

Emotion–Cognition Interactions

Jeffrey R. Huntsinger and Simone Schnall

Abstract

Viewing affect and cognition as independent from one another has had a long history. Even if interaction between the two was entertained, affect was seen as contaminating cognition, leading to errant thinking and suboptimal decisions. A quite different perspective has emerged in recent years. From this view, rather than constituting distinct constructs or opposing forces, affect and cognition are intimately intertwined and the influence of affect is seen as functional rather than dysfunctional. This chapter reviews how affective states, such as moods and emotions, influence memory, perception, judgment, and cognitive processing style. Many of these influences can be understood by the idea that affect provides information. It is noted that many of the hallmark findings in cognitive psychology appear to have an affective trigger.

Key Words: emotion, mood, affective states, memory, perception, judgment, cognition

Feeling without [thinking] is a washy draught indeed; but [thinking] untempered by feeling is too bitter and husky a morsel for human deglutition.

—Charlotte Brontë (1847/2005, p. 190)

Does affect influence cognition? If one looks to classic philosophical and psychological treatments of emotion and cognition the answer is: Not much. According to these perspectives, affect and cognition are utterly independent and opposing influences on judgment and decision making (Aristotle, 1991; Plato, 1992). These ideas are echoed in contemporary affect-cognition models, in particular affect-primacy models, which argue for the independence of affect and cognition (Bargh, 1997; Zajonc, 1980). Even among perspectives that entertained the possibility that affect and cognition interact in meaningful ways, affect was believed to contaminate cognition and reason, leading to suboptimal decisions and behaviors (Kant, 1960).

In contrast to these views, a consensus has emerged across various subfields of psychology that affect and cognition are fundamentally intertwined (for reviews, see Martin & Clore, 2001). Research informing this view reveals that affect, in the form of moods and emotions, plays a critical role in regulating how people perceive, remember, and think about their physical and social worlds. Likewise, this research also shows that cognition is crucial to the generation, experience, and regulation of emotion. Indeed, some have gone so far as to argue that the distinction between affect and cognition may be more phenomenological than ontological (Duncan & Barrett, 2007; Pessoa, 2008).

Although we think it premature to cast aside the distinction between affect and cognition, our point here is that a wealth of empirical evidence shows that affect permeates cognition just as cognition permeates affect. As the epigraph that begins this chapter suggests, rather than having a dysfunctional role, affect plays a largely functional role in regulating cognition (Barrett & Salovey, 2002; Clore, 2005; Damasio, 1994; Frijda, 1986). When the ability to experience emotional reactions is impaired or absent, for example, the ability to make the most mundane through the most important decisions is impaired (Damasio, 1994). Delineating how emotion and cognition interact is, therefore, critical to understanding how people effectively navigate their social and physical worlds.

In what follows, we outline how affect informs judgments and regulates cognition. We begin by sketching historical developments to understanding how affect regulates cognition. We then review the different ways that affect has been shown to regulate cognition, including memory, perception, judgment, and decision making, and cognitive processing style. The affect-as-information approach serves to organize our discussion of how affect regulates cognition.

Before we continue, however, it is necessary to define some key terms. The first concerns what we mean by *affect*. According to Clore and Huntsinger (2007), affect is a representation of value (i.e., the goodness or badness of something) and can take several different forms, including neurological, physiological, experiential, cognitive, and behavioral. An affective state involves the co-occurrence of several of these reactions. *Emotions* represent affective states with an object and reflect an underlying appraisal. Although emotions can be classified according to valence, their influence on cognition depends on the appraisal pattern that accompanies their experience. In contrast, *moods* are diffuse affective states that lack specific objects and appraisals. We thus speak of affect as the category that comprises both emotion and mood.

Models of Affect–Cognition Interactions

Classic understandings of affect–cognition interaction relied either on psychodynamic or conditioning principles. From the psychodynamic view, affect creeps into cognition unconsciously, leading people to see the world and others through affect-tinged lenses. Consistent with this idea, people experiencing a particular emotion such as anger or fear, for example, tend to perceive similar

emotions in others (e.g., Feshbach & Singer, 1957). As with much psychodynamic theory, empirical examination of its ideas proved difficult, if not impossible. Early conditioning perspectives concentrated on the role of affect in shaping attitudes (e.g., Razran, 1954; Staats & Staats, 1958). For example, Razran's (1954) studies showed that the positive affect evoked by a free luncheon led to more positive evaluations of ethnic outgroups, political slogans, paintings, and a variety of other attitude objects.

As the cognitive revolution swept across psychology in the 1960s, the study of emotion and mood fell out of favor and so too did these approaches to affect and cognition. When the study of motivation and emotion regained a foothold in psychology in the late 1970s and early 1980s, there emerged two decidedly different ways of understanding affect–cognition interaction: spreading activation models and the affect-as-information approach. We first discuss the former because these were some of the earliest formulations of how affect influences cognition. Because evidence for such models is limited, our treatment is brief. We then describe the affect-as-information approach, which provides the theoretical framework for our discussion of affective influences on cognition throughout the chapter.

Spreading Activation Models

Spreading activation models propose that affect influences what thoughts come to mind (Clark & Isen, 1982; Forgas, 1995; Isen, Shalke, Clark, & Karp, 1978). This work was motivated by Bower's (1981) associative network model of mood and memory, in which mood states are represented as specific nodes in memory that become activated, and subsequently this activation spreads to other material in memory. When a person is happy, for example, this activates happy memories and other positive mental content. When making evaluative judgments, memory-priming models propose that the positive or negative thoughts primed by positive and negative moods, respectively, bias judgment in a mood-congruent fashion.

Although early research revealed mood-congruent recall for both positive and negative moods (Bower, 1981), later research revealed that this effect was both weak and only occurred under certain conditions (for reviews, see Blaney, 1986; Matt, Vasquez, & Campbell, 1992; Wyer, Clore, & Isbell, 1999). Mood-congruent recall, for example, is more likely to emerge for positive moods than negative moods

(Singer & Salovey, 1988). Mood-*incongruent* recall among *both* happy and sad participants has also been observed (Parrott & Sabini, 1990). Furthermore, evidence of mood-congruent recall is most consistent when mood is induced prior to encoding (Bower, Gilligan, & Monteiro, 1981), suggesting that mood directs how people process the story rather than activating mood-congruent material from memory.

Although spreading activation models originally were designed to explain affective influences on judgment and memory, they were later expanded to describe how affect influences cognitive processing in general. According to some accounts, positive moods activate a greater amount and more diverse mental content than negative moods, which then reduces the ability of people in positive moods to deploy cognitive resources to meet task demands (e.g., Mackie & Worth, 1991). People in positive moods, therefore, engage in more heuristic and simplified processing than those in negative moods. According to other accounts, rather than constraining cognitive capacity, the more diverse mental content called to mind by positive moods actually allows for a more divergent and flexible style of cognitive processing (Isen, 1987).

Despite the intuitive appeal of spreading activation models, evidence supporting the idea that affect primes memories and other thoughts of similar valence is mixed at best. First, emotions do not appear to be stored in memory. Just as memory in general is reconstructive (Bartlett, 1932), memories of past emotions are reconstructed based on subsequent reinterpretations of past events (Levine, 1997). For example, participants' recollection of their emotional responses to a salient event changed if their current appraisal of the event had changed from the time the event had occurred (Levine, Prohaska, Burgess, Rice, & Laulhere, 2001).

In addition, mood and emotion manipulations unlikely to elicit much mental content—such as posing happy or sad facial expressions or listening to cheery or gloomy musical selections—lead to the same effects on cognition as more elaborate mood and emotion inductions. Finally, these models have difficulty explaining why individual differences in attention to feelings (Gasper & Clore, 2000) and bodily cues (Schnall, Haidt, Clore, & Jordan, 2008) moderate the influence of affect on judgment and processing. These results are more readily understandable via the affect-as-information approach, which we discuss next.

Affect–Cognition Interactions: Affect as Information

As its name implies, the affect-as-information approach focuses on the information conveyed by affect. Although there are several different variations on this approach, each with a slightly different set of assumptions (for a collection, see Martin & Clore, 2001), they all share the basic idea that affect provides embodied information about the value of whatever happens to be in mind at the time (Clore & Huntsinger, 2007, 2009; Schwarz & Clore, 1983, 2007). Such an influence is direct, because the affective cue itself, rather than its association with other similarly valenced material, guides cognitive processes. The affect-as-information approach applies to affective cues from both moods and specific emotions. In the case of emotions, this approach proposes that different emotions convey different information about the ways in which objects are positive or negative so that emotions of similar valence can have different effects and their implications for cognition depend on their object.

The influence of affect on cognition is revealed across a wide variety of domains and comprises influences on memory, perception, judgment, and cognitive processing style. In what follows, using the affect-as-information approach as an explanatory framework, we review evidence of affective influences in these four domains. Although we discuss both mood and emotional influences on cognition, more research attention has been devoted to studying the former than the latter; thus, our review is necessarily tilted more toward mood than emotion.

Memory

We first discuss the influence of mood on memory because in some sense the ground work was done in this domain, and then discuss how specific emotions convey information about importance, and thus enhance memory for words, stories, and events by directing encoding and consolidation.

The affect-as-information approach presumes that affect is not directly stored in memory (Wyer et al. 1999; see also Robinson & Clore, 2002). Thus, any observation of mood-congruent recall is not the result of affect per se, but rather the result of the cognitive content called to mind by the mood inductions used in prior research. For example, participants are explicitly asked to get into a happy or sad mood, watch films with explicit happy and sad themes, or are given success or failure feedback, all of which likely activated mood-relevant concepts. Indeed, mood inductions unlikely to explicitly

activate mood-relevant concepts fail to produce mood-congruent recall (Rholes, Riskind, & Lane, 1987), which suggests that rather than being a general memory phenomenon, effects of mood-congruent recall depend on very specific experimental paradigms. Moreover, research (Storbeck & Robinson, 2004) directly comparing descriptive versus evaluative priming suggests that memory is primarily organized in terms of descriptive categories (i.e., animals, furniture) rather than in terms of networks of spreading activation based on valence (i.e., positive thoughts, negative thoughts).

Another early effort to uncover mood influences on memory examined what is called mood-dependent memory. This assumes better recall of material for which the mood at recall matches the mood at encoding. As with mood-congruent memory, later research failed to reliably demonstrate mood-dependent retrieval. Indeed, after repeated failures to replicate their earlier findings, Bower and Mayer (1985, p. 42) concluded that “mood-dependent retrieval is an evanescent will-o’-the-wisp, and not the robust outcome suggested by earlier reports.”

Rather than influencing memory by activating valence-congruent memories and thoughts, recent research reveals that mood influences the styles of cognitive processing that people utilize during memory experiments. The tasks commonly used in memory research often evoke relational processing—relating incoming information to what is already known. According to the affect-as-information approach, when this is the case mood should shape performance on such tasks by signaling the value of this accessible or dominant processing style.

This idea is illustrated in research on false memory and intentional forgetting. In false memory experiments, people study lists of words (i.e., bed, pillow, rest, etc.), implying a related, but not presented, concept called a critical lure—in this case *sleep*. During a recall phase of the experiment, people often falsely “recall” the nonpresented critical lure (i.e., *sleep*). Such false memories are assumed to reflect relational or gist processing (Roediger, Balota, & Watson, 2001). Affect as information proposes that positive mood should promote, and negative mood should inhibit, such relational processing, leading to mood-related differences in false memory. Across several studies, Storbeck and Clore (2005) found precisely that individuals in happy and neutral moods displayed high numbers of false memories, whereas this tendency was significantly reduced among individuals in sad moods.

Retrieval-induced forgetting occurs when rehearsal of a subset of previously observed material inhibits memory for nonrehearsed material (MacLeod, 2002). As in production of false memory, retrieval-induced forgetting is thought to be promoted by relational processing and inhibited by item-specific processing. Consistent with the idea that affect regulates use of accessible processing styles, retrieval-induced forgetting is sustained in positive moods and is inhibited in negative moods (Bäuml & Kuhbandner, 2007).

Emotion, on the other hand, appears to enhance memory. The influence of emotion on memory can be understood via the idea that emotional arousal provides information about importance, which guides attention and selection of material that is encoded and consolidated into long-term memory (for a review, see Storbeck & Clore, 2008b). This effect of emotional arousal appears quite general, occurring for both emotional memories and for nonemotional declarative mental content (McGaugh, 2004). The influence of emotion on memory appears more pronounced for long-term than short-term memory.

Perception

The possibility of affective influences on perception was first raised by New Look theorists (Bruner & Postman, 1947; Postman, Bruner, & McGinnies, 1948). Rather than treating perception as a process in which the mind constructs a veridical model of the world via a passive registration of sensory input, New Look theorists treated perception as a dynamic process in which internal cues from motivation and emotion and external cues from the environment combine to shape how people perceived their worlds. Despite promising early results, devastating methodological and theoretical critiques left much of the New Look approach in shambles.

Recent work, however, has revived research questions relating states of the perceiver with his or her current perceptions of the physical environment. Following Gibson’s (1979) ecological approach, spatial perception is seen to be informed by a person’s potential to carry out certain actions in a given environment (Proffitt, 2006). For instance, when a person is standing in front of a steep hill, that hill will appear steeper to her when she is wearing a heavy backpack, compared to when she is not (Bhalla & Proffitt, 1999). Factors such as age and aerobic fitness also influence hill slant perception, with elderly or nonfit individuals perceiving hills as steeper than young or fit individuals (Proffitt,

Bhalla, Gossweiler, & Midgett, 1995). Presumably, such factors constrain perception because they are relevant to actions: A hill would be more difficult to climb when wearing a backpack, or for an elderly or unfit person, and thus, looks steeper. This describes an *economy of action* (Proffitt, 2006), namely an individual's attempt to scale the world in terms of the actions that are afforded by her bodily capabilities.

Direct evidence for such an economy of action comes from the findings that when physiological energy is provided in the form of glucose, high levels of blood glucose make hills appear less steep than low levels of blood glucose (Schnall, Zadra, & Proffitt, 2010). In addition to physiological resources, psychosocial resources such as social support also influence hill slant perception (Schnall, Harber, Stefanucci, & Proffitt, 2008), as do participants' current affective states. Riener, Stefanucci, Proffitt, and Clore (2010) investigated the influence of mood on hill slant. Participants were induced to feel happy or sad by music in one study, and by recalling a happy or sad life event in the other study, and then completed slant estimates of a steep hill. In both studies, sad participants judged the hill as being steeper than those in the happy condition. In a related manner, the influence of fear on hill perception has been explored. In one study participants were asked to stand on a skateboard at the top of a hill, and their perception of hill slant was compared to participants who stood on a wooden box at the top of the hill (Stefanucci, Proffitt, Clore, & Parekh, 2008). Participants who felt afraid when standing on the skateboard gave higher slant estimates than participants standing on the wooden box. People's perception of height can also be changed by fear (Stefanucci & Proffitt, 2009). Participants stood either on a balcony and looked down to estimate the vertical distance to the ground, or they stood underneath the balcony and looked up to estimate the distance to the handrail. These vertical estimates generally lead to overestimation relative to equivalent horizontal distance. More important, this overestimation was greater when looking down compared to when looking up, and when looking down from a high balcony rather than low balcony, suggesting that the fear of falling when standing on a high balcony influences estimates of height. Fear of heights also is associated with more exaggerated height estimates (Teachman, Stefanucci, Clerkin, Cody, & Proffitt, 2008). In addition to stable individual differences regarding fear of height, fear arousal can also have an effect (Stefanucci & Storbeck, 2009).

Participants were first shown either arousing or non-arousing visual images. Subsequent height estimates from a balcony were greater for participants who had been exposed to arousing stimuli, presumably because the arousal from the images amplified the fear of falling associated with looking down from a high balcony.

Evaluative Judgment

When making evaluative judgments, people often implicitly ask themselves, "How do I feel about it?" Current moods then inform people of the value of whatever happens to be the object of judgment (Schwarz & Clore, 1983) and are experienced as liking or disliking. The use of feelings as information in judgments occurs quickly and is often considered a more compelling basis for judgment than whatever thoughts about an object come to mind (Pham, Cohen, Pracejus, & Hughes, 2001). As a result, feelings-based judgments frequently produce more optimal decisions than more considered or sophisticated evaluative strategies (e.g., Wilson & Schooler, 1991).

Schwarz and Clore (1983) first demonstrated the informational influence of mood in studies examining life-satisfaction judgments. In a telephone survey people were called on either rainy or sunny spring days and asked how satisfied they were with their lives as a whole. The weather reliably influenced people's moods—people called on sunny days were happier than those called on dreary days. As part of an implicit misattribution process, these feelings were then drawn on by respondents when rating their levels of life satisfaction, leading them to report being more satisfied with life on a sunny than a rainy day. The influence of mood on judgments of life satisfaction, however, disappeared when participants were first asked about the weather. Asking about the weather did not change their feelings, but it did change what their feelings seemed to be about.

A parallel influence of mood can be seen in risk judgments. The experience of positive affect, as compared to negative affect, leads people to see less risk in their environment (Gasper & Clore, 1998). Similarly, Slovic and colleagues (Slovic, Finucane, Peters, & MacGregor, 2002) propose an "affect heuristic" in the context of risk perception. Furthermore, mood effects on risk judgments are stronger for people who pay attention to their feelings than those who do not (Gasper & Clore, 2000): Only people who attended to their feelings were influenced by the positive or negative mood

they experienced when judging risk, presumably because they are more inclined to use the information conveyed by their current affective reactions than people who tend to ignore their feelings.

Although a similar influence of mood on judgment has been observed across a wide variety of domains, including judgments of consumer products, other people, the self-concept, and so forth (for a review, see Schwarz & Clore, 2007), mood-*incongruent* judgments also occur. In a clever series of experiments (Martin, Abend, Sedikides, & Green, 1997) positive and negative moods were induced prior to participants rating the success of stories designed to elicit happy or sad emotions. In this situation, rather than mood providing direct information about the object of judgment, people should consult their feelings to determine whether a story successfully elicited a specific emotion (i.e., happiness or sadness). Indeed, when participants' current feelings and a story's intended emotion matched (i.e., positive mood–happy story or negative mood–sad story), they judged the story positively, but when feelings and the story's emotion clashed, they judged it negatively.

In the case of emotions, specific appraisals direct judgment rather than affective valence *per se*. For example, anger and anxiety, clearly two negative emotions, have very different effects on judgments of risk because each involves a different pattern of appraisal, with different implications for risk judgments. Fear and anxiety involve displeasure about the prospect of an undesirable outcome and are accompanied by feelings of threat and uncertainty. As such, the experience of fear and anxiety is linked to increased judgments of risk (e.g., Gasper & Clore, 1998). In research on perceptions of terrorism and the second Iraq war, for example, fearful people perceived greater risk from terrorism (Lerner, Gonzalez, Small, & Fischhoff, 2003) and anxiety increased the perceived risk associated with the Iraq war as well as decreased support for the war (Huddy, Feldman, & Cassese, 2007). Fear and anxiety are also linked to a tendency to make risk-averse decisions, a more pessimistic outlook on future events (Lerner & Keltner, 2001), and preferences for consumer products that emphasize safety (Raghunathan, Pham, & Corfman, 2006).

Disgust involves dislike of the unappealing attributes of an object (Ortony, Clore, & Collins, 1988). The object of disgust can be anything from foul-tasting foods to offensive ideas (Rozin, Haidt, & McCauley, 2008). Thus, the experience of disgust decreases the perceived value of objects. An

illustration is the endowment effect, which refers to people's tendency to set higher selling prices than buying prices on objects they own. Consistent with a decrease of perceived value of objects, feelings of disgust eliminate the endowment effect (Lerner, Small, & Lowenstein, 2003).

The influence of disgust on judgments has been most thoroughly mapped out in studies of morality, because people often report finding immoral acts physically disgusting. In fact, similar neural structures appear to be involved in the experience of physical and moral disgust (Moll et al., 2005). Furthermore, the same facial muscle involved in the expression of physical disgust, namely the levator labii facial muscle, is contracted when participants are confronted with an unfair decision (Chapman, Kim, Susskind, & Anderson, 2009), and such facial activity predicts participants' moral judgments of transgressions violating assumptions of purity (Cannon, Schnall, & White, 2011).

Experimentally induced feelings of disgust can be misattributed to moral judgments such that, for example, the feeling of disgust derived from being exposed to a foul smell is incorrectly interpreted as being diagnostic about a moral transgression, thus leading the person to infer that a particular moral action is quite wrong (Schnall, Haidt, et al., 2008; Wheatley & Haidt, 2005). This effect can be eliminated or reversed by either priming participants with the concept of cleanliness, or allowing them to physically cleanse themselves after the experimental disgust induction, thus resulting in less severe moral judgments (Schnall, Benton, & Harvey, 2008). In addition to experimental manipulations of disgust and cleanliness, individual differences in people's predisposition to experience disgust are associated with moral attitudes. Jones and Fitness (2008) describe what they call moral hypervigilance in people high on disgust sensitivity (Haidt, McCauley, & Rozin, 1994), namely an increased propensity to see potential transgressions as morally wrong, and a desire to reduce one's own exposure to the moral transgressions of others. Furthermore, relative to people low in disgust sensitivity, those high in disgust sensitivity are more likely to be politically conservative (Inbar, Pizarro, & Bloom, 2009) and show a higher implicit bias against homosexual people (Inbar, Pizarro, Knobe, & Bloom, 2009).

Anger is a relatively complex emotion that has two key ingredients: being displeased at an undesirable outcome and disapproval of the blameworthy actions that caused them (Ortony et al., 1988). As such, anger has been shown to increase judgments

of blame (Keltner, Ellsworth, & Edwards, 1993). Because anger is also associated with a feeling of one's position being correct (Clore & Huntsinger, 2009), it has been shown to increase support for actions associated with one's group. In the research discussed earlier on emotional reactions to terrorism, for example, anger after the September 11 attacks was associated with support for the Iraq war and the perception that it was less risky (Lerner et al., 2003). Similar to disgust, anger becomes relevant in the moral domain. However, in contrast to disgust, which does not seem to require reasoned justification, the experience of anger is often justified by presumed harm to other people, even when no harm is present (Gutierrez & Giner-Sorolla, 2007).

Cognitive Processing Style

Explanations for the connection between mood and cognitive processing style have included the notion that positive mood reduces cognitive capacity (e.g., Mackie & Worth, 1991) or processing motivation (e.g., Schwarz, Bless, & Bohner, 1991), thus increasing reliance on heuristics and other cognitive shortcuts. Positive moods are hypothesized to activate more mental content than negative moods, thereby reducing the ability of people in positive moods to deploy cognitive resources to meet task demands. The motivational perspective holds that people in positive moods use little cognitive effort because they either see little reason to do so or because they want to preserve their positive mood. These perspectives have been challenged on a number of grounds (for a review, see Schwarz & Clore, 2007).

As both the cognitive capacity and motivation explanations became less influential, the idea emerged that positive and negative affect are linked to specific styles of cognitive processing. For example, positive affect has been associated with heuristic processing, a global focus, relational processing, enhanced creativity, and assimilation, to name but a few (see Martin & Clore, 2001). Such findings, and the theories that evolved with them, suggest a direct or dedicated link between affect and particular styles of cognitive processing.

Another (or perhaps additional) way of accounting for the link between affect and cognitive processing is that affect regulates cognitive processing by serving as evaluative feedback about currently accessible thoughts and response tendencies (Clore & Huntsinger, 2007; 2009). From this view, rather than directly instigating differences in cognitive

processing, positive mood signals that accessible thoughts and response tendencies are valuable or valid, encouraging their use, whereas negative mood signals such thoughts and response tendencies are not valuable or invalid, discouraging their use. Thus, under this idea, links between affect and cognitive processing should be highly variable and should depend on what thoughts and response tendencies happen to be in mind at the moment.

COGNITIVE PRIMING: SEMANTIC, AFFECTIVE, AND CATEGORY ACTIVATION

Various priming phenomena commonly observed in cognitive and social psychology should be more frequent among people in positive moods than those in negative moods because positive moods promote, and negative moods inhibit, the use of semantic, affective, and category associations. Indeed, people in positive moods are more likely than those in negative moods to exhibit semantic, evaluative, and categorical priming (Storbeck & Clore, 2008a), whereas sad moods eliminate priming. This effect is evident not only in the priming of words but also in the priming of social categories: Priming the category "elderly" can lead people to express more conservative attitudes and to walk more slowly (Dijksterhuis, Chartrand, & Aarts, 2007). If affect confers positive or negative value on activated cognitions, then people should be more likely to show such effects in happy moods than in sad moods. In several experiments (Ashton-James, Huntsinger, Clore, & Chartrand, unpublished data), for example, the category elderly or young was primed in several ways. The results showed that positive moods led to more conservative social attitudes and slower walking after the category "elderly" was primed compared to when the category "young" was primed. In contrast, negative moods led to more liberal attitudes and faster walking after exposure to elderly faces than young faces.

HEURISTICS

A similar influence of mood on the use of accessible mental content and response tendencies can be seen in research on mood and judgmental heuristics. People often base frequency judgments on the ease with which examples of an event come to mind (Tversky & Kahneman, 1974). Similarly, when people make self-relevant judgments, the more easily instances of past behavior exemplifying a trait come to mind, the more likely it is a person will think the trait is self-descriptive (Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka, & Simons 1991).

This is called the availability or ease-of-retrieval heuristic. People in positive moods are more likely than those in negative moods to rely on the ease or difficulty with which trait-relevant behaviors come to mind to determine whether they possess a given trait (Rüder & Bless, 2003; see also Isen & Means, 1983). A similar influence of mood on reliance on the availability heuristic can be seen with more chronic affective states, such as mild depression (Greifeneder & Bless, 2008).

People often evaluate a new product more positively if it is from an already established brand than from an unknown brand (Aaker, 1991). This brand heuristic is more evident among those in positive moods than those in negative moods (Barone, Miniard, & Romeo, 2000). Importantly, this effect depends on whether the brand is favorable or unfavorable (Greifeneder, Bless, & Kuschmann, 2007). As in past research, for favorable brands, positive moods led to more positive evaluations of the new product than negative moods. For unfavorable brands, by contrast, positive moods led to more negative evaluations than negative moods. Such findings would be difficult to explain via memory-priming models, but they can readily be accommodated by the affect-as-information approach.

IMPLICIT-EXPLICIT ATTITUDE CORRESPONDENCE

Recent research on mood regulation of implicit-explicit attitude correspondence is also consistent with the idea that moods confer value on accessible cognitions, which then regulates their use. Implicit attitudes reflect automatically activated tendencies to respond in a positive or negative fashion toward an attitude object, whereas explicit attitudes reflect more controlled evaluative tendencies (Gawronski & Bodenhausen, 2006). In most circumstances people base their endorsed evaluative judgments on their automatic reactions (i.e., implicit attitudes), unless these reactions are considered an invalid basis for an evaluative judgment (Gawronski & Bodenhausen, 2006). In addition, positive moods validate, and negative moods invalidate, these automatic reactions, leading to differences in implicit-explicit attitude correspondence between the two types of mood (Huntsinger & Smith, 2009).

People reliably differ in whether they trust and rely on their intuitions. Differences in this tendency to trust or distrust one's intuitions, whether measured or manipulated, moderate correspondence between implicit and explicit attitudes—people who trust their intuitions, as compared to those who distrust

them, display greater implicit-explicit attitude correspondence (Jordan, Whitfield, & Zeigler-Hill, 2007). A recent set of studies (Huntsinger, 2011) explored the idea that, rather than directly influencing implicit-explicit attitude correspondence, mood would do so indirectly by signaling the value of momentarily primed tendencies to trust or distrust intuition. Supporting this reasoning, for both self and academic attitudes, when trust in intuition was primed, people in positive moods displayed greater implicit-explicit attitude correspondence than those in negative moods. When distrust in intuition was primed, however, the opposite pattern was found—people in positive moods now displayed lesser implicit-explicit attitude correspondence than those in negative moods.

PERSUASION

Mood effects on the validation and use of accessible thoughts can be seen when examining responses to persuasive messages (Brinol, Petty, & Barden, 2007). Participants in this research first were exposed to persuasive appeals consisting of either strong arguments or weak arguments and then wrote down their thoughts, which tended to be positive for strong arguments and negative for weak arguments. Positive or negative moods were then induced and participants rated their agreement with the persuasive appeal. Positive mood validated thoughts about the messages so that participants were more persuaded by strong than by weak arguments. In contrast, negative mood invalidated such thoughts, reversing these effects.

This research may, at first glance, appear to contradict past research in which people in positive moods are found to be equally persuaded by strong and weak persuasive appeals, whereas those in negative moods are found to be more persuaded by strong than weak appeals (Schwarz et al., 1991). The key to resolving this discrepancy is to locate the object of mood in each of these types of studies. In past research on mood and persuasion, mood is induced prior to reading persuasive appeals, thus it signaled the value of accessible response tendencies, mood management strategies, and so forth, which then influenced persuasion. In the Brinol et al. (2007) studies, affect was induced after participants read the persuasive appeals; thus, it signaled the value of participants' thoughts about the message.

TRANSFER OF LEARNING

A similar influence of mood on the use of accessible mental content and response tendencies can

be found when investigating the influence of mood on transfer and learning on cognitive tasks (Brand, Reimer, & Opwis, 2007). Participants first learned to master the Tower of Hanoi problem and then experienced either a positive or negative mood induction. When trying to solve several tasks with similar or dissimilar surface features to the Tower of Hanoi problem, for both tasks with similar and dissimilar features, participants in positive moods, as compared to those in negative moods, relied on previously learned problem-solving strategies and algorithms, leading to superior performance on the second set of tasks.

STEREOTYPES

People in positive moods are more likely than those in negative moods to use stereotypes. When judging a defendant's guilt, for example, people in positive moods rely more on stereotypes than those in negative and neutral moods (Bodenhausen, Kramer, & Süsser, 1994). Although most studies in this area simply examine downstream judgments, rather than disentangling the role of stereotype activation versus application, recent findings suggest that the effects of mood occur at the stereotype activation stage (Huntsinger, Sinclair, & Clore, 2009). Using Payne's (2001) weapon-identification task, people in positive moods displayed greater stereotypical bias than did those in negative moods. Process-dissociation analyses, used to decompose performance into separate estimates of automatic and controlled processing, revealed that mood influenced the use and, consequently, the activation of race-related stereotypes rather than influencing the extent of controlled, data-driven processing (i.e., stereotype application).

Although there might appear to be a direct connection between positive and negative moods and stereotyping, from the affect-as-information approach, this connection rests on the fact that, for most people and in most circumstances, stereotypes are highly accessible responses whenever people encounter or merely entertain thoughts about members of stereotyped groups (Bargh, 1997). Thus, positive moods simply encourage people to embrace, and negative moods encourage people to avoid, this highly accessible response. Consistent with this idea, the usual relation between mood and stereotyping can be reversed by varying the accessibility of stereotype-relevant thoughts and responses. In research directly exploring this idea (Huntsinger, Sinclair, Dunn, & Clore, 2010), mood was manipulated to be positive or negative and egalitarian

response tendencies were measured or manipulated, or counterstereotypical thoughts were made accessible. Stereotype activation was measured using a variety of reaction-time measures, including the implicit association task and the weapon-identification task. In the presence of accessible egalitarian response tendencies or counterstereotypic thoughts, people in positive moods exhibited less stereotype activation than those in negative moods—a reversal of the standard link between mood and stereotyping. By contrast, in the absence of such response tendencies and thoughts, people in positive moods displayed greater stereotype activation.

GLOBAL-LOCAL FOCUS

People in positive moods tend to focus on the forest, whereas those in negative moods focus on the trees. For example, when judging the similarity between a series of geometric figures, people in positive moods tend to base their judgments on the global features of the stimuli more than people in negative moods (Fredrickson & Branigan, 2005; Gasper & Clore, 2002). Similar effects already occur for 6- to 7-year-old children completing the Embedded Figures Task, with sad children outperforming happy children because successful performance requires focusing on details while ignoring global information (Schnall, Jaswal, & Rowe, 2008). When recalling autobiographical events, people in positive moods, compared to those in negative moods, describe such events using more abstract, global representations (Beukeboom & Semin, 2005). However, drawing participants' attention to the true cause of their affective reactions eliminates mood-related differences in a global or local focus (Gasper, 2004a). Many explanations for this link suggest that positive and negative moods are uniquely dedicated to global and local orientations, respectively (for a review, see Schwarz & Clore, 2007).

Similar to the case of mood and stereotyping, however, the connection between mood and global-local focus appears to rest on the fact that a global focus is frequently a dominant or highly accessible orientation toward incoming information (Bruner, 1957; Kimchi, 1992). In past research, then, mood may have had its influence by signaling the value of this accessible response orientation, rather than by directly sparking a global or local focus. Consistent with this reasoning, recent research found no dedicated relationship between affect and perceptual focus when a global versus local focus was manipulated (Huntsinger, *in press*; Huntsinger, Clore, &

Bar-Anan, 2010). Instead, affect acted on whichever orientation was momentarily more accessible. When a global focus was more accessible, positive moods led to a greater global focus than negative moods, thus replicating past research. But when a local focus was made more accessible, then positive moods led to a greater local focus than negative moods.

CREATIVITY

People in positive moods tend to display greater creativity and flexibility in their thinking than do those in negative moods (Isen, 1987). In general, positive emotions expand a person's thought-action repertoire and build social and intellectual resources (Fredrickson, 1998), and as a consequence, this can broaden attention (Fredrickson & Branigan, 2005). Effects on creativity are revealed in research employing a variety of different tasks, such as the remote associates task (RAT; Mednick, 1962), in which, for example, people are asked to write down uses for a brick, as well as the Tower of Hanoi problem, and categorization tasks. These findings are often taken to indicate that positive mood directly activates greater cognitive flexibility and a divergent thinking style (Isen, 1987). Although this certainly could be the case, consistent with the affect-as-information approach, the link between mood and creativity appears quite flexible and depends on what thoughts and responses happen to be in mind at the moment.

Altering whether a focus on similarities or differences is accessible, for instance, changes the relation between mood and creativity. When a focus on differences is accessible, people in positive moods display greater breadth of categorization than those in negative moods. However, when a focus on similarities is accessible, people in positive moods display less breadth of categorization than those in negative moods (Murray, Sujan, Hirt, & Sujan, 1990).

The influence of mood on creativity also depends on the framing of the task. When people are enjoyment focused, those in positive moods may persist longer on a creativity task than those in negative moods because positive mood signals the task is enjoyable, which may then lead to mood-related differences in creativity (Wyer et al., 1999). Consistent with this idea, when a task is framed in a way that stresses enjoyment, people in positive moods, as compared to those in negative moods, devote more time to the task, and thus come up with more creative responses (Martin, Ward, Achee, & Wyer, 1993). When performance is stressed, by contrast,

people in positive moods devote less time to the task, and thus come up with less creative responses, than those in negative moods. One might speculate that many creativity tasks are probably among the more enjoyable tasks that participants in psychology experiments complete. This suggests that participants may spontaneously adopt an enjoyment focus when completing creativity tasks in laboratory experiments, which may underlie many of the mood-related differences in creativity found in past research (see also Wyer et al., 1999).

Another way that mood shapes creativity is by influencing whether people use currently accessible thoughts. For example, when contemplating uses for a brick, mood may signal the value of thoughts that come to mind (e.g., "A brick would make a useful doorstop"), influencing whether they are reported during the task. Because they view accessible thoughts as valid and valuable, people in positive moods should be more likely to report those thoughts than those in negative moods. This may then contribute to mood-related differences in divergent and creative thinking. Indeed, people in negative moods were less likely than those in positive moods to report thoughts that came to mind while completing a creativity task (Gasper, 2004b). This difference in reporting thoughts and thus creativity vanished, however, when participants in positive and negative moods were instructed to write down whatever thoughts came to mind while completing the task. Thus, rather than shaping what type of thoughts come to mind during a creativity task, as is often assumed (e.g., Isen, 1987), mood influences what people do with their thoughts.

SPECIFIC EMOTIONS

As with evaluative judgments, research shows that the influence of specific emotions on cognitive processing depends on the pattern of appraisal associated with the emotion rather than its valence *per se*. The appraisal pattern associated with specific emotions, and thus their influence on cognitive processing, will be elaborated on later.

As discussed earlier, anger involves displeasure over undesirable outcomes and disapproval of the blameworthy action that caused them (Ortony et al., 1988). Although anger is a negative emotion, its influence on cognitive processing is similar to that of positive mood. Specifically, the experience of anger is accompanied by feelings of confidence in one's point of view (Clore & Huntsinger, 2009), which encourages reliance on accessible thoughts and response tendencies. This influence is nicely

illustrated in studies of stereotyping and persuasion. Anger has been shown to increase reliance on stereotypes in jury decision-making contexts (Bodenhausen, Sheppard, & Kramer, 1994; Tiedens & Linton, 2001) and also to increase the display of implicit intergroup bias (DeSteno, Dasgupta, Bartlett, & Cajdric, 2004). In the persuasion domain, research demonstrates that anger increases reliance on heuristic cues when processing persuasive messages (Moons & Mackie, 2007; Tiedens & Linton, 2001).

Fear and anxiety are accompanied by feelings of threat and uncertainty (Ortony et al., 1988; Tiedens & Linton, 2001), which lead people to avoid relying on accessible mental content and routine response tendencies. Fearful people, for example, avoid relying on stereotypes when making judgments and, when processing persuasive message, they also avoid relying on heuristic cues (Tiedens & Linton, 2001).

Conclusion

Affective reactions, in the form of emotions and moods, exert a far-reaching and largely functional influence on cognition (Clore, 2005; Damasio, 1994; Frijda, 1986). We discussed both classic and contemporary approaches to affective influences on cognition. These included psychodynamic perspectives, classical conditioning models, memory-priming models, and the affect-as-information approach. The latter perspective served as the theoretical framework for organizing our discussion of how affect influences four important cognitive domains: memory, perception, judgment, and cognitive processing. As this research reveals, many classic findings in cognitive psychology appear to have an affective trigger.

Future Directions

1. What is the neurological basis for mood and emotional influences on cognition? It is imperative that a neurologically plausible model of affect–cognition interaction be developed in order to fully understand their interaction.

2. Cognitive feelings, such as fluency and certainty; bodily cues, such as head nodding and shaking; and so forth often have a similar influence on cognition as corresponding affective feelings. And some research reveals they may serve a similar information function as mood and emotion. Future research is necessary to establish whether these seemingly disparate internal cues can be unified under a single theoretical framework.

3. The information about value conveyed by affect can be represented at multiple levels, including neurological, physiological, experiential, cognitive, and behavioral. What are the consequences for cognition of coherence versus incoherence between these levels? Some research indicates that feelings of affective coherence versus incoherence produce epistemic advantages and disadvantages, respectively (Centerbar, Schnall, Clore, & Garvin, 2008). Does this influence extend beyond the epistemic realm? Does affective coherence serve an information function like mood and emotion?

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