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COMMENT

Toward an Understanding of the Influence of Affective States on Attentional Tuning: Comment on Friedman and Förster (2010)

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Friedman and Förster (2010) reviewed an extensive program of research that was consistent with the view that positive affective states broaden, whereas negative affective states narrow, the scope of attention. We applaud their creative investigations into these important psychological questions and appreciate their thorough review. However, recent evidence strongly suggests that the conclusions drawn by Friedman and Förster need to be tempered, for the recent evidence suggests that motivational intensity rather than affective valence causes the modulations of attentional tuning. That is, affective states of low motivational intensity (e.g., sadness, postgoal positive affect) broaden attention, whereas affective states of high motivational intensity (e.g., disgust, pregoal positive affect) narrow attention. Our viewpoint is that attentional narrowing occurs during affective states of high motivational intensity to aid organisms in acquiring desirable objects and avoiding aversive ones. Attentional broadening occurs during affective states of low motivational intensity to open organisms to new opportunities.

Keywords: attentional tuning, local–global attention, approach motivation, positive affect

Friedman and Förster (2010) have provided an excellent review of research on implicit affective cues' influence on attentional tuning. On the basis of their review, they suggested that implicit benign situation cues broaden and threatening situation cues narrow the scope of attention. By benign situation cues, they meant arousing positive emotional states, and by threatening situation cues, they meant arousing negative emotional states. The conclusion drawn from their review is consistent with much past research on explicit affect (see reviews by Easterbrook, 1959; Fredrickson, 2001).

In contrast to the views that positive affective states broaden and negative affective states narrow attentional precedence, we have theorized that the influence of affective states on attentional precedence should not depend on the positivity or negativity of the affective state but should instead depend on the motivational intensity of the affective state (Harmon-Jones & Gable, 2008). The narrowing of attention during motivationally intense affective states may exist because it is functional. Attentionally zeroing in on the object of desire (or aversion) probably assists in successfully acquiring (or avoiding) the object. Having a broadened attentional scope during low motivationally intense affective states may also prove functional, as individuals are open to new opportunities after goal accomplishment in positive affective states of low motivational intensity (e.g., contentment) or after the goal is lost in negative affective states of low motivational intensity (e.g., sadness).

Friedman and Förster (2010) reviewed two of our published empirical articles that have questioned whether positive affect broadens and negative affect narrows attentional precedence (Gable & Harmon-Jones, 2008; Harmon-Jones & Gable, 2009). They asked a number of important questions about the implications of those two articles, questions that we have addressed in recent research. We briefly review this recent work below.

Unconfounding Affective Valence and Motivational Intensity

On the basis of a review of the literature, we suggested that most prior research on the link between affective states and attentional precedence examined positive affective states low in motivational intensity (amusement) and negative affective states high in motivational intensity (fear), thus confounding affective valence with motivational intensity (Harmon-Jones & Gable, 2008). For example, research on positive affect and attentional broadening evoked positive affect using gifts (Isen & Daubman, 1984), recall of past positive events (Gasper & Clore, 2002), or film clips of humorous

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or satisfying events (Fredrickson & Branigan, 2005). The positive affective state created by these manipulations was likely to be one associated with low approach motivation, as the individuals experiencing these states were not in goal pursuit. Positive affective states, however, can be associated with higher levels of approach motivation, as when individuals actively pursue obtainable, desirable goals. This distinction between low and high approach-motivated positive affect, which we view as a continuous variable, is similar to other theoretical conceptions that treat low versus high approach motivation as a categorical variable.

By approach motivation, we mean the impulse to move toward a stimulus. Our conception of a high-approach positive affective state is similar to the SEEKING system proposed by Panksepp (1998), whereas a low-approach affective state is similar to the PLAY system also discussed by Panksepp (1998). Panksepp (1998) posited that the PLAY system "may help animals project their behavioral potentials joyously to the very perimeter of their knowledge and social realities" (p. 283). In contrast, the SEEKING system "leads organisms to eagerly pursue the fruits of their environment" (p. 145). In effect, the PLAY system seems linked to attentional broadening, whereas the SEEKING system seems linked to attentional narrowing.

Other researchers have discussed appetitive or pregoal positive states as being different from consummatory or postgoal positive states (Knutson & Wimmer, 2007) or have discussed wanting as being different from liking (Berridge, 2007). 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). Seeking, pregoal, high approach-motivated positive affective states may have emerged to assist in promoting reward acquisition, whereas playful, postgoal, low approach-motivated positive affective states may have emerged to assist in promoting openness to new opportunities.

We began our program of research by examining this distinction in positive affective states for attentional tuning or precedence. Our first experiment compared the effects of low approach-motivated positive affect with high approach-motivated positive affect on attentional precedence (Gable & Harmon-Jones, 2008, Experiment 1). These states were manipulated with film clips of funny cats versus desserts, respectively. Self-report manipulation checks revealed that the funny cats evoked more amusement than the desserts, whereas the desserts evoked more desire than did the funny cats. Both film clips evoked high levels of general positive affect (e.g., happiness), and the two conditions did not differ from one another on general positive affect. In addition, both film clips evoked low levels of negative affect (e.g., anger, anxiety, fear, sadness), and the two conditions did not differ from each other on negative affect. Most important, the dessert film clip (high approach positive affect) caused more narrowing of attention than did the funny cats film clip (low approach positive affect).

Subsequent experiments revealed that dessert pictures evoked more narrowing of attention than did neutral pictures (Gable & Harmon-Jones, 2008, Experiment 2); that cute baby animal pictures evoked more narrowing of attention than did neutral pictures (Gable & Harmon-Jones, 2008, Experiment 3); that individuals who scored higher in trait approach motivation showed even more narrowing of attention following dessert pictures and cute baby animal pictures (Gable & Harmon-Jones, 2008, Experiment 3); and that increasing approach motivation by causing individuals to believe they would get to eat desserts following the experiment caused even more narrowing of attention (Gable & Harmon-Jones, 2008, Experiment 4).

Considering Appetitive Versus Consummatory Positive Affective States

In discussing Gable and Harmon-Jones (2008), Friedman and Förster (2010) wrote, "it will be important to examine whether implicit affective cues predominantly associated with the desire to attain rewards, rather than with anticipated or actual reward attainment, engender a narrower, as opposed to broader, scope of attentional selection" (p. 883). We have recently published evidence that bears on this issue (Gable & Harmon-Jones, 2010d). In one experiment, we manipulated "desire to attain rewards" using the pregoal positive affect manipulation created by Knutson and colleagues, and in the same experiment, manipulated "actual reward attainment" using the postgoal positive affect manipulation created by Knutson and colleagues (e.g., Cooper, Hollon, Wimmer, & Knutson, 2009; Knutson & Greer, 2008; Knutson, Westdorp, Kaiser, & Hommer, 2000; Knutson & Wimmer, 2007). These manipulations occur 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 (i.e., whether a reward was obtained) are used to evoke postgoal (low approach) positive affect.

In our experiment, we measured attentional narrowing/broadening 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. We found that memory for centrally presented words was better following the pregoal positive affect cues than after postgoal positive affect cues. In contrast, memory for peripherally presented words was better following the postgoal positive affect cues than after pregoal positive affect cues. We have since conceptually replicated these results using the Navon (1977) local/global attentional precedence task (Gable & Harmon-Jones, 2010a).

Perceptual Versus Conceptual Processing

In further discussing our 2008 article, Friedman and Förster (2010) questioned whether "the effects of appetitive positive states on conceptual attention mirror their effects on perceptual attention" (p. 883). Recently, we found evidence suggesting that appetitive positive affective states also influence conceptual attention (Price & Harmon-Jones, 2010b). In this experiment, we measured narrowing/broadening of conceptual attention using Isen and Daubman's (1984) cognitive categorization task. We manipulated high approach (appetitive) and low approach (consummatory) positive states using an embodiment manipulation. Participants in the high approach positive condition were instructed to smile and lean forward in a chair, similar to how one might lean toward delicious food. Participants in the low approach positive condition were instructed to smile and recline backward in a reclining chair, similar to how one might recline once the delicious food has been eaten. While in these postures, participants completed the categorization task, which involves rating the extent to which weakly

associated exemplars (camel) of a particular category (vehicle) fit within that category. Consistent with predictions, participants in the high approach positive condition categorized more narrowly, indicating that the exemplars did not belong to the category. In contrast, participants in the low approach positive condition categorized more broadly, indicating that the exemplars belonged to the category. These results were replicated in a second experiment. Together, they lend credence to Friedman and Förster's (2010) speculation that "whereas consummatory positive emotion expands access to cognitive material with low a priori accessibility and bolsters creativity, appetitive positive affect may choke off access to remote associates" (p. 883). Moreover, our results demonstrate that the effects of low versus high approach motivated positive affect influence attention in opposite directions even when these affective states are implicit. That is, these body postures do not influence self-reported emotional experience but do influence psychophysiological measures of affective states (Price & Harmon-Jones, 2010a).

On the Roles of Relative Hemispheric Activation in Affect and Attentional Tuning

Regarding the connection between relative hemispheric activation, emotional states, and attentional tuning, Friedman and Förster (2010) reviewed evidence suggesting that the right hemisphere is specialized for processing global structure, whereas the left hemisphere is specialized for processing local structure. They then reviewed evidence from their labs that suggested that benign cues activate the right hemisphere, whereas threatening cues activate the left hemisphere. To measure hemispheric activation, they used line bisection tasks and occasionally chimeric faces tasks. The section on relative hemispheric activation presented several inconsistent results, leaving the authors to conclude that "barring resolution of empirical discrepancies, one or more of the foregoing propositions regarding the connection between benign and threatening situation cues, lateralized activity, and attentional tuning will have to fall by the wayside" (p. 886).

In this review of lateralized activity, emotion, and attentional tuning, Friedman and Förster (2010) did not discuss the results of Harmon-Jones and Gable (2009), which are consistent with our conceptual analysis. Moreover, we have since published a conceptual replication of Harmon-Jones and Gable (2009) using a different measure of hemispheric activity that may shed additional light on the connection between lateralized activity, emotion, and attentional tuning (Gable & Harmon-Jones, 2010b).

In our first experiment, we measured EEG alpha power and found that neural activation associated with approach motivation, relatively greater left than right frontal cortical activity, to the dessert pictures (but not to the neutral pictures) predicted attentional narrowing immediately following the dessert picture primes (Harmon-Jones & Gable, 2009). These results further support our conceptual model that positive affective states high in approach motivational intensity narrow the scope of attention, as much past research has linked greater relative left frontal cortical activity to approach motivation (Coan & Allen, 2004; Harmon-Jones, Gable, & Peterson, 2010). Gable and Harmon-Jones (2010b) conceptually replicated these results using event-related brain potentials (ERPs), specifically the late positive potential of the ERP. Moreover, these results fit with previous research showing that local attentional processes occur in the left hemisphere (Volberg & Hübner, 2004).

The empirical inconsistencies noted by Friedman and Förster (2010) may have to do with the measurement of lateralized activity. The research reviewed by Friedman and Förster (2010) used the line bisection task and the chimeric faces tasks, which are visual judgment tasks that provide indirect measures of hemispheric dominance. Importantly, performance on the line bisection task does not correlate with performance on the chimeric faces tasks (Luh, 1995), suggesting that these tasks are tapping different psychophysiological processes. Moreover, several studies suggest that the right inferior parietal lobe is critical for performance on the line bisection task (Mort et al., 2003; Verdon, Schwartz, Lovblad, Hauert, & Vuilleumier, 2010), the task most often used in the reviewed studies of Friedman and Förster (2010). The connection of activity in this cortical region with motivational or emotional variables has not received much theoretical or empirical attention, suggesting that these cortical regions are not directly involved in the effect of emotive states on attentional tuning. EEG and ERP measures, on the other hand, provide more direct evidence of lateralized cortical activity (though not without limitations), and the results obtained with EEG and ERP measures regarding the effect of emotive states on attentional tuning fit well with a broader literature supporting the role of relative left frontal cortical activity in approach motivational processes (Carver & Harmon-Jones, 2009; Davidson, Jackson, & Kalin, 2000).

Comparing Negative Affective States Differing in Motivational Intensity

Throughout most of their article, Friedman and Förster (2010) stated, like many past theorists (e.g., Fredrickson, 2001), that positive affect broadens attention and negative affect narrows attention. As reviewed above, our recent research with positive affect suggests that the motivational intensity associated with the positive affect is critical in determining whether positive affect causes broadening or narrowing of attention. Recently, we tested our motivational analysis with negative affect (Gable & Harmon-Jones, 2010c) by manipulating negative affective states that vary in motivational intensity. That is, sadness-inducing pictorial stimuli were used to create a low motivationally intense negative affective state, whereas disgust-inducing pictorial stimuli were used to create a high motivationally intense negative affective state. Both sad and disgust pictures evoked intense self-reported negative affect, but the sad pictures evoked lower self-reported arousal than the disgust pictures. This latter finding suggests that the disgust pictures evoked higher motivational intensity than the sadness pictures, consistent with the idea that self-rated arousal is a proxy for motivational intensity (Bradley & Lang, 2007). Attentional precedence was measured using the Navon (1977) local–global precedence test. Results indicated that compared with neutral pictures, sad pictures caused a broadening of attention, whereas disgust pictures caused a narrowing of attention.

Future research is needed to investigate the relationships of hemispheric activity, negative affective states varying in motivational intensity, and attentional precedence. The right hemisphere appears to process information more globally than does the left hemisphere (Volberg & Hübner, 2004), but the right frontal cortex appears to be more involved than the left frontal cortex in with-

drawal emotive states (Coan & Allen, 2004). These pieces of evidence do not suggest a simple relationship between withdrawal emotive states (e.g., fear), right hemispheric activity, and attentional precedence, as an intense withdrawal emotive state such as fear should increase right frontal cortical activity but not global attentional processing, which is presumably due to right hemispheric processing.

In reconciling the results from Gable and Harmon-Jones (2008) with their own results, Friedman and Förster (2010) suggested that their positive affect manipulations all may have evoked a consummatory state, whereas our low approach positive affect manipulations evoked a consummatory state and our high approach positive affect manipulations evoked an appetitive state. We completely agree with this interpretation and offered a similar one in our previous article (Gable & Harmon-Jones, 2008). However, the recent results obtained with negative affective states that vary in motivational intensity suggest the need for a broader concept, one that accounts for both positive and negative affective states. We refer to this concept as motivational intensity.

Affective States, Arousal, and Motivational Intensity

Friedman and Förster (2010) suggested that the implicit affective cues used in their reviewed research evoke arousing positive and arousing negative states (though they presented no evidence for the arousing nature of these states). However, later in the review, when incorporating our 2008 results into their review, they suggested that the cheese maze and arm flexion movements may be cues associated with consummatory rather than appetitive responses. We suspect that these implicit cues related to consumption elicit lower arousal than the implicit cues used to evoke negative affective states (e.g., owl maze, arm extension). If arousal is related to motivational intensity, as prominent theories suggest (Bradley & Lang, 2007), then our conceptual model can explain the results reviewed in Friedman and Förster.

However, whereas we suspect that arousal may be associated with motivational intensity in most cases, we believe that there are instances where the two are separable. We tested this idea in one recent experiment (Harmon-Jones, Gable, & Hobbs, 2010). Participants were randomly assigned to pedal a stationary bike exerciser or not while performing the appetitive versus neutral picture/attentional precedence task used in Gable and Harmon-Jones (2008, Experiment 2). Pedaling was used to manipulate arousal, and results indicated that individuals who pedaled had faster heart rates than individuals who did not. Most importantly, however, the manipulated arousal had no effect on attentional precedence. Thus, motivational intensity, rather than arousal per se, appears to be the variable most related to attentional narrowing.

Conclusion

Taken together, these recent results suggest an important refinement of the hypothesis that benign situation cues (positive affect) broaden and threatening situation cues (negative affect) narrow the scope of attention. Instead, recent research suggests that affective states low in motivational intensity broaden and affective states high in motivational intensity narrow the scope of attention. Low motivationally intense positive affective states are certainly benign, but we doubt that low motivationally intense negative affective states (e.g., sadness, which also causes broadening of attention) are benign. Similarly, high motivationally intense negative affective states are threatening, but high motivationally intense positive affective states (e.g., desire, which causes narrowing of attention) are not. Instead, motivationally intense positive affective states feel good and are not rated as threatening (Gable & Harmon-Jones, 2008).

Friedman and Förster (2010) reviewed an extensive program of research that was consistent with the view that positive affective states broaden, whereas negative affective states narrow the scope of attention. We applaud their creative investigations into these important psychological questions and appreciate their thorough review. However, recent evidence strongly suggests that the conclusions drawn by Friedman and Förster need to be tempered, for the recent evidence suggests that motivational intensity rather than affective valence causes the modulations of attentional tuning.

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