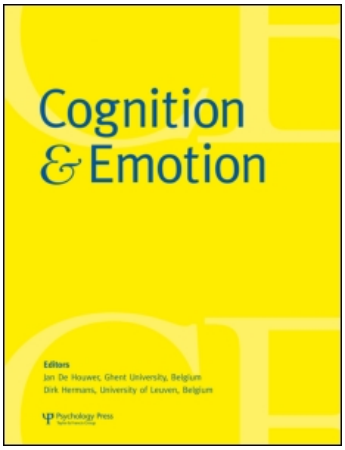

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The motivational dimensional model of affect: Implications for breadth of attention, memory, and cognitive categorisation

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The motivational dimensional model of affect: Implications for breadth of attention, memory, and cognitive categorisation

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Over twenty years of research have examined the cognitive consequences of positive affect states, and suggested that positive affect leads to a broadening of cognition (see review by Fredrickson, 2001). However, this research has primarily examined positive affect that is low in approach motivational intensity (e.g., contentment). More recently, we have systematically examined positive affect that varies in approach motivational intensity, and found that positive affect high in approach motivation (e.g., desire) narrows cognition, whereas positive affect low in approach motivation broadens cognition (e.g., Gable & Harmon-Jones, 2008a; Harmon-Jones & Gable, 2009). In this article we will review past models and present a motivational dimension model of affect that expands understanding of how affective states influence attentional and cognitive breadth. We then review research that has varied the motivational intensity of positive and negative affect and found that affect of low motivational intensity broadens cognitive processes, whereas affect of high motivational intensity narrows cognitive processes.

Keywords: Affect; Motivation; Attention; Cognitive breadth.

Affective states influence cognition. Most previous conceptual approaches to the study of affect–cognition effects have been predicated on models that emphasise major differences between positive and negative affect (Fredrickson & Cohn, 2008). Recent conceptual models that emphasise the approach versus withdrawal dimensions underlying affect, however, suggest similarities between specific positive and negative affects, as well as dissimilarities between specific positive (or negative) affects (Harmon-Jones, 2003b, 2004; Harmon-Jones & Gable, 2008). These (dis)similarities may suggest an increased understanding of affect–cognition interactions.

In this article, we first review previous models of affect–cognition interactions, particularly those models that make predictions for how affect influences attentional and cognitive breadth. Then we present a conceptual model concerning the relationship between motivational intensity and cognitive breadth. Next we review recent research investigating positive affect that differs in

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approach motivational intensity. Finally we present evidence obtained with negative affect that further supports the model.

SOME DEFINITIONS

Before beginning, we will clarify what we mean by different terms used throughout this article. An emotion or affect is not a "thing" but is a multicomponent process made up of basic processes such as feelings of pleasure or displeasure, facial/body expression components, particular appraisals, and particular action plans and activation states (Frijda, 1993). Moreover, these components are not perfectly correlated with each other (Lang, 1995).

Previous research on positivity and cognition has used the terms affect (Isen, 2002), mood (Gasper & Clore, 2002), or emotion (Fredrickson, 2001) to describe the positive state manipulated. Although moods may be different from emotions, past research has found that both positive moods and positive emotions typically yield identical outcomes on cognitive processes. Because of this and because it is difficult to empirically separate moods from emotions at the measurement level, we use the broader term "affect" to describe the state manipulated in experiments.

Approach and withdrawal motivation are often implicated in emotional processes. Some theorists have linked positive affect directly with approach motivation and negative affect with withdrawal motivation (Watson, 2000). Other research and theory, however, suggests that motivational direction and affective valence are not linked in this manner. In particular, anger is a negative affective state associated with approach motivation (Carver & Harmon-Jones, 2009; Harmon-Jones, 2003a). Thus, motivational direction and affective valence can be independent.

Theories differ regarding whether approach and withdrawal are viewed as bipolar or unipolar dimensions. We believe that this debate need not be settled here. Regardless of whether a bipolar or unipolar model is preferred, we posit that approach and withdrawal motivation vary in intensity. Motivational direction is the drive to approach or avoid an object or goal. Motivational intensity refers to the strength of the motivation, and it can range from low to high. That is, within a given motivational direction (e.g., approach), the motivation can range from low to high in intensity.

An important clarification should be mentioned here. The concept of arousal is often related to the concept of motivational intensity. Motivational intensity or the impetus to act is related directly to arousal, but unlike arousal, motivation always has action implications (even if they are vague). In Bradley and Lang's (2007) theory of emotion, "judgments of arousal index (again, roughly) the degree of activation in each motivation system" (p. 585). More motivationally intense states are also associated with greater sympathetic nervous system activation (see Bradley & Lang, 2007, for a review). Although these concepts are similar, there are instances in which arousal is divorced from motivational intensity. For instance, amusement can be thought of as an arousing, positive state or a "higher activation state" (Fredrickson & Brannigan, 2005, p. 326). However, this state is unlikely to urge one to approach something in the environment.

THEORIES OF AFFECT–COGNITION INTERACTION

Several theories have made predictions regarding the influence of affective states on cognitive breadth. In an early model on affect–cognition interactions, Schwarz and Clore (1983) proposed that affect provides information for cognitive processing. This affect-as-information model proposed that individuals in a positive mood rely on general knowledge structures, whereas individuals in negative moods focus on specific details and rely on outside information (Bless, Schwarz, Clore, Golisano, & Rabe, 1996). Positive affect is proposed to signal a safe situation, resulting in more global, heuristic cognitive processing. In contrast, negative affect signals a problematic situation, resulting in a more local, analytic processing. In sum, the affect-as-information model could be viewed as an unconscious affective

appraisal, which in turn leads to a cognitive script (Schwarz & Clore, 2003).

Along similar lines, Fredrickson (2001) proposed that positive affect increases cognitive breadth. This model was based largely on evidence that positive affect increases cognitive flexibility (see Isen, 2002, for a review). In this model, positive affect broadens momentary though–action repertoires, whereas negative affect narrows thought–action repertoires. Positive affect is posited to suggest a stable and comfortable environment and encourage an organism to be more attentionally and cognitively broad (Fredrickson, 2001). In this theory, the affect itself is believed to cause the broadening.

Research supporting this model has found that positive affect creates a broadening of cognitive processing in categorisation (Isen & Daubman, 1984), unusualness of word association (Isen, Johnson, Mertz, & Robinson, 1985), social categorisation (Isen, Niedenthal, & Cantor, 1992), and the recall of memory details (Talarico, Berntsen, & Rubin, 2008). In these studies, positive affect was manipulated by having participants receive a gift (Isen, Daubman, & Nowicki, 1987), watch a funny film (Isen & Daubman, 1984), recall a pleasant memory (Murray, Sujan, Hirt, & Sujan, 1990; Schwarz & Clore, 1983), or remember a positive life event (Talarico et al., 2008).

Working within the affect-as-information model, Gasper and Clore (2002) tested whether a positive, as opposed to negative, affect manipulation would cause a more global and heuristic bias. In both studies, participants were assigned to recall a positive or negative memory. Then, they were asked to reproduce a novel drawing (Study 1) or perform the Kimchi and Palmer (1982) global–local attention task (Study 2). The concept of global–local attentional scope is similar to the idea of seeing the forest (global) or the trees (local). To measure this attentional scope, Kimchi and Palmer (1982) developed a task where individuals make similarity judgements. In this task, three global figures (large triangles or squares) each comprised of local elements (small triangles or squares) are presented. The standard figure is positioned on top and the two comparison figures are positioned below. One of the comparison figures has local elements that match the standard, whereas the other comparison figure has global elements that match the standard (see Figure 1). Individuals can make similarity judgements based on either the global or local elements of the standard figure. Similarity judgements based on global elements indicate a global attentional focus, whereas judgements based on local elements indicate a local attentional focus.

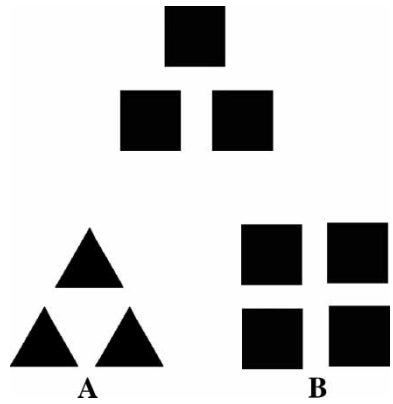

Figure 1. *Kimchi and Palmer task stimuli.*

Results of the Gasper and Clore (2002) studies suggested that positive, relative to negative, mood states produced a dependency on heuristics or gist and also a global bias. However, in Study 2, where a neutral memory condition was included, no differences occurred between positive and neutral mood states. Nonetheless, the authors concluded that "positive affective cues, whether resting or manipulated positive affect, foster global processing" (p. 39, Gasper & Clore, 2002).

In 2005, Fredrickson and Branigan used the same measure of attention to investigate the attentional broadening effects of discrete positive states of amusement and contentment. Using film clips to evoke these discrete positive states, the authors found that relative to neutral affect states, amusement and contentment broadened attentional focus. More recently, Rowe, Hirsh, and Anderson (2007) found positive moods, as opposed to neutral moods, elicited by music resulted in broadened visual-spatial processing.

The idea that positive affect creates attentional and cognitive broadening is widely accepted and supported by many investigations (Fredrickson & Branigan, 2005; Gasper & Clore, 2002; Rowe et al., 2007). However, recent evidence indicates these theories to be incomplete in their consideration of all positive (and negative) affect. Below, we present evidence that supports a new model of affect–cognition interactions. It incorporates previous work on the influence of positive affect on attentional and cognitive broadening and extends it by showing how motivational intensity rather than affective valence is the primary cause of attentional and cognitive narrowing/broadening.

THE MOTIVATIONAL DIMENSION MODEL OF AFFECT

In most previous work on the attentional and cognitive consequences of affect, research has focused on the valence dimension, that is, whether the affect was positive or negative. Another important and relatively neglected dimension of affect is motivational direction: whether the affect is associated with a motivation to approach or avoid a stimulus. All past research on the broadening effects of positive affect could be said to have used positive affect that evoked low-intensity approach motivation. That is, positivity was created by giving participants gifts (Isen & Daubman, 1984), having them watch a funny film (Isen et al., 1987), listen to pleasant music (Rowe et al., 2007), or recall pleasant memories (Gasper & Clore, 2002; Murray et al., 1990). These manipulations likely evoked low approach motivation; they involve affect that is post-goal or not goal-relevant.

Positive affect, however, varies in the degree with which it is associated with approach motivation. Some positive affective states are relatively low in approach motivation (e.g., joy after watching a funny film), whereas others are relatively high in approach motivation (e.g., enthusiasm while approaching a desirable object). Positive affect that varies in motivational intensity could have different effects on attention, cognition, and behaviour.

Given the importance of approach-motivated positive affective states to biologically important outcomes such as reproduction, social attachment, and the ingestion of food and water, it seems unlikely that such states would be associated with increased attentional and cognitive broadening. Rather, they should be associated with reduced broadening or more narrowing, as organisms shut out irrelevant stimuli, perceptions, and cognitions as they approach and attempt to acquire the desired objects. As such, positive affect high in approach motivation may encourage tenacious goal pursuit. During goal pursuit, broadening of attention might prove maladaptive as it may lead one away from the current goal pursuit. Easterbrook's (1959) model that emotional arousal causes a reduction in the "range of cue utilization" is consistent with these ideas. However, Easterbrook's model referred to drive. He defined drive as "a dimension of emotional arousal or general covert excitement, the innate response to a state of biological deprivation or noxious stimulation ... The emotional arousal is greater in neurotic than in normal subjects ... " (p. 184). Easterbrook clearly viewed this arousal state as negative. More recent models of emotion consider arousal to be positive or negative and to reflect motivational activation.

The distinction between low versus high approach positive affect bears similarity to other concepts. For instance, Panksepp (1998) discussed a PLAY emotive system that "may help animals project their behavioral potentials joyously to the very perimeter of their knowledge and social realities ... " (p. 283). He also discussed a second system, the SEEKING emotive system "that leads organisms to eagerly pursue the fruits of their environment ... " (p. 145). The PLAY system seems linked to broadening, whereas the SEEKING system seems linked to narrowing/focusing. Others have discussed appetitive or pre-goal positive states as being different from consummatory or post-goal positive states (Knutson & Wimmer, 2007), or "wanting" as different from "liking" (Berridge, 2007). SEEKING, pre-goal, approach-motivated positive affect may have emerged to assist in promoting reward acquisition.

Also, intrinsically motivated interest in a given task may arouse approach-oriented positive affect that attentionally narrows one's focus rather than broadens it. The narrowing of attention and cognition as one is engaged in goal pursuit is likely to assist in the goal-directed action and increase the chances of success. Such a process has been noted in research on action orientation (vs. state orientation) and implemental mindsets. Implemental mindsets increase approach-motivated positive affect and increase the likelihood of goal accomplishment (Brandstätter, Lengfelder, & Gollwitzer, 2001).

These pre-goal and post-goal positive affective states are associated with different patterns of neural activation in areas of the prefrontal cortex, nucleus accumbens, anterior cingulate cortex, and hippocampus (Berridge, 2007; Davidson & Irwin, 1999; Harmon-Jones, 2006; Knutson & Wimmer, 2007; Panksepp, 1998). In addition, asymmetrical frontal cortical activity has been found to relate to motivational direction and intensity, with greater relative left frontal activity relating to more approach motivation and greater relative right frontal activity relating to more withdrawal motivation (Harmon-Jones, 2003b). Indeed, manipulations of positive affect high in approach motivation increase relative left frontal cortical activity, whereas manipulations of positive affect low in approach motivation do not (Harmon-Jones, Harmon-Jones, Fearn, Sigelman, & Johnson, 2008). In addition, individuals with stronger approach-motivational tendencies show greater relative left frontal activation to appetitive stimuli (Gable & Harmon-Jones, 2008b; Peterson, Gable, & Harmon-Jones, 2008).

In contrast, positive affective states low in approach motivation may increase attentional broadening and enhance memory for peripherally presented information because such states suggest that things are going better than necessary, coasting can occur, and attention and efforts are open to unforeseen opportunities (Carver, 2003). This conception of low approach-motivated positive affect is broadly consistent with the previously reviewed models of positive affect, which posit that positive affect suggests a stable and comfortable environment and encourages broadened cognitive processing. The motivational model, however, suggests that only positive affect *low* in approach motivational intensity should broaden cognitive processing. In contrast, positive affect *high* in approach motivational intensity should narrow cognitive processing.

HIGH APPROACH-MOTIVATED POSITIVE AFFECT AND ATTENTIONAL FOCUS

Past work on the cognitive consequences of positive affect has studied only low-intensity approach-motivated positive affect, leaving the area of approach-motivated positive affect unexplored. The experiments presented here represent a body of research examining approach-motivated positive affect states. These investigations have examined the consequences of approach-motivated positive affect on attention and the neurophysiological processes associated with these states.

Comparing the attentional effects of low vs. high approach-motivated positive affect

Based on the preceding overview, Gable and Harmon-Jones (2008a) predicted that high approach positive affect would narrow attentional focus. To this end, this experiment compared the attentional effects of high vs. low approach positive affect, using methods similar to those used in previous experiments examining low approach positive affect.

Participants first viewed a neutral film. Then they viewed either a low approach positive affect film (cats in humorous situations) or a high approach positive affect film (delicious desserts). After this film, participants completed Kimchi and Palmer's (1982) global–local visual-processing task to assess breadth of attention (Fredrickson & Branigan, 2005; Gasper & Clore, 2002). Following this, participants rated how they felt during the film.

Results indicated that the low approach positive film caused more global attentional focus than the

high approach positive film. Also, affective ratings showed the high approach positive film evoked more desire than the low approach positive film, whereas the low approach positive film evoked more amusement than the high approach positive film. These results provide initial support that high approach-motivated positive affect (desire) decreases attentional broadening as compared to low approach-motivated positive affect (amusement).

Investigating attentional narrowing of high approach positive affect relative to a neutral state

One limitation of the initial investigation is that it did not include a neutral comparison condition, making it difficult to know whether approach-motivated positive affect decreased attentional broadening as compared to a neutral condition. That is, approach-motivated positive affect may reduce broadening to the same level as neutral affect. Study 2 of Gable and Harmon-Jones (2008a) tested whether high approach positive affect reduced attentional breadth relative to a neutral condition.

Participants viewed either appetitive (dessert) or neutral (rocks) pictures. After each affective/neutral picture, a Navon (1977) letter was presented to assess attentional breadth. In this task, pictures of a large letter composed of smaller letters are presented. The large letters are made up of closely spaced smaller letters (e.g., an *H* made of small *F*s; see Figure 2). Individuals are asked to respond to particular individual letters throughout the task (e.g., *T* or *H*). If the response letters were T and H, global targets would be those in which a *T* or an *H* is composed of different smaller letters.

Figure 2. *Navon letter stimuli.*

Local targets would be those where a large letter is composed of smaller *T*s or *H*s. Faster responses to the large letters indicate a global (broad) focus, whereas faster responses to the small letters indicate a local (narrow) focus.

As predicted, reaction times to global targets were slower after appetitive pictures than after neutral pictures. In contrast, reaction times to local targets were faster after appetitive pictures than after neutral pictures. See Figure 3 for an example of the results. Picture ratings revealed that appetitive pictures were more pleasing and arousing, and caused more desire than neutral pictures. This second experiment revealed that high approach positive affect narrowed attention relative to a neutral condition.

Relating trait approach motivation to reduced attentional breadth

To provide convergent evidence that approach motivation was responsible for the effects of positive affect manipulations on reduced attentional broadening, Study 3 investigated whether individual differences in approach motivation would relate to attentional responses following appetitive stimuli. Carver and White's (1994) Behavioural Inhibition/Behavioural Activation Sensitivity (BIS/BAS) questionnaire was used to measure trait approach motivation and the Navon letters task was used to measure attentional breadth following appetitive pictures. The BAS scale measures persistent pursuit of desired goals, positive responses to the occurrence or anticipation of reward, and a desire for new rewards and a willingness to approach rewarding events. It has been found to relate to measures of approach motivation such as greater left frontal activation (Harmon-Jones & Allen, 1997), achievement goals (Elliot & Thrash, 2002), and mania (Meyer, Johnson, & Winters, 2001).

The primary results of the previous experiment were replicated: Appetitive stimuli caused a relative narrowing of attention. Moreover, this experiment used two types of appetitive stimuli—pictures of desserts and pictures of cute baby animals. Both appetitive stimuli produced greater

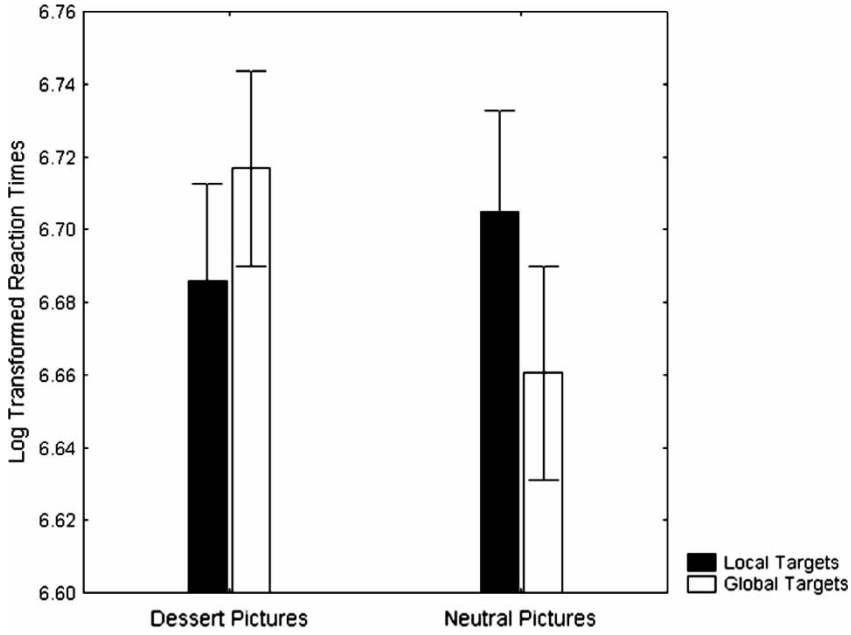

Figure 3. *Mean reaction times for local and global Navon letter targets after appetitive and neutral pictures. Error bars indicate standard errors. These results are representative of the pattern obtained in several experiments; these particular results are from an unpublished figure from results obtained by Harmon-Jones and Gable (2009).*

narrowing than neutral stimuli, thus suggesting that the effects replicate over many types of appetitive stimuli.

In addition, individuals higher in trait approach motivation responded with more narrowed attention following approach-motivating stimuli (controlling for responses to neutral pictures). This study provided convergent evidence supportive of the hypothesis that attentional narrowing caused by appetitive stimuli is due to approach motivation, as individuals high in BAS showed more narrowed attention following appetitive stimuli.

Manipulating approach motivation in high approach positive affect

To test whether approach motivation causes the attentional narrowing following appetitive stimuli, intensity of approach motivation needed to be experimentally manipulated. Study 4 of Gable and Harmon-Jones (2008a) tested this by varying the expectancy to consume desserts viewed in pictures. Past research has suggested that the expectancy to act increases motivational intensity generally (Brehm & Self, 1989) and approach motivation in approach-oriented contexts (Harmon-Jones, Lueck, Fearn, & Harmon-Jones, 2006; Harmon-Jones, Sigelman, Bohlig, & Harmon-Jones, 2003). Participants were: (1) shown dessert pictures and told they could expect to consume them; (2) shown dessert pictures without this expectancy; or (3) shown neutral pictures. Following a block of picture viewing, attentional breadth was measured using the Navon letters task.

Participants who viewed dessert pictures and expected to consume desserts were the most attentionally narrow, followed by participants who simply viewed the dessert pictures, and finally participants who viewed neutral pictures. Participants reported increasingly more excitement and enthusiasm from the neutral to the dessert and then to the expectancy-dessert condition. Results of this study strongly supported the hypothesis that high approach-motivated positive affect causes attentional narrowing.

Left frontal cortical activation, approach-motivated positive affect, and attentional narrowing

In an exploration of the neural underpinnings of the effect of approach-motivated positive affect on attentional narrowing, Harmon-Jones and Gable (2009) investigated whether greater left frontal activation associated with high approach-motivated positive affect would relate to attentional narrowing. The study was predicated on research showing left frontal activation is associated with approach motivation (Harmon-Jones, 2003b), and research showing left hemisphere activation is associated with attentional narrowing (Volberg & Hübner, 2004).

We examined whether neural activations associated with approach motivation would relate to the effect of approach-motivated positive affect on narrowed attention. Neural activation was measured using Electroencephalography (EEG) alpha power, which is inversely related to cortical activity. Also, we examined whether individual differences in approach motivation would relate to attentional narrowing. Results showed that individual differences in approach motivation (time since eaten) related to local attentional bias following appetitive (dessert) pictures. Also, relative left frontal-central activation predicted this local attentional bias.

A subsequent experiment was designed to investigate another possible neurophysiological underpinning of this effect, the late positive potential (LPP). Previous research has suggested that the LPP of the event-related brain potential is increased by emotionally arousing stimuli because of the attention-grabbing nature of such stimuli. Harmon-Jones and Gable (in press–a) suggested that left prefrontal cortical regions are associated with narrowed attention and approach-motivated affect. Integrating these two lines of evidence, Gable and Harmon-Jones (in press-a) examined LPPs to appetitive versus neutral pictures and assessed the relationship of these LPPs to local versus global attentional bias following the picture primes. Results revealed that appetitive as compared to neutral pictures evoked larger LPP amplitudes bilaterally over central and parietal regions and asymmetrically over frontal regions, with greater LPPs over the left than right frontal cortices. Moreover, these LPP amplitudes to appetitive pictures predicted greater locally biased attention caused by the appetitive pictures. These results provide the first evidence that LPPs are associated with the local attentional bias induced by appetitive motivation.

These results demonstrated that greater narrowed attention induced by appetitive stimuli is driven by neurophysiological activations associated with approach-motivational processes. Thus, it suggests approach motivation engages the same neural circuitry that drives local attention in general, and the approach-motivated activation of this circuitry biases local attention even more.

MOTIVATIONAL INTENSITY, POSITIVE AFFECT, AND MEMORY

In addition to attentional processes, emotions influence processes involved in the formation, retrieval, and distortion of memories (Brown & Kulik, 1977; Cahill & McGaugh, 1995; Kensinger, 2009a). Although some research has suggested that positive affect categorically influences these processes differently from neutral or negative affect (Kensinger, 2009a), the previously reviewed findings with attention suggest that motivational intensity of positive affective states may influence memory processes. That is, positive affect varying in motivational intensity may have different influences on memory, an idea that has been recently proposed but not yet directly tested (Kensinger, 2009b; Larson & Steuer, 2009; Levine & Edelstein, 2009).

We predicted that positive affect of varying levels of approach motivational intensity would differentially affect memory for centrally versus peripherally presented information. Specifically, high approach-motivated positive affect, as compared to a neutral state or low approach-motivated positive state, should cause better memory for centrally presented information. In contrast, low approach-motivated positive affect, as compared to a neutral state or high approach-motivated

positive state, should cause better memory for peripherally presented information.

In an examination of the effects of positive affect varying in motivational intensity on memory, Gable and Harmon-Jones (in press-b, Experiment 1) examined memory for stimuli that were presented in the centre or periphery of the visual field. Low and high approach-motivated positive affect were manipulated using the monetary incentive delay paradigm, which has been used in other experiments to create low versus high approach-motivated positive affect or pre- versus post-goal positive affective states (Knutson, Westdorp, Kaiser, & Hommer, 2000; Knutson & Wimmer, 2007). In the task, cues indicating the possibility of gaining money for a subsequent reaction-time task were used to evoke pre-goal (high approach) positive affect. Different cues indicating the outcome of the task performance (i.e., whether a reward was obtained) were used to evoke post-goal (low approach) positive affect. Neutral words were presented either centrally or peripherally after these cues.

After all trials were presented, recognition memory for the words presented in the task along with foil words was measured. Results showed that the high approach-motivated (pre-goal) positive state caused better memory for centrally presented stimuli, as compared to the neutral state. The low approach-motivated (post-goal) positive state, however, caused better memory for peripherally presented stimuli, as compared to the neutral state.

In Experiment 2, the effect was conceptually replicated using pictures of delicious desserts to evoke high approach-motivated positive affect. Appetitive pictures (delicious desserts) caused better memory for centrally presented stimuli than neutral pictures (rocks). Furthermore, peripherally presented stimuli were better remembered after neutral object pictures than after appetitive pictures.

Although the above two experiments were the first to examine the effects of high approach-motivated positive affect on memory, a number of other studies have examined the effects of low approach-motivated positive affect on memory. Consistent with the findings from Gable and Harmon-Jones (in press-b, Experiment 1), low approach-motivated positive affect enhanced recollection of peripheral details (Berntsen, 2002; Storbeck & Clore, 2005; Talarico et al., 2008). For example, participants were more likely to recall false words relating to the overall gist of a list of words when in a pleasant as opposed to a negative mood evoked by music (Storbeck & Clore, 2005). When asked to recall memories, participants in the studies by Berntsen (2002) and Talarico et al. (2008) had better recollection of peripheral details for positive mood events (e.g., feeling happiness or calm) than negative mood events (e.g., feeling angry).

In sum, these results suggest that high approach-motivated positive affect causes a general narrowing of cognitive resources and facilitates memory for centrally presented information. In addition, this cognitive narrowing hindered memory for peripherally presented stimuli. In contrast, low approach-motivated positive affect causes a broadening of cognitive resources, facilitating memory for peripherally, but not centrally presented information.

MOTIVATIONAL INTENSITY, POSITIVE AFFECT, AND COGNITIVE CATEGORISATION

Previous research has indicated that when participants are given a free gift or asked to watch amusing films, manipulations which likely evoke low approach positive affect, they are more likely to think of categories in a broader sense (Isen & Daubman 1984). The motivational dimensional model, however, posits that positive affect varies in approach motivational intensity and that positive affect lower in motivational intensity should broaden cognitive processes, whereas positive affect higher in motivational intensity should narrow cognitive processes. High approach positive affect, therefore, might narrow categorisation. Two recent experiments (Price & Harmon-Jones, 2009) investigated this possibility by having participants respond to cognitive categorisation tasks in three body postures designed to elicit

different levels of approach motivation: (1) reclining backward, which should evoke low approach motivation; (2) sitting upright, which should evoke moderate approach motivation; and (3) leaning forward, which should evoke high approach motivation. Participants smiled while in each posture in order to experience positive affect. Cognitive categorisation was measured as it was in Isen and Daubman (1984): participants rated the extent to which weak exemplars (e.g., camel) fitted into categories (e.g., vehicle). Experiment 1 provided initial support for the idea that high approach positive affect narrows categorisation and low approach positive affect broadens categorisation. Experiment 2 replicated these findings. These results extend previous work by showing that the motivational model's predictions hold for basic attentional processes as well as higher level cognitive processes such as categorisation.

MOTIVATIONAL INTENSITY IN NEGATIVE AFFECT AND ATTENTION

This review has focused on the cognitive consequences of positive affect varying in motivational intensity. Negative affect varies in motivational intensity, with some being higher in motivational intensity (e.g., disgust, fear) and others being lower in motivational intensity (e.g., sadness). Recent evidence provides further support for the motivational dimension model in the domain of negative affect. Below, we review evidence that negative affect varying in motivational intensity has distinct effects on attentional breadth.

Similar to positive affect high in motivational intensity, negative affect high in motivational intensity also causes a general narrowing of attention (Chajut & Algom, 2003; Easterbrook, 1959; Wells & Matthews, 1994). However, not all negative affective states are high in motivational intensity and thus may not cause a narrowing of attentional focus. Similar to the effect of low approach-motivated positive affect on broadened attention, negative affect low in motivational intensity may also cause a broadening of attention. In this section, we refer to negative affect as low or high in motivational intensity without mentioning motivational direction (approach, avoid) because not all negative affect is associated with avoidance (e.g., anger; Carver & Harmon-Jones, 2009).

As noted above, negative affect high in motivational intensity is associated with a narrowing of attention, and these states have been the primary negative states examined in research on negative affect and attentional scope. Early work on affect and attention found that high withdrawal-motivated negative affect narrowed attentional focus (Easterbrook, 1959). Other studies have found attentional narrowing occurs to high withdrawal-motivated affect evoked by social stress (Sanders, Baron, & Moore, 1978), electric shock (Wachtel, 1968), scary novel situations (Weltman & Egstrom, 1966), difficult ego-threatening tasks, and noise stimuli (Chajut & Algom, 2003).

Research investigating the effect of negative affect low in motivation on attentional scope is less abundant, less direct, and primarily correlational. For example, persons with depression tend to be more creative (Andreasen, 1987; Ludwig, 1994) and show broadening of memory (von Hecker & Meiser, 2005). These findings fit with conceptual views of sadness that suggest it occurs following a "failure of major plan or loss of active goal" and that it causes one to "do nothing and/or search for a new plan" (Oatley & Johnson-Laird, 1987, p. 36). In such situations, "a more open, unfocused, unselective, low-effort mode of attention would prove not deficient but, on the contrary, beneficial" (von Hecker & Meiser, 2005, p. 456). This interpretation fits with past views suggesting that disengaging from a terminally blocked goal and becoming open to new and previously irrelevant possibilities might be part of the function of depression and sadness (Klinger, 1975).

Together with our recent research, these ideas and findings about low motivation negative affect suggest that low intensity motivations increase broadening, whereas high intensity motivations (regardless of direction) reduce broadening. However, no direct tests of this hypothesis have been performed. Based on the above reasoning, Gable

and Harmon-Jones (in press-c) predicted that negative affect low in motivational intensity (e.g., sadness) would increase attentional breadth, whereas negative affect high in motivational intensity (e.g., disgust) would decrease attentional breadth.

In Experiment 1, participants viewed unpleasant (sad) pictures low in motivational intensity and neutral pictures. Following each picture, participants responded to a Navon local–global letter. Sad pictures caused relatively more broadening of attention as compared to neutral pictures. Furthermore, sad pictures were rated as more unpleasant but equivalent in arousal to the neutral pictures, consistent with the idea that the sad pictures were low in arousal and thus low in motivational intensity.

Experiment 2 assessed whether the attentional effects observed in Experiment 1 were caused by motivational intensity. Highly motivating negative pictures evoking disgust and neutral pictures were shown, followed by Navon local–global targets. Disgusting pictures caused a relative narrowing of attention as compared to neutral pictures. Furthermore, disgusting pictures were rated as more unpleasant and more arousing than the neutral pictures, consistent with the idea that the disgusting pictures were high in arousal and thus high in motivational intensity. These results extend previous findings by showing that disgust, in addition to fear and anxiety, reduces the breadth of attention.

These studies revealed that low and high motivationally intense negative affective states produce effects on attentional scope similar to those produced by positive affective states low and high in motivational intensity. These results are consistent with the conceptual idea that the influence of affect on local–global precedence is not due to negative versus positive affect, but is instead due to motivational intensity.

SUMMARY AND CONCLUSIONS

Positive affect varies in motivational intensity; some positive affective states are high in motivational intensity, whereas others are lower in motivational intensity. We have shown that these positive affective states have different effects on attentional breadth. Positive affect high in approach motivation causes a narrowing of attentional focus, whereas positive affect low in approach motivation causes a broadening of attentional focus.

The attentional effects predicted by the motivational dimension model are not limited to positive affect, but also apply to negative affect varying in motivational intensity. Negative affect high in motivational intensity narrows attentional focus, whereas negative affect low in motivational intensity broadens attentional focus. Thus, motivational intensity influences affect–cognition interactions across both positive and negative affect.

Increased narrowing vs. decreased broadening

In the seven experiments using the Navon measure of attentional scope, we have found approach-motivated positive affect to slow global reactions (Gable & Harmon-Jones, 2008a, Experiment 3, in press-a; Harmon-Jones & Gable, 2009), or to both slow global and speed local reactions (Gable & Harmon-Jones, 2008a, Experiment 2). Similar effects have also emerged in some past research on motivationally intense negative affect (e.g., Wachtel, 1968; Weltman & Egstrom, 1966). Thus, we suggest that motivational states high in intensity will cause a relatively narrow attentional scope, whereas motivational states low in intensity will cause a relatively broad attentional scope (as revealed by the relative difference between local and global reaction times). In other words, the conceptual idea of narrowing could manifest as faster detection of local information or slower detection of global information. Both manifestations may assist with ultimately mobilising energy toward or away from the significant environmental stimulus.

Narrowing of other cognitive processes

In addition, high approach-motivated positive affect improved memory for centrally presented information, whereas low approach-motivated

positive affect improved memory for peripherally presented information (Gable & Harmon-Jones, in press-b). Also, high approach-motivated positive affect narrowed cognitive categorisation, whereas low approach-motivated positive affect broadened cognitive categorisation (Price & Harmon-Jones, 2009). In conjunction with the studies on attention, these findings indicate that positive affect varying in motivational intensity may cause a general narrowing versus broadening of cognitive processes. This evidence indicates that the motivational dimension model extends beyond attention. Future work should incorporate additional measures of broadening/narrowing.

Affect manipulations

Some readers/theorists may suggest that positive emotions are different from biological pleasures, and that our experiments using dessert primes show that biological pleasures but not positive emotions cause narrowing of cognition. However, our data do not support this interpretation and instead suggest that different positive states have similar effects on attentional/cognitive breadth. Indeed, several of our experiments manipulated appetitive states using dessert pictures, but others have manipulated appetitive states using reward tasks (Gable & Harmon-Jones, in press-b), pictures of cute baby animals (Gable & Harmon-Jones, 2008a, Experiment 3), and body postures and facial expressions (Price & Harmon-Jones, 2009). All of these experiments, regardless of the type of appetitive manipulation used, revealed that appetitive states evoked narrowing of attention and cognition.

Motivation vs. arousal

Consistent with major theories of emotion, we view motivational intensity as being closely related to the arousal level of affective states (Bradley & Lang, 2007). As expected from this line of reasoning, the high-intensity motivation stimuli we used in the reviewed studies evoked strong levels of arousal. In contrast, when low-intensity motivation was evoked, participants also reported low arousal, sometimes equivalent to the arousal reported in response to the neutral stimuli. However, arousal and motivation are not identical. In a recent experiment, the effect of general arousal on attentional narrowing was tested by having participants respond to Navon letters after appetitive and neutral pictures while undergoing stationary physical exercise. Although physical exercise heightened arousal as measured by heart rate relative to a no-exercise state, the increased arousal level did not cause narrowing of attention (Harmon-Jones, Gable, & Hobbs, 2009).

Fredrickson and Branigan (2005) manipulated amusement, a state believed to be high in arousal or a "higher activation state" (p. 326), but we would suggest that it is low in motivational intensity. Relative to a neutral state, this higher activation positive affect caused attentional broadening and was similar to attentional broadening caused by contentment, a low-arousal low-motivational state. Later, Talarico et al. (2008) investigated peripheral memory for autobiographical memories associated with discrete positive emotions believed to be high in arousal (e.g., happiness and love) and low in arousal (e.g., calm). There were no differences in peripheral memory recall between high arousal positive emotions (happiness and love) and low arousal positive emotion (calm). In both of these studies, however, arousal was not measured. We would posit that these states are low in approach motivation, because they were not associated with strong urges to act.

Implications

Attentional narrowing in high-approach or high-withdrawal states may prove adaptive. In a high-approach positive state, narrowed attentional focus likely assists in helping an organism to zero-in on obtaining the desired object or goal. Shutting-out irrelevant cognitions and focusing on the desired goal would help to promote pre-goal target-directed action. Likewise, in a motivationally intense negative state, a narrowed attentional focus would assist in helping an organism to assess and avoid a frightening or disgusting object or situation. In both examples,

incorporating distracting peripheral information could hinder goal acquisition or avoidance and could prove to be dysfunctional.

Attentional broadening in low-intensity affective states might serve a less-specific function and may not be associated with the acquisition or avoidance of a specific goal or action orientation. In a low approach positive state, a broadened attentional focus incorporating a wider array of environmental cues may facilitate exploratory or playful behaviours that could lead to more creative or alternative approaches (Fredrickson, 2001). Low approach positive affect may also induce an organism to "ease back" (Carver, 2003, p. 246) in order to conserve energy and resources following successful pre-goal pursuit. Carver (2003) predicted that, "people who exceed the criterion rate of progress (i.e., who have positive feelings) will reduce the subsequent effort in this domain" (p. 246). The affect in such a situation is likely low in motivational intensity and is related to part of the goal (i.e., the criterion rate) having been achieved. That is, although the overall goal might not be achieved, the affect is low in motivational intensity and partially post-goal because the goal has been partially accomplished. Likewise, the increase of attentional breadth occurring with low intensity negative affect may cause an indiscriminate and low-effort focus of attention (von Hecker & Meiser, 2005). This may help one to disengage from a failed goal and encourage creative and novel solutions (Klinger, 1975). Low motivationally intense negative affect may also encourage resource conservation in the face of a terminally blocked goal.

Taken together, the research reviewed herein indicates a consistent pattern among both positive and negative affect along the lines of motivational intensity. Affect high in motivational intensity causes a general narrowing of cognitive processes, whereas affect low in motivational intensity causes a general broadening of cognitive processes. These results are consistent with the conceptual idea that the influence of affect on local/global precedence is not due to negative versus positive affect, but is instead due to motivational intensity. That is, positive and negative affect of low motivational intensity broadens attention, whereas positive and negative affect of high motivational intensity narrows attention. This evidence and its conceptual framework, the motivational dimension model, integrates previous research and theory, and thus leads to an increased understanding of the influence of affective states on cognitive broadening/narrowing

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