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The Influence of Affective States on Cognitive Broadening/Narrowing: Considering the Importance of Motivational Intensity

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Abstract

Decades of research suggested that positive affective states broaden cognitive processes, whereas negative affective states narrow cognitive processes. More recent research suggests, however, that these conclusions may be premature. These past experiments often compared positive affects low in motivational intensity with negative affects high in motivational intensity. These past experiments, therefore, may have confounded affective valence with motivational intensity. Recent evidence suggests that motivational intensity rather than affective valence influences cognitive broadening/narrowing. That is, affective states of low motivational intensity (e.g., sadness, postgoal positive affect) broaden cognition, whereas affective states of high motivational intensity (e.g., disgust, pregoal positive affect) narrow cognition. We posit that narrowing occurs during affective states of high motivational intensity to aid organisms in acquiring desirable objects or avoiding aversive ones. In contrast, broadening occurs during affective states of low motivational intensity to open organisms to new opportunities.

Introduction

Decades of research have suggested that positive affective states broaden cognitive processes, whereas negative affective states narrow cognitive processes (see reviews by Easterbrook, 1959; Fredrickson, 2001). In contrast, we have theorized that the influence of affective states on cognitive broadening/narrowing does not depend on the positivity or negativity of the affective state but may instead depend on the motivational intensity of the affective state (Harmon-Jones & Gable, 2008). Motivationally intense affective states narrow cognitive processes to assist in goal-directed behavior. That is, by attentionally zeroing in on the object of desire (or aversion), the organism is more likely to successfully acquire (avoid) the motivationally significant object. On the other hand, affective states low in motivational intensity broaden cognitive processes to open the organism to new opportunities. That is, after accomplishing a desirable goal, the organism is in a positive affective state of low motivational intensity (e.g., satisfaction), and this low motivationally intense positive state assists in broadening the organism's perspective. After losing a desirable goal, the organism, in some cases, is in a negative affective state of low motivational intensity (e.g., sadness), and this low motivationally intense negative state also broadens the organism's perspective. In other cases, after losing a desirable goal, the organism is in a negative affective state of high motivational intensity (e.g., anger), and this motivationally intense negative state should narrow the organism's perspective.

Before jumping into a review of the evidence, we will define some terms of import to this research. We conceive of motivational intensity as the urge to engage in a behavior

or the impulse to move toward/away from a stimulus, and thus it can range on a dimension from low to high. Arousal, as measured subjectively and by activation of the sympathetic nervous system, is often posited to be a proxy for motivational intensity (Bradley & Lang, 2007). We agree with this idea but suspect that motivational intensity and arousal may sometimes be separable, as when one is aroused but not driven to engage in action. Humor or excess caffeine consumption can produce high arousal with no motivation to engage in action. Motivation may occasionally involve more than an urge to act (e.g., pursuit of abstract goals), but at this point in our work on cognitive broadening/narrowing, we have focused on this more basic definition of motivation.

The broadening or narrowing of cognition is another term in need of definition. This concept, similar to cognitive expansiveness, has been used widely in past discussions of the effects of emotions on cognition (e.g., Fredrickson, 2001). It has been measured in a number of ways, such as local/global attentional scope (Fredrickson & Branigan, 2005), cognitive categorization (Isen & Daubman, 1984), and unusualness of associations (Isen, Johnson, Mertz, & Robinson, 1985). Generally, broadening/narrowing can occur at attentional or conceptual levels.

Positive Affects Vary in Motivational Intensity

After reviewing the literature, we suggested that most prior research on the relationship between affective states and cognitive scope (broad vs. narrow) had examined positive affective states low in motivational intensity (amusement) and negative affective states high in motivational intensity (fear; Harmon-Jones & Gable, 2008). We suggested that this confounding of affective valence with motivational intensity made it difficult to claim that positive affect broadened and negative affect narrowed cognitive scope. Because most of the affect-and-cognitive-scope research of the last two decades focused on positive affect, we will focus this review on positive affect but will comment on negative affect occasionally.

In the prior research on positive affect and cognitive scope, researchers manipulated positive affect by giving participants gifts (Isen & Daubman, 1984), having participants recall past positive events (Gasper & Clore, 2002), or showing participants film clips of humorous or satisfying events (Fredrickson & Branigan, 2005). The positive affective state created by these manipulations, we suspect, is likely to be low in approach motivation because these manipulations create relatively passive states and do not evoke goal pursuit. These positive affective states are certainly common ones and may be the states that come to mind most readily when thinking about positive affect. Words that may express these low motivationally intense positive affective states are good mood, satisfied, joy, and happiness, though we suspect that some forms of joy and happiness may be higher in approach motivation (i.e., they may occur pregoal).

Another class of positive affective states exists that is higher in approach motivation. However, these states were not examined in past research on positive affect's influence on cognitive scope. These states often occur when individuals actively pursue obtainable, desirable goals. Some words that may express these high motivationally intense positive affective states are desire, excitement, enthusiasm, lust, interest, joy, and happiness, though again we suspect that some forms of joy and happiness may be lower in approach motivation (i.e., they may occur postgoal). These lists of words are not intended to be definitive.

We view this distinction between low and high approach-motivated positive affect as a continuous variable of motivational intensity. Moreover, we suspect that this dimension is

not particularly well represented in most individuals' language or introspection. That is, individuals likely focus on the valence intensity of their affective state and use language to express such (e.g., ''I'm very happy!''). Most individuals may not be able to express in language how motivationally intense their positive affective state is at the moment. Why might this be? Motivation is about doing, not talking; the colloquial expression, ''Talkin' ain't doing,'' expresses this well. Motivational science has recognized this for decades and this may be one reason implicit measures (e.g., projective tests, biological responses) are often used in motivational research (McClelland, Atkinson, Clark, & Lowell, 1953; Schultheiss & Brunstein, 2010). Another possibility is that the verbal expression of motivationally intense positive affective states is unacceptable. Indeed, these factors may partially explain why some scientists overlook motivational intensity when designing theories and emotion-related research (see Harmon-Jones, Schmeichel, Mennitt, & Harmon-Jones, 2011, for further discussion).

Our distinction between low and high approach motivated positive affect is also similar, perhaps identical, to other conceptualizations, such as ones that discuss appetitive or pregoal positive states as being different from consummatory or postgoal positive states (Knutson & Wimmer, 2007), or ones that discuss wanting as being different from liking (Berridge, 2007). Research has revealed that pregoal and postgoal positive affect states are associated with different neural structures and neurochemicals (Berridge, 2007; Harmon-Jones, Harmon-Jones, Fearn, Sigelman, & Johnson, 2008; Knutson & Wimmer, 2007; Panksepp, 1998). We posit that pregoal, high approach-motivated positive affective states assist in promoting reward acquisition and may do so by narrowing cognitive scope, so that organisms are not distracted by irrelevant, peripheral details that may impede goal pursuit. In contrast, postgoal, low approach-motivated positive affective states may assist in promoting openness to new opportunities. After the desirable goal is accomplished, the organism briefly savors the moment, which broadens cognitive scope and allows for new goal opportunities to be seen and later pursued. Of course, when individuals confront difficulties to obtaining goals, they may pull back, motivation may lower, and they may broaden attention as a way to obtain the goal. But during the heat of unhindered goal pursuit, attention and other cognitive processes may narrow to assist with behavioral engagement and goal accomplishment.

The Effect of Low vs. High Approach-Motivation Positive Affect on Attentional Scope

We started our program of research by examining the differences between positive affective states low and high in approach-motivation on attentional scope. We measured attentional scope using two commonly used measures: the Kimchi and Palmer (1982) local-global visual processing task and the Navon (1977) local-global letters task. In the Kimchi and Palmer (1982) task, participants are presented several trials. In each trial, three figures, each comprising three to nine local elements (triangles or squares), are presented. One figure, the standard, is positioned on top, and the two other figures, the comparisons, are positioned below. One of the comparison figures has local elements that matched the local elements of the standard, whereas the other comparison figure has a global element that matches the global element of the standard. Thus, judgments of which comparison figure are more similar to the standard figure are based on either the global element of one comparison figure or the local elements of the other comparison figure. Participants are asked to press a key to indicate their ''first and most immediate impression'' as to which of the two comparison figures in each triad best matches the

standard figure, and their choice indicates whether they were more locally (narrowly) or globally (broadly) focused at the moment.

In the Navon (1977) letters task, participants are also presented several trials. The stimuli in the letters task are large letters composed of smaller letters. Each vertical and horizontal line of a large letter is made up of five closely spaced local letters (e.g., an H made up of Fs). Participants are asked to indicate "as quickly and accurately as possible" whether the picture contains the letter T or the letter H, by pressing one button for T and another button for H. Global targets are those in which a T or an H is composed of smaller Ls or Fs. Local targets are those in which a large L or F is composed of smaller Ts or Hs. Faster responses to the large than to the small letters indicate a global (broad) focus, where faster responses to the small than to the large letters indicates a local (narrow) focus.

Our first experiment compared the effects of low approach-motivated positive affect with high approach-motivated positive affect on attentional scope (Gable & Harmon-Jones, 2008, Experiment 1). Low approach positive affect was created with a film clip of funny cats, and high approach positive affect was created with a film clip of desserts. The funny cats evoked more self-reported amusement than the desserts film clip, whereas the desserts evoked more self-reported desire than the funny cats film clip. Both film clips evoked relatively high levels of general positive affect (e.g., happiness) and the two conditions did not differ from one another on this measure of general positive affect. Also, both film clips evoked equally low levels of self-reported negative affect (e.g., anger, anxiety, fear, sadness). In support of the primary hypothesis, the dessert film clip (which caused high approach positive affect) caused less broadening of attention than the funny cats film clip (which caused low approach positive affect).

Follow-up experiments found that dessert pictures caused more narrowing of attention than neutral pictures (Gable & Harmon-Jones, 2008, Experiment 2) and that cute baby animal pictures caused more narrowing of attention than neutral pictures (Gable & Harmon-Jones, 2008, Experiment 3). Also, individuals who scored higher in trait approach motivation demonstrated even more narrowing of attention following dessert pictures and cute baby animal pictures (Gable & Harmon-Jones, 2008, Experiment 3).[1] We also found that increasing approach motivation by leading individuals to believe they would get to eat desserts following the picture viewing caused even more narrowing of attention (Gable & Harmon-Jones, 2008, Experiment 4).[2] In addition, alcohol-related pictures cause a narrowing of attention among individuals who possess a strong motivation to consume alcohol (Hicks, Friedman, Gable, & Davis, forthcoming).

Our experiments have revealed that the approach motivated positive affect manipulations increased positive affect (e.g., excited, enthusiastic) but did not increase negative affect. To give just one example, in Experiment 4 of Gable and Harmon-Jones (2008), the participants were shown pictures of desserts and some of these participants were given the expectation that they would get to eat desserts at the end of the experiment; other participants simply viewed the desserts without this expectation. Consistent with the theoretical idea that the expectation to act would increase approach motivation, our results indicated that the expectation also caused more narrowed attention. More important for the present discussion, neither dessert condition caused more negative affect than the neutral condition, and participants in the expectation/dessert condition actually reported less negative affect than participants in the neutral condition (although both conditions reported very low negative affect).

Evoking Low vs. High Approach-Motivated Positive Affect with Money

One criticism of the preceding experiments is that they all used affective pictures to evoke the high approach motivated positive affect state, and it could be argued that the pictures themselves, rather than the affective state evoked, narrowed attention. This argument is consistent with other research that found that individuals focus on the emotional content of a picture (MacNamara, Foti, & Hajcak, 2009). That is, in the experiments finding appetitive pictures to narrow attentional scope, participants may have been placed into a narrowed attentional state because they were focusing on specific objects in the pictures. To address this concern, we have conducted experiments to test whether positive affective states created by stimuli other than emotional pictures would influence attentional breadth.

In one experiment (Gable & Harmon-Jones, 2010a), we manipulated high approach positive affect using the pregoal positive affect manipulation of Knutson and colleagues. In the same experiment, we manipulated low approach positive affect using their postgoal positive affect manipulation (e.g., Cooper, Hollon, Wimmer, & Knutson, 2009; Knutson & Greer, 2008; Knutson, Westdorp, Kaiser, & Hommer, 2000; Knutson & Wimmer, 2007). These manipulations are created in a monetary incentive delay task in which cues indicating the possibility of gaining money for subsequent task performance are used to evoke pregoal (high approach) positive affect, and different cues indicating the outcome of the task performance (whether a reward was obtained) are used to evoke postgoal (low approach) positive affect.

In this particular experiment (Gable & Harmon-Jones, 2010a), cognitive narrowing/broadening was measured by assessing recognition memory for neutral words that were presented either in the center of the computer monitor or in the periphery of the computer monitor. Results indicated that memory for centrally presented words was better following the pregoal positive affect cues than postgoal positive affect cues. On the other hand, memory for peripherally presented words was better following the postgoal positive affect cues than pregoal positive affect cues. These results have been conceptually replicated in two experiments using the Navon (1977) local/global attentional precedence task (Gable and Harmon-Jones, 2011a), with monetary incentives (Experiment 1; see Figure 1) and dessert incentives (Experiment 2).

In addition to demonstrating that stimuli other than affective pictures can produce the predicted effects of low vs. high approach motivated positive affect on attentional scope, these experiments revealed that low and high approach-motivated positive affect have the predicted (divergent) effects on the same individuals in the same experiment. Past experiments had only examined the attentional consequences of low or high approach-motivated positive affects in between-subjects designs or in separate experiments.

Perceptual vs. Conceptual Processing

In all of the preceding experiments, perceptual attention was measured. However, the past research on positive affect and cognitive broadening had found that positive affect influences a number of measures of cognitive broadening. To test whether low vs. high approach positive affect would influence other, more conceptual cognitive processes, we conducted an experiment in which narrowing/broadening of cognition was measured using Isen and Daubman's (1984) cognitive categorization task (Price & Harmon-Jones, 2010). In addition, in this experiment, we manipulated high approach and low approach positive states using an embodiment manipulation. In the high approach positive affect condition, participants smiled and leaned forward in a chair, similar to how one might lean towards delicious food. In the low approach positive affect condition, participants smiled and reclined backward in a

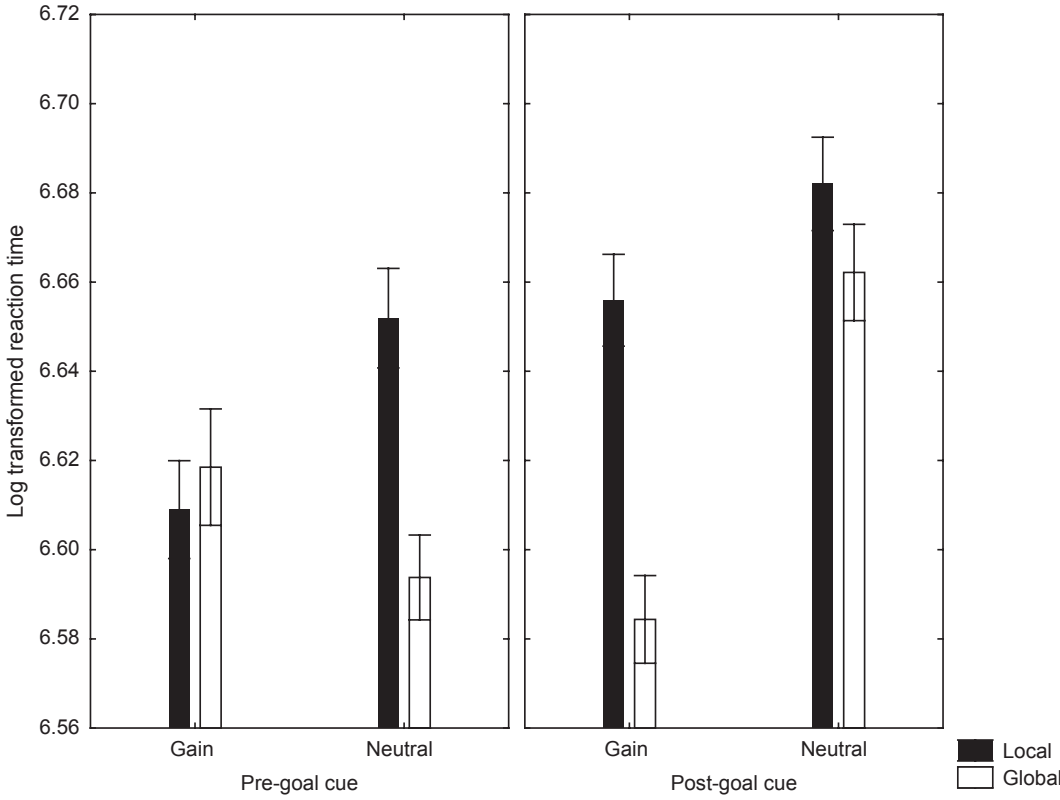

Figure 1 Example of global/local attentional bias results.

reclining chair, similar to how one might recline once the delicious food has been eaten. In a moderate approach positive affect condition, participant sat upright and smiled. See Figure 2. Participants completed the categorization task while in one of these postures. In the categorization task, participants were instructed to rate the extent to which weakly associated exemplars (e.g., camel) of a particular category (e.g., vehicle) fit within that category. Results revealed that the high approach positive condition was most narrow in categorizations (i.e., participants were more likely to indicate that the exemplars did not belong to the category), followed by the moderate approach positive condition, and lastly by the low approach positive condition. A second experiment replicated these results.

Figure 2 Pictures display body postures of high, moderate, and low approach.

These experiments demonstrated that the effects of low vs. high approach motivated positive affect influence cognitive scope in opposite directions even when these affective states are implicit. That is, such manipulations of body posture have not been found to influence self-reported emotional experience but they do influence psychophysiological measures of approach motivation (Price & Harmon-Jones, 2011).[3]

Neuroscientific Evidence

According to our conceptual analysis, the manipulations of high approach positive affect cause a narrowing of attention because they activate high approach positive affect. As reviewed above, the differences on self-reported affect between conditions are consistent with this analysis. However, in the majority of the reviewed experiments, the self-report affect measures were assessed after measures of cognitive scope. This was done because the assessment of self-reported affect in between the affect manipulation and the cognitive measures might interfere with the effect of affect on cognition. Perhaps because of the placement of the affect measures or because of the insensitivity of the affect measures, self-reported affect has not been found to correlate with the cognitive scope measures in our experiments or in the experiments conducted prior to our experiments.

To provide evidence for the role of approach motivation in the effects of high approach positive affect on cognitive narrowing, we have conducted a few experiments using measures of electrical brain activity. In our first experiment (Harmon-Jones & Gable, 2009), we measured electroencephalographic (EEG) alpha power as participants completed an experiment in which neutral and dessert pictures served as primes and attentional scope was measured following each picture using the Navon (1977) letters task. From the EEG alpha power measure, we focused on asymmetric frontal cortical activity, as much past research has linked greater relative left frontal cortical activity to approach motivation (Coan & Allen, 2004; Harmon-Jones, Gable, & Peterson, 2010). Results revealed that relatively greater left than right frontal cortical activity to the dessert pictures (but not neutral pictures) predicted attentional narrowing immediately following the dessert picture primes (Harmon-Jones & Gable, 2009). These results are consistent with previous research showing that local attentional processes occur in the left hemisphere (Volberg & Hübner, 2004).

In a subsequent experiment, we used the same design (affective pictures and Navon letters task) but measured event-related brain potentials (ERP), specifically the late positive potential (LPP) of the ERP (Gable & Harmon-Jones, 2010b). The LPP has been found to be sensitive to the motivational significance of stimuli (for review, see Hajcak, Weinberg, MacNamara, & Foti, 2012), and thus we predicted and found that the LPP was larger to dessert than neutral pictures. This LPP effect occurred over several brain regions, including central and parietal cortices. It also showed an asymmetric effect over the frontal cortex, with the dessert pictures evoking greater relative left frontal cortical activity measured with LPPs, thus conceptually replicating the EEG alpha power effect observed in the previous experiment (Harmon-Jones & Gable, 2009). Most importantly, LPPs to dessert pictures predicted attentional narrowing following the dessert pictures (no such correlations were observed for neutral stimuli).

Comparing Negative Affective States Differing in Motivational Intensity

The above research suggests that the motivational intensity of the positive affect is critical in determining whether positive affect causes broadening or narrowing of cognitive

scope. We recently extended our motivational analysis to negative affect (Gable & Harmon-Jones, 2010c), by manipulating negative affective states that vary in motivational intensity. Sadness-inducing pictures were used to create a low motivationally intense negative affective state, whereas disgust-inducing pictures were used to create a high motivationally intense negative affective state. Both sad and disgust pictures evoked greater self-reported negative affect than neutral pictures did. However, the sad pictures evoked lower self-reported arousal than the disgust pictures. This arousal evidence suggests that the disgust pictures evoked higher motivational intensity than the sadness pictures, based on the idea that self-reported arousal is a proxy for motivational intensity (Bradley & Lang, 2007). Attentional scope was measured using the Navon (1977) task. As predicted, sad pictures caused a broadening of attention, whereas disgust pictures caused a narrowing of attention relative to neutral pictures.

At present, it is unknown how hemispheric activity, negative affective states varying in motivational intensity, and attentional scope relate. Some research has suggested that the right hemisphere processes information more globally than the left hemisphere (Volberg & Hübner, 2004). However, the right frontal cortex has been found to be more involved than the left frontal cortex in withdrawal emotive states (Coan & Allen, 2004). Unlike the research on relative left frontal cortical activity, high approach positive affect, and attentional narrowing, these lines of evidence do not suggest a simple relationship between withdrawal emotive states (e.g., disgust), right hemispheric activity, and attentional scope, because an intense withdrawal emotive state like disgust should increase right frontal cortical activity but not global attentional processing, which presumably involves right hemispheric processing. Future research is necessary to understand cortical mechanisms involved in how motivationally intense negative affective states cause a narrowed attentional scope.

The recent results obtained with negative affective states that vary in motivational intensity suggest the need for a concept that can explain how some positive (e.g., desire) *and* negative (e.g., disgust) affective states cause a narrowing of cognitive scope, whereas other positive (e.g., amusement) *and* negative (e.g., sadness) affective states cause a broadening of cognitive scope. We propose that the concept of motivational intensity accounts for these effects: low motivationally intense affective states cause a broadening of cognitive scope but high motivationally intense affective states cause a narrowing of cognitive scope.

Affective States, Arousal, and Motivational Intensity

Some scientists might suggest that arousal rather than motivational intensity better accounts for the effects of these different affective states' influence on cognitive scope. One way to handle this alternative explanation is to posit that arousal is a proxy for motivational intensity, a proposition made in prominent theories of emotion (Bradley & Lang, 2007). If arousal is the same as motivational intensity, then the arousal interpretation is the same as the motivational intensity interpretation. But this solution may not satisfy those who do not regard arousal as equal to motivational intensity.

If, instead, we consider the evidence collected on humor or amusement (Fredrickson & Branigan, 2005; Gable & Harmon-Jones, 2008), then we may also arrive at the conclusion that motivational intensity rather than arousal per se best explains the data. That is, humorous films have been found to cause more attentional broadening than neutral films (Fredrickson & Branigan, 2005; Gable & Harmon-Jones, 2008), and humor is thought to be an arousing state that is low in approach motivational intensity: humor does not urge

action toward something. Thus, this evidence suggests that arousal per se cannot account for the effect of high approach positive affective states on attentional narrowing.

Another way to address this issue is to consider instances where arousal and motivational intensity may be separable. In other words, some arousal states, such as one prompted by physical exercise or caffeine, are not necessarily associated with motivationally intense states. We tested this idea in one experiment (Harmon-Jones, Gable, & Hobbs, forthcoming) in which participants were randomly assigned to pedal a stationary bike exerciser or not while performing the appetitive vs. neutral picture/attentional scope task used in Gable and Harmon-Jones (2008, Experiment 2). Results indicated that individuals who pedaled had faster heart rates than individuals who did not. More importantly, however, the manipulated arousal had no effect on attentional scope. These results suggest that motivational intensity, rather than arousal per se, is the variable that causes attentional narrowing.

The Effect of Cognitive Scope on Motivational Intensity

Given the effect of approach-motivated positive affect on the narrowing of attentional scope, we recently conducted an experiment to test whether the relationship between approach-motivated positive affect and attentional scope was bi-directional (Gable and Harmon-Jones, 2011b). That is, would a manipulated local attentional scope cause greater approach motivational processing than a global attentional scope? We suspected it would. Focusing narrowly on an appetitive object is predicted to increase desire for the object, whereas a broader consideration of an appetitive object is predicted to decrease the desire for the object. Research has revealed that a local as opposed to a global attentional scope reduced estimates of psychological distances of time, space, and social distance (Liberman & Forster, 2009). And ''perceiving desirable objects as closer can energize actions meant to obtain those objects'' (Balcetis & Dunning, 2010, p. 151). Thus, both desire and narrowed attentional scope cause individuals to perceive things as psychologically closer, and psychological proximity to a goal enhances motivation.

To assess motivational processing, we measured ERPs to appetitive and neutral pictures, and focused on the N1 component, the earliest ERP component influenced by motivational intensity (Foti, Hajcak, & Dien, 2009; Keil et al., 2001). The amplitude of the N1 component is larger to motivationally significant stimuli (Baldauf & Deubel, 2009; Plihal et al., 2001).

Attentional scope was manipulated prior to each affective or neutral picture by having participants simply indicate what letter was displayed at the local or global level. That is, in this between-subjects design, participants viewed Navon (1977) letters and were randomly assigned to indicate the name of the letter that was displayed as a local element (the small letters making up the large global letter) or to indicate the name of the letter that was displayed in the global configuration (the large letter).

As compared to a global attentional scope, a local attentional scope caused a larger N1 to appetitive pictures but not to neutral pictures. These results suggest that the relationship between narrowed attentional scope and approach-motivated positive affect is bi-directional.

Issues to Consider in Future Research

In our research, we have examined the narrowing/broadening of cognition with measures of attentional scope, visual spatial memory, and cognitive categorization. And these

measures have produced converging outcomes conceptually speaking. In future research, it will be important to examine other cognitive processes that may be associated with broadening/narrowing. Creativity was once thought to tap broadening of cognition. However, recent research has revealed that creativity is a complex construct, and some measures of creativity may tap a broadening of cognition, whereas others may tap persistence. Different emotional dimension responses influence these different aspects of creativity (Baas, De Dreu, & Nijstad, 2008, 2011; De Dreu, Baas, & Nijstad, 2008).

We have conducted much less research on the effects of negative affective states on attentional scope than on the effects of positive affective states. Thus, more work is clearly needed. However, our results with negative affect are conceptually similar to some that have already been published with individuals with depression (von Hecker & Meiser, 2005). In any research on affective states and/or traits, it will be important to ensure that the intended state is manipulated or trait is measured. We posit that sadness is often associated with low motivational intensity. However, sadness is often mixed with other affective states of higher motivational intensities (e.g., anger), possibly increasing the motivational intensity of such sadness.[4] Other instances of sadness may be associated with higher motivational intensity if one is attempting to eliminate the sadness and approach the goal of no sadness.

Future work may reveal that our theoretical perspective is incorrect. We have done more research on positive affect and thus feel more confident in it. Our studies manipulated approach motivated positive affect with films, pictures, pre- and postgoal information, and body postures, and measured cognitive scope in a variety of ways. We doubt that all of our high approach motivation manipulations cause only desire. As we noted above, high approach-motivated positive affect may not be well represented in most individuals' language. In addition to positive affective states that vary in approach motivation, other positive emotions may exist that may not be clearly associated with approach motivation and thus have no connection to perceptual/conceptual narrowing or broadening.

Conclusion

The reviewed evidence suggests an important refinement of the well-accepted hypothesis that positive affect broadens and negative affect narrows the scope of cognition. The refinement accepts the previous evidence but suggests that it likely occurred because of a confound of affective valence and motivational intensity: positive affective states low in motivational intensity were compared to negative affective states high in motivational intensity. The more recent research, which manipulated affective valence independently of motivational intensity, suggests that affective states low in motivational intensity broaden and affective states high in motivational intensity narrow the scope of cognition. As such, this work challenges the broaden-and-build model that posits that "positive emotions broaden the scope of attention and thought-action repertoires" (Fredrickson & Branigan, 2005, p. 313).

We hope that the consideration of motivational direction and intensity as separate from affective valence will inspire new research that yields a better understanding of the relationships between emotion and cognition. Along these lines, the examination of approach motivational intensity within positive affect has proved useful in recent research on time perception, where it was found that approach-motivated positive affect shortened time perception relative to low approach positive affect, withdrawal-motivated negative affect, and neutral affect (Gable & Poole, forthcoming).

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Short Biographies

Eddie Harmon-Jones, PhD, is Professor of Psychology at University of New South Wales. Dr. Harmon-Jones's research focuses on emotions and motivations, their implications for social processes and behaviors, and their underlying neural circuits. His research has been supported by the National Institute of Mental Health, the National Science Foundation, and the Fetzer Institute. In 2002 he received the Distinguished Award for an Early Career Contribution to Psychophysiology from the Society for Psychophysiological Research. He has co-edited three books, is (or has) served as an associate editor of the *Journal of Personality and Social Psychology, Emotion, Psychological Science*, and *the International Journal of Psychophysiology*.

Tom F. Price is currently a postdoctoral fellow at University of New South Wales. His research focuses on embodiment, emotion, motivation, and cognition.

Philip A. Gable is Assistant Professor of Psychology at the University of Alabama. He investigates the interactions of motivation, emotion, and cognition with multiple measures such as personality traits, attitudes, and reaction times as well as neurophysiological measures such as regional brain activation through electroencephalography (EEG), reflex physiology, and event related brain potentials (ERPs).

Endnotes

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[1] One reviewer asked why the cute baby animal pictures produced narrowing while the funny cats video produced broadening. The cute baby animal pictures and the funny cats video are different and likely evoke different emotive states. The cute baby animal pictures depict baby animals one would want to approach and perhaps cuddle. The funny cats video depicts cats running around in unpredictable, almost crazy ways. Most viewers would not want to approach such cats. They are not cute and cuddly but are very funny.

[2] In these experiments, a fixation cross is presented for 500 ms between each affective (neutral) picture and the attentional scope task.

[3] Friedman and Förster (2011) criticized this experiment by saying that the reclining position caused participants to feel powerful and that this feeling rather than low approach positive affect caused the conceptual broadening. Our manipulation simply involves participants reclining in a chair with arms at the sides, sitting upright, or leaning forward with arms reaching, as shown in Figure 2. In research manipulating high power with the body, one manipulation involves an expansive sitting posture with arms lifted and hands placed behind the head, and another involves an expansive posture of standing up and leaning forward with the arms outward (Carney, Cuddy, & Yap, 2010). Our approach manipulation posture is not similar to the power postures. The key variable with power postures is expansion; power postures can be slightly reclining as in the sitting-expansive pose or they can be leaning forward as in the standing-expansive pose. The key variable with the approach postures is leaning forward/reclining backward, without any expansion. It is not clear how a power interpretation could explain our results of reclining causing broadening and leaning causing narrowing. A power explanation should predict that both reclining and leaning, because they are high power, should cause broadening, according to the results of Smith and Trope (2006). However, we doubt power researchers would make this prediction for reclining/leaning alone without expansion. Finally, our reclining posture has been found to reduce approach-oriented physiological responses to anger (Harmon-Jones & Peterson, 2009) and desire (Harmon-Jones, Gable, & Price, 2011) manipulations. Power research suggests that high power (if reclining is high power) is associated with more approach (Keltner, Gruendfeld, & Anderson, 2003), more anger (Tiedens, 2000) and perhaps desire (Bargh, Raymond, Pryor, & Strack, 1995).

[4] One reviewer suggested that a paper by Gasper and Clore (2002) showed different results than our results with sadness. Gasper and Clore (2002) induced positive and negative affect by asking participants to write about ''a

personal life event that had made them feel either 'happy and positive' or 'sad and negative.' " In Study 1, the manipulation check is similarly worded. In Study 2, the same manipulation is used and negative affect is measured with the following words: unhappy, afraid, anxious, sad, unhappy, nervous, unpleasant, depressed, and frustrated. The authors average all of these words together for their analyses, leading us to think that the affective state manipulated was a mix of negative states and not sadness alone.

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