, anticipatory enthusiasm did lead to a bias toward positive thoughts about the persuasive message, consistent with heuristic processing, but awe—a “systematic” emotion—also led to a bias in this direction. Overall, close examination of Table 2 reveals that no single appraisal rating or thought type accounts for the overall pattern of emotion condition effects on persuasion. Thus, we do not find support for a single-mediator hypothesis.

Performing a series of regression analyses, we next examined the effects of each emotion versus the neutral control condition on persuasion, and on the predicted emotion-specific mediators. Results for Step 1 of the mediation analyses—contrasting effects of the target positive emotion versus the neutral control on persuasion—are illustrated in Figure 2. The results for Steps 2, 3, and 4 of the mediation analyses are summarized in Table 3, as are the results of the Sobel tests.

Anticipatory enthusiasm versus neutral control mediation analyses. As in Study 1, participants in the anticipatory enthusiasm condition were more persuaded by the weak arguments than were participants in the neutral control ($B = .26, r = .17, p = .042$), documenting a significant effect to be mediated. As was discussed earlier, we predicted that the effects of anticipatory enthusiasm on persuasion would be mediated by a bias toward favorable versus unfavorable thoughts about the message. Indeed, anticipatory enthusiasm participants reported a marginally significant greater bias toward favorable–unfavorable thoughts in relation to neutral participants, as was predicted (see Table 3). In a

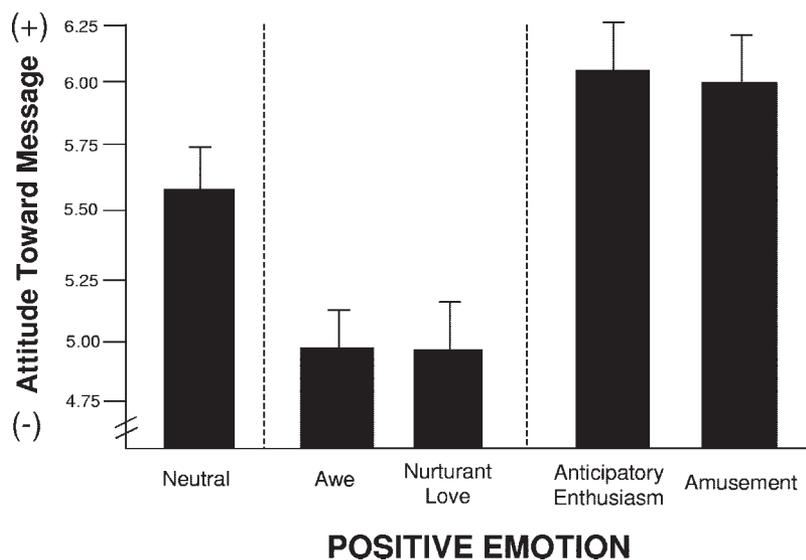


Figure 2. Emotion and persuasiveness of weak expert message (Study 2).

Table 2
Mean Appraisals of Emotion Scenarios and Thoughts During Persuasion Task, by Emotion Condition (Study 2)

Appraisal/thought type	Emotion condition					
	Omnibus <i>F</i>	Neutral	Nurturant love	Awe	Anticipatory enthusiasm	Amusement
Certainty appraisal	17.22**	6.33	5.41	5.77	6.43	5.35
Responsibility appraisal	29.71**	5.63	3.14	4.78	2.49	5.13
Total thoughts	5.58**	5.12	4.71	7.17	5.35	5.25
Favorable thoughts	2.96*	2.00	1.76	2.98	2.72	2.12
Unfavorable thoughts	1.25	1.94	1.98	2.23	1.62	1.51
Favorable–unfavorable thoughts	1.71	0.06	−0.23	0.75	0.49	1.21

Note. Means are on a 1–9 scale; higher means indicate greater association between a specific emotion and a specific appraisal or thought type.
 * $p < .05$. ** $p < .01$.

simultaneous regression analysis predicting persuasion, the effect of favorable–unfavorable thoughts was significant, but the anticipatory enthusiasm versus neutral contrast was not, fulfilling the third and fourth criteria for mediation. The Sobel test value associated with mediation was marginally significant ($z = 1.89, p = .059$). Thus, these analyses offer preliminary evidence for bias toward favorable over unfavorable thoughts about the persuasive message—a likely consequence of enhanced, uncritical reward seeking—as the mediator of the effect of anticipatory enthusiasm on persuasive message processing.

The effects of anticipatory enthusiasm and the neutral control did not differ significantly for certainty appraisals, responsibility appraisals, or total thoughts about the persuasive message, making these unlikely candidates as mediators (see Table 3). In summary, the effect of anticipatory enthusiasm on message processing appears to be mediated by this positive emotion, leading to a bias toward favorable versus unfavorable thoughts about the message.

Amusement versus neutral control mediation analyses. As in Study 1, participants in the amusement condition were relatively more persuaded by the weak arguments than were participants in the neutral control, although this effect was only marginally significant ($B = .23, r = .15, p = .086$). As was discussed earlier, we predicted that the effect of amusement on persuasion would be mediated by low responsibility appraisals. However, rather than significantly mediating this effect, as was hypothesized, responsibility appraisals actually suppressed this effect. Participants in the amusement condition reported significantly lower responsibility than did those in the neutral control condition, as was expected, but lower responsibility then predicted higher endorsement of the persuasive message, and the effect of the amusement versus neutral contrast on persuasion was significantly stronger after controlling for responsibility than without this control (Sobel test $z = -2.50, p = .012$). Thus, our hypothesis about the predicted mediator for amusement was not supported.⁷

The amusement and neutral conditions did not differ in total thoughts about the persuasive message, or in favorable–unfavorable thoughts bias, so these variables did not mediate the effects of amusement. In summary, the present analyses failed to identify a significant mediator of the effects of amusement on persuasion.

Awe versus neutral control mediation analyses. As in Study 1, participants in the awe condition were less persuaded than were those in the neutral control ($B = -.28, r = .18, p = .036$), documenting a significant effect to be mediated. As was discussed

earlier, we hypothesized that the effects of awe on processing would be mediated by (a) low certainty appraisals or (b) high total number of thoughts about the persuasive message. Indeed, participants in the awe condition reported lower certainty appraisals than did those in the neutral condition, as was predicted, although this effect was only marginally significant (see Table 3). In a simultaneous regression, certainty appraisals and the awe versus neutral emotion contrast each had a marginally significant effect on persuasion, with lower certainty predicting lower persuasion, as was predicted. Although the regression analyses thus far offered tentative support for the hypothesized partial mediation of awe effects by certainty appraisals, the Sobel test value was not significant ($z = -1.24, p = .215$). The effect of the awe versus neutral contrast on total thoughts was also significant. However, Total Thoughts did not predict Persuasion, failing to support total thoughts as a mediator of the effect of awe.⁸

In summary, awe significantly decreased persuasion by a weak argument, replicating the finding of Study 1. Mediation analyses offered preliminary support for decreased certainty as part of the mechanism behind this effect, although not to a significant degree.

Nurturant love versus neutral control mediation analyses. As in Study 1, participants in the nurturant love condition were less persuaded than were those in the neutral control ($B = -.28, r = .17, p = .031$), documenting a significant effect to be mediated. As was discussed earlier, we predicted that the effects of nurturant

⁷ It is notable that certainty appraisals also showed signs of suppressing the effects of amusement on persuasion: Amusement led to lower certainty than did the neutral control; lower certainty was associated with lower persuasion at the marginal level of significance; and the effect of the amusement versus neutral contrast in predicting persuasion was significant after controlling for certainty, although the Sobel test associated with the mediation effect was not significant ($z = -1.54, p = .123$).

⁸ However, the emotion contrast did have an unexpected, significant effect on responsibility appraisals, with participants in the awe condition reporting less responsibility. In addition, responsibility appraisals and the awe versus neutral emotion contrast each had marginally significant effects in a simultaneous regression predicting persuasion. Surprisingly, higher responsibility appraisals were associated with greater persuasion, not less. This latter effect likely reflects the specific content of the persuasive message—a proposal to alter grading standards to counter grade inflation, which would arguably be endorsed by more responsible students and rejected by students feeling less responsible. Results of the Sobel test of mediation were not significant ($z = -1.32, p = .188$).

Table 3
 Mediation Analyses: Regression Steps and Sobel Tests (Study 2)

Mediation analysis	Proposed mediator			
	Certainty	Responsibility	Total thoughts	Favorable-unfavorable thoughts
<i>Awe vs. neutral</i>				
Step 2: Emotion contrast → mediator	-.28 (.16) [†]	-.42 (.20) [*]	1.03 (.30) ^{**}	.35 (.34)
Step 3: Mediator → persuasion	.12 (.07) [†]	.10 (.06) [†]	.03 (.04)	.12 (.03) ^{**}
Step 4: Emotion contrast → persuasion	-.24 (.13) [†]	-.23 (.13) [†]	-.30 (.14) [*]	-.32 (.13) [*]
Sobel test <i>z</i> value	-1.24	-1.32	.64	.99
<i>Nurturant love vs. neutral</i>				
Step 2: Emotion contrast → mediator	-.46 (.16) ^{**}	-1.24 (.17) ^{**}	-.20 (.26)	-.14 (.30)
Step 3: Mediator → persuasion	.06 (.07)	.11 (.07) [†]	-.01 (.04)	.15 (.04) ^{**}
Step 4: Emotion contrast → persuasion	-.25 (.13) [†]	-.14 (.15)	-.28 (.13) [*]	-.26 (.12) [*]
Sobel test <i>z</i> value	-.80	-1.58	.17	-.47
<i>Anticipatory enthusiasm vs. neutral</i>				
Step 2: Emotion contrast → mediator	.05 (.16)	-.25 (.19)	.12 (.26)	.57 (.29) ⁺
Step 3: Mediator → persuasion	.14 (.07) [*]	.04 (.06)	.03 (.04)	.19 (.03) ^{**}
Step 4: Emotion contrast → persuasion	.26 (.13) [*]	.27 (.13) [*]	.26 (.13) [*]	.16 (.12)
Sobel test <i>z</i> value	.31	.51	.38	1.89 ⁺
<i>Amusement vs. neutral</i>				
Step 2: Emotion contrast → mediator	-.49 (.16) ^{**}	-1.57 (.16) ^{**}	.07 (.27)	.22 (.30)
Step 3: Mediator → persuasion	.13 (.07) [†]	.18 (.07) ^{**}	.07 (.04)	.20 (.03) ^{**}
Step 4: Emotion contrast → persuasion	.29 (.14) [*]	.51 (.17) ^{**}	.23 (.13) [†]	.19 (.12)
Sobel test <i>z</i> value	-1.54	-2.50 [*] (suppressor)	.24	.72

Note. Entries in all cells show the regression coefficient (B), with the standard error in parentheses.

[†] $p < .10$. ^{*} $p < .05$. ^{**} $p < .01$.

love on processing would be mediated by (a) high responsibility appraisals or (b) a bias toward unfavorable versus favorable thoughts about the message, or both. Indeed, the nurturant love versus neutral contrast significantly predicted responsibility appraisals; however, nurturant love led to significantly lower appraisals of responsibility than did the neutral control—the opposite of the hypothesized effect.⁹ In a simultaneous regression predicting persuasion, responsibility had a marginally significant effect, and the effect of the nurturant love versus neutral contrast was no longer significant, although the Sobel test value associated with mediation was not significant ($z = -1.58$, $p = .115$). As in the awe analyses, above, higher appraisals of responsibility were associated with greater persuasion, likely reflecting the proposal to make grading standards more difficult.

In summary, these analyses offer tentative support for responsibility appraisals as a partial mediator of effects of nurturant love on persuasion, but for a completely unexpected reason: nurturant love decreased feelings of responsibility, and this led in turn to rejection of the proposal for stricter grading standards. Additional research is needed to assess whether the observed effects of nurturant love on persuasive message processing would also be found with a proposal outside the academic domain. One possibility is that the effects of nurturant love on persuasive message endorsement were not due to systematic processing per se, but rather to more content-focused biases activated by the emotion.¹⁰

Discussion

Study 2 replicated the Study 1 finding that the positive emotions of nurturant love and awe led to decreased endorsement of a weak

persuasive message (consistent with systematic processing), whereas anticipatory enthusiasm and amusement led to greater endorsement (consistent with heuristic processing). This pattern replicated with different positive emotion elicitors, and a different method of assessing message processing, than did those used in Study 1.

Moreover, Study 2 provided evidence that these effects were not mediated by differences among the four positive emotions on a single factor, but rather by different factors. That is, differences among emotion conditions on single appraisal dimensions and thought types were not consistent with the overall pattern of differences in persuasion. When the mediation and suppressor effects are considered together, a few general trends emerge. On the whole, high responsibility appraisals predicted greater persuasion (of this message), and a bias toward favorable over unfavorable thoughts predicted greater persuasion as well. However, these

⁹ This likely reflects the wording of the standard responsibility appraisal items, which emphasize responsibility for creating the target situation, rather than responsibility for resolving or acting on the situation. In the short story used in Study 2, participants clearly had no responsibility for the child's situation, indeed less than they would if they were doing their laundry.

¹⁰ Nurturant love led to lower appraisals of certainty than did the neutral control; however, certainty failed to predict persuasion in this subsample, and this is not supported as a mediator. The nurturant love versus neutral contrast did not significantly predict either total thoughts about the persuasive message, or favorable-unfavorable thoughts bias, removing these as mediator candidates as well.

trends did not explain the effect of every positive emotion, and in some cases suppressed the intensity of that effect.

Looking at the predictions for each emotion, the strongest evidence for mediation was in the anticipatory enthusiasm condition, with bias toward favorable thoughts about the message explaining greater persuasion by a weak argument, as was hypothesized. Analyses also hinted that low certainty appraisals might partially mediate the effects of awe in reducing persuasion, consistent with the theory that awe increases systematic processing when existing schemas fail to explain one's current experience, although the formal test of mediation was not significant. Analyses did not sufficiently account for the effects of nurturant love; to the extent that responsibility appraisals met the criteria for mediation, it was through an unexpected process, and it is unclear whether this process would carry over to a persuasive message with different content. Analyses not only failed to account for the effects of amusement on persuasion, they also uncovered suppressors of the effect.

With the exception of anticipatory enthusiasm, it may be that the cognitive process best accounting for the observed effect of each emotion was not among the appraisals and thought profiles we measured in Study 2, and may differ across the positive emotions. Although identifying the precise mediators of each effect is an important goal for future research, the present findings support a strong prediction of our evolutionary function-based approach—that effects of the different positive emotions on processing of persuasive messages will be mediated by different cognitive processes reflecting the different functions of each emotion, and not by differences among all emotions in a single cognitive process.

General Discussion

Findings from decades of research suggest that emotion is a key factor influencing social cognition (e.g., Schwarz & Bless, 1991). Much of this research has emphasized the importance of affect valence in predicting cognition. For instance, negative affect has typically been found to facilitate systematic processing of new information, whereas positive affect has typically been found to facilitate heuristic-based processing (e.g., Mackie & Worth, 1991). However, recent research emphasizing a discrete emotion perspective shows that negative states are not equivalent in this regard. Fear, anger, and disgust, for example, have emotion-specific effects on cognition that cannot be explained by valence alone (e.g., DeSteno et al., 2004; Griskevicius, Goldstein, et al., 2009; Lerner & Keltner, 2001). Using an evolutionary function-based approach to defining specific positive emotions (e.g., Fredrickson, 1998, 2001; Keltner & Haidt, 2003; Kenrick & Shiota, 2008; Shiota et al., 2004; Tracy & Robins, 2008), we investigated how six positive emotions influenced the processing of persuasive messages. Overall, we found that positive affect can produce more "heuristic" or more "systematic" processing than can an emotionally neutral state, depending on the specific positive emotion that is elicited.

In these studies, the positive emotions of anticipatory enthusiasm, amusement, and to a lesser degree attachment love appeared to enhance heuristic processing, consistent with traditional findings on the influence of positive affect. Participants induced to feel any of these three emotions were more easily persuaded by a weak argument that had persuasive heuristic cues than did those in a neutral control condition. In fact, a closer look at previous studies

indicates that researchers have generally used "positive affect" manipulations targeting one or more of these emotions: watching a funny video clip, which elicits amusement; receiving a gift of candy, which likely elicits anticipatory enthusiasm; or writing about a time one felt "happy," which is likely to elicit a blend of attachment love or amusement (see Smith & Ellsworth, 1985). In contrast, when individuals were in an emotional state of awe (e.g., seeing a breathtaking panorama for the first time) or of nurturant love (e.g., seeing a cute, vulnerable child), they were less persuaded by weak arguments than were people in an emotionally neutral state—an effect that suggests systematic processing (e.g., Petty & Wegener, 1998; Tiedens & Linton, 2001).

In addition to demonstrating variation in the effects of different positive emotions on persuasive message processing, we gained some insight into the process (or processes) through which these effects do and do not take place. Although several studies considering the effects of discrete emotions on social cognition have emphasized certainty appraisals as likely mediators, we did not find that certainty—or any other single appraisal dimension—adequately explained our pattern of findings. Also, no single aspect of thoughts about the persuasive message adequately explained the pattern of positive emotion effects. Instead, meditational analyses suggest that anticipatory enthusiasm, amusement, nurturant love, and awe each affect persuasion through a somewhat different mechanism, some of which are yet to be established empirically. This is consistent with the evolutionary perspective driving our research, which defines each emotion as a fitness-enhancing package of cognitive, physiological, and behavioral responses to a prototypical eliciting situation. Different emotion packages may include some overlapping elements, but no single element (such as an appraisal dimension) is expected to account for the effects of all emotions.

Strengths, Limitations, and Future Directions

Our approach to the present research had several important strengths. First and foremost, we systematically compared the effects of several positive emotion states. Studies examining the effects of emotion on some aspect of cognition or behavior typically include one, or at best two, emotions of the same valence. This latter approach is critical for demonstrating that the effects of emotion go "beyond valence" (Lerner & Keltner, 2000), but limits the potential for assessing the full range of effects and the mechanisms by which those effects take place.

Second, the target positive emotions were defined not in terms of English-language vocabulary, but in terms of fitness-enhancing function. This provided us with a theoretical basis for developing prototypical emotion stimuli, one that did not rely upon participants' definitions of particular emotion words, or upon emotional experiences that may have been idiosyncratic to the research team.

Third, the effects of anticipatory enthusiasm, amusement, nurturant love, and awe were observed across studies that varied in methodology, and in comparison with a neutral control condition. This is important because the vast majority of studies examining the influence of affect on cognition have tested differences between global positive versus neutral affect, or between positive versus negative affect. It is rare that a study includes multiple emotion conditions, in which emotions are predicted to have opposing effects and includes a neutral control condition. Overall,

the current research is the first to use a functional evolutionary perspective to investigate systematically how specific positive emotions influence cognition.

One limitation of these studies is that participants were college students, and thus mostly young adults. Although there is no particular reason to think that emotions would have a different effect on the cognition of middle-aged adults, an interesting future direction is to examine the influence of emotions on cognition in aging adults. For instance, both new information processing and emotion regulation change substantially in later adulthood (Cabeza, Nyberg, & Park, 2006; Charles & Carstensen, 2007), but less is known about age-related changes in the effects of emotion on cognition. Similarly, future studies should examine whether culture and individual differences moderate the effects of emotions on cognition (e.g., Campos, Keltner, Beck, Gonzaga, & John, 2007; Kenrick, Griskevicius, Sundie, Li et al., 2009; Tybur, Lieberman, & Griskevicius, 2009). Also, future studies of emotion and cognition should include other positive emotions, including sexual desire, gratitude, and pride (e.g., Bartlett & DeSteno, 2006; Gonzaga, Turner, Keltner, Campos, & Altemus, 2006; Griskevicius et al., 2007; Tracy & Robins, 2008; Williams & DeSteno, 2008), not considered in the present research. Finally, further research is needed to assess whether affect valence and discrete emotion each have an independent effect on cognition. Although the present work emphasized the effects of specific positive emotions, it is quite possible that affect valence and specific emotions have independent main effects, or even interacting effects, on various aspects of cognition.

Conclusion

Positive emotion has been treated for a long time as a unidimensional construct. Despite increasing recognition that different negative emotions may serve different adaptive functions, few empirical studies have thus far explicitly considered such differences among positive emotions. Perhaps this should not be surprising: Much of the work on discrete emotions can be traced to Paul Ekman's classic studies of cross-cultural expression of emotions, which featured only one expression for positive emotion: "happiness." Even researchers taking an evolutionary approach to defining emotions have often assumed that avoiding threats (the functional domain of negative emotions) is more important for evolutionary success than is taking advantage of opportunities (the functional domain of positive emotions). Yet avoiding threats to survival is of zero evolutionary consequence if one fails to take advantage of opportunities presented by the environment. The current work strongly suggests that paying more careful attention to the ways in which positive emotions are both different from and similar to other positive emotions is likely to be fruitful and generative. At the very least, "happiness" is more complicated than it initially appeared.

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