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What is it about positive affect that alters attentional scope?

Micayla F Lacey[1], Ricardo A Wilhelm[1] and Philip A Gable[2]

The relationship between positive affect and attentional scope has been of interest for over forty years. Historically, most work has focuses on the relationship of negative affect and attentional scope. For this reason, this article reviews literature on the relationship between positive affect and attentional scope. Many studies have discovered divergent findings of the influence of positive affect on attentional scope, such that some research suggests that all positive affect broadens attentional scope, while other research has found evidence that some positive affects may instead narrow attentional scope. In the current review, we discuss these discrepancies, examine behavioral and physiological evidence, and provide suggestions for incorporating these contrasting findings into one coherent perspective.

Addresses
[1] Department of Psychology. The University of Alabama, United States

[2] Department of Psychological and Brain Sciences, University of Delaware, United States

Corresponding author: Gable, Philip A (pagable@gmail.com)

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In recent years, researchers have asked a variety of questions regarding how positive affect relates to other psychological processes. One area in which there has been divergent findings is in research examining the relationship between positive affect and attentional scope [1]. Despite the use of seemingly similar methodologies, discrepancies in empirical findings suggest that it may be more than positive affect alone that influences attentional scope [2,3]. In the current article, we briefly review research supporting some of the theoretical models offering explanations for how positive affect alters the scope of attention. Before reviewing this research, however, we find it necessary to define positive affect and attentional scope.

Emotions are complex phenomena comprising multiple components such as feeling states, action systems, and processes that organize cognition and behavior. This is not an exhaustive list (see Ref. [4] for a more comprehensive definition) and many constructs of emotion may not be observed or present in every emotional situation. We use the term positive affect in this article to encompass both emotion and mood, because past research has found that positive moods and positive emotions have identical effects on attentional scope. Some of the most important components of emotions are affective valence, arousal, and motivational direction. Affective valence refers to how positive (pleasant) or negative (unpleasant) an organism experiences the feeling. Positive affects are generally considered approach-motivated, but this may not be the case for all positive affects. Motivational direction refers to the impetus to move towards or away, and can vary in intensity, or strength of drive (see Ref. [5] for review). Attentional scope is similar to cognitive breadth and reflects a disposition towards certain types of information acquisition. Quickly or consistently attending to centrally versus peripherally presented information, for example, is associated with a narrowed (versus broadened) attentional scope [6]. Attentional scope is frequently assessed through breadth of attentional processing, whether one has a more global (broad) or local (narrow) attentional scope. Attentional scope has also been associated with cognitive control and flexibility, such that increased flexibility may be associated with broadened attentional scope [5] and proactive control, may be associated with narrowed attentional scope [7].

Valence-based models of attentional scope

Initial inquiry into the influence of positive affect on cognitive scope focused on comparing positive and negative affects, thus suggesting positive valence was the mechanism influencing emotion-attention interaction. This approach led to theory-formulation and research that positive affects lead to a cognitive expansion of creativity, and categorization [8], and to more direct tests of how positive affect influences attentional scope [9,10]. Presumably, the experience of positive valence causes an individual to attend to broad (global) elements, rather than narrow (local elements). Functionally, broadening may enable faster identification and more inclusive information processing of holistic or global details within the environment [10]. This may help facilitate exploration of new opportunities or detection of new information [11,12].

A number of experimental studies have found evidence that some positive affects increase the breadth of attention (see Ref. [13] for review). These studies utilize a variety of methods to measure participants' attentional scope, including measuring reaction times to congruent or incongruent flankers, measuring reaction times in letter processing between small and large targets, and asking participants to make similarity judgments between a target and standard figures matched on either local or global elements [13]. Additionally, positive affect influences control of the allocation of resources for control processing [14]. This work frequently distinguishes between reactive and proactive control processing. There is potential evidence that positive affect could also influence the simultaneous or independent activation of these cognitive control processes [15]. This is notable as some recent work has conceptually associated attentional scope with proactive control processes [16,13].

Positive affect may increase thought-action repertoires by enabling cognitive flexibility (e.g. task/goal switching), which is closely associated with broadened attentional scope [17, see Ref. 7] and distractibility (e.g. temporarily attending to new information; [11,18]). Moreover, the relationship between broadened scope of attention and positive affect may be bidirectional [19,20], suggesting a close link between positive affect and attentional scope. Manipulating attentional scope may even help facilitate the recognition of positive affect [21], though support for this is mixed [22].

Despite some promising early findings, not all research examining positive affects has found similar patterns of attentional broadening, and contradictory and null effects have been observed [2,13]. Early work on affect and attentional scope has focused almost exclusively on comparing positive and negative valence, resulting in past work investigating a limited number of positive affects and situational circumstances [18]. Most importantly, this past work has only examined the valence dimension of positive affect, ignoring the dimension of motivation inherent in positive affect.

Motivation-based model of attentional scope

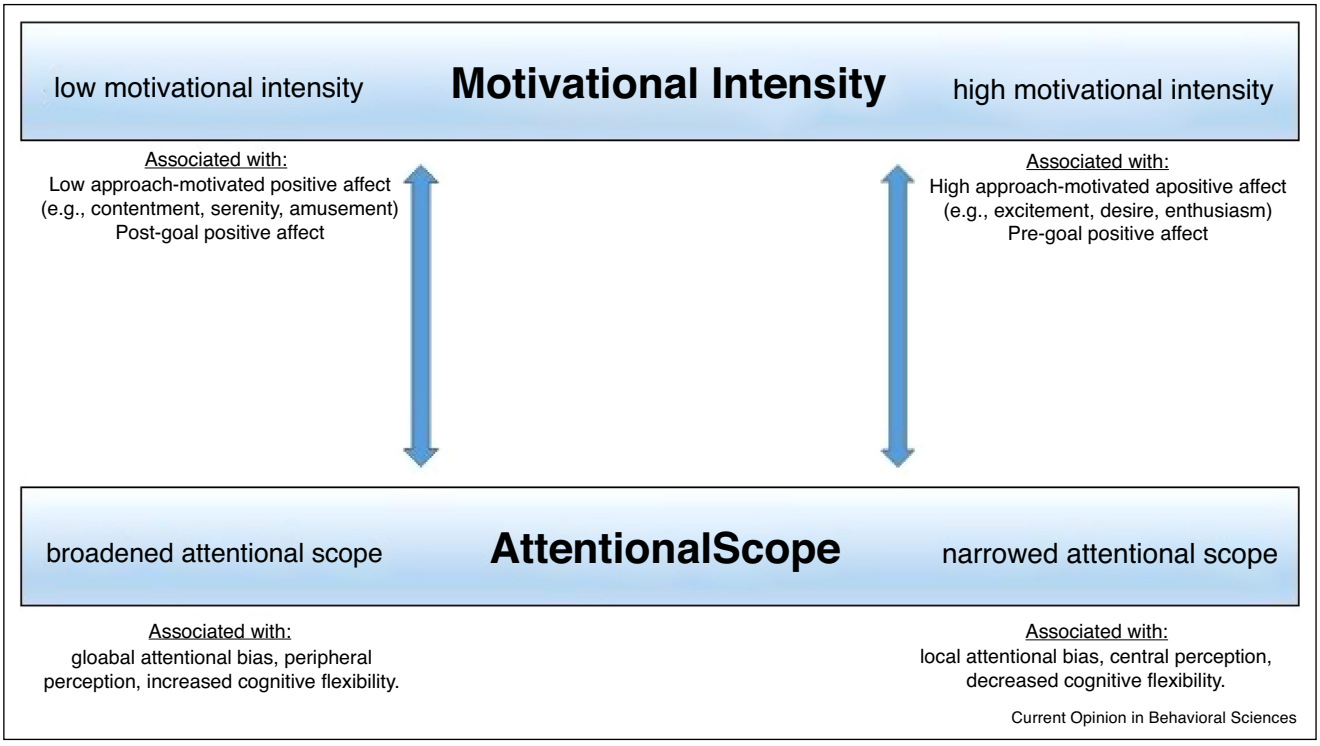
The motivational dimension of affect is a critical component to examine when studying positive affect, as positive affects vary in their strength of motivation. Positive affect can be low in motivational intensity (e.g. amusement) or high in motivational intensity (e.g. desire). The motivational dimensional model of affect (MDM; [2]) posits that positive affects low in motivational intensity will broaden attentional scope, while positive affects high in motivational intensity will narrow attentional scope (see Figure 1). Importantly, it is thought that motivational intensity may broaden or narrow attention independent of affective valence. Functionally, it is hypothesized that the narrowing of attentional scope in response to positive affects high in motivational intensity facilitates goal or target acquisition [23,24]. For example, desire and interest are both positive affective states high in motivational intensity, and have been related to narrowed attentional scope [25,26]. Since this model was first proposed [2], these findings have been supported by dozens of direct and conceptual replications [27,28••]. Below, we review recent behavioral and neural evidence revealing the critical role of motivational intensity in positive affect and attentional scope interaction.

Motivational intensity may be manipulated in a variety of ways. One of the most frequently used manipulations is presenting participants with affective images [27,29••] or videos [25] that vary in motivational intensity. Researchers have also manipulated motivational intensity during positive affect by using pre-goal reward anticipation (high approach-motivated positive affect) and post-goal reward attainment (low approach-motivated positive affect) [28••,30]. Recent work has found that outperforming others on a difficult task evokes high intensity approach motivation, even without extrinsic rewards [31].

The Navon [32] letter task is one of the most widely used measures of attentional scope. This task incorporates hierarchical stimuli where small letters (local targets) comprise a larger letter (global target). Faster identification of local (vs. global) targets, indicates a more narrowed attentional scope. Noguchi and Tomoike [33], sought to assess whether high approach motivation positive affect would narrow attention relative to a neutral non-biased state. High approach-motivated positive affect pictures (e.g. desserts) narrowed attentional scope relative to a neutral state. Similarly, research utilizing other measures of attentional scope has also found positive affects high in approach motivation narrow attention. For example, in the Kimchi and Palmer [34] local-global task, participants must decide which of two comparison sets of geometric shapes best match a standard set of geometric shapes. One comparison set matches the standard on local elements, while the other comparison set matches the standard on global elements. Gable and Harmon-Jones [25] found that participants experiencing positive affect high in motivational intensity (desire) were more likely to match shapes on a local (rather than global) level when compared to participants experiencing positive affect low in motivational intensity (amusement). Other recent research has used eye gaze as a measure of attentional focus. Approach-motivating images of cute baby animals increased task precision and eye gaze relative to adult animals [35•]. Similarly, viewing images of alcohol or chocolate with the expectancy of acquiring (versus no expectancy of acquiring) the object increases attentional gaze [36•].

Some research has sought to test whether the relationship between motivational intensity and attentional scope is

Figure 1



The motivational dimensional model of affect posits that positive affects low in motivational intensity broaden attentional scope, while positive affects high in motivational intensity narrow attentional scope. Importantly, research suggests that this relationship is bidirectional, and that attentional scope may also influence motivational intensity.

bi-directional through a process validated by recent research [38]. Narrowing attentional scope in individuals increases approach motivation to positive stimuli [37]. Kotynski and Demaree [39] manipulated participants to have a narrowed scope of attention and then measured their approach tendencies and subjective feelings of desire towards appetitive or neutral images. Participants with a narrowed attentional scope exhibited increased approach motivation toward appetitive images without reporting increased desire, suggesting that attentional scope can influence motivational intensity, irrespective of affective valence.

Neural correlates of attentional scope

Recent evidence has also examined the underlying psychophysiological processes linking positive affect and attentional scope. Recent electroencephalography (EEG) work has found positive affects enhance event-related potential (ERP) components associated with motivated attentional processing [40,14]. Approach-motivated positive affect is associated with increased P3 amplitudes [40,41], and increased Late Positive Potential (LPP) amplitudes [42,43], ERP components which are indicative of sustained attentional processing. This work has also been supported by fMRI data showing that positive affects activate corticostriatal and paralimbic regions during high approach motivation, suggesting neural regions associated with reward anticipation, motivation to obtain the reward, and attentional focus are enhanced by approach-motivation [44].

Research has also linked EEG frequencies with motivational intensity and attentional scope [42,43]. Research on greater relative left frontal cortical activation, a correlate of approach motivation, suggests greater relative left frontal activation is related to attentional narrowing to positive cues high in motivational intensity [45,46]. Additionally, suppression of beta activity over the pre-motor cortex, a neural correlate of approach-motivated motor preparation, during high approach-motivated positive states (versus neutral states) relates to greater attentional narrowing [47,29••], indicating that participants may have a more narrowed attentional scope when preparing for approach-motivated motor movement. This is consistent with the theory that a narrowed attentional scope facilitates goal achievement by preparing an organism to act.

Conclusions

Recent research has demonstrated a strong relationship between positive affect and attentional scope. Prior

reviews and research examining positive affects low in motivational intensity have found that positive affect broadens attentional scope, however, much of this work has failed to examine how motivational intensity may influence the interaction between affect and attention. Here, we provide an updated review of the literature investigating the relationship between positive affect and attentional scope. Much research has revealed that motivational intensity in positive affect is a key mechanism of change in attentional scope [8]. Considering positive affect without the motivational dimension provides an incomplete understanding of how positive affect relates to attentional scope. This body of research suggests the relationship between positive affect and attentional scope appears to be dependent on motivational intensity.

The motivational dimensional model of affect provides a framework for incorporating these seemingly disparate research findings on positive affect and attentional scope into a cohesive understanding of how positive affects influence our breadth of attention. Positive affect does not influence attentional scope in only one way. Instead, positive affect and motivational intensity interact to influence breadth of attention. Experiencing affects low in motivational intensity encourages attentional broadening [9], while experiencing affects high in motivational intensity encourages attentional narrowing [2]. Indeed, motivational intensity and positive affect may interact in even more complex ways to influence cognitive scope [48•].

Assessing motivational intensity is important to consider in studies examining positive affect. A growing body of research suggests that narrowed attentional scope may serve as an indicator of high approach-motivational intensity in positive states. In contrast, broadened attentional scope may serve as an indicator of low approach-motivational intensity in positive states. Assessing attentional scope would be especially important when self-reports fail to accurately capture motivational intensity. Physiological correlates of approach motivation can also aid measurement of motivational intensity when individuals do not, or cannot accurately report motivational states. In summary, the current evidence suggests a multi-method approach investigating self-report, neurophysiology, and attentional scope may more fully assess dimensions of motivational intensity in positive affect.

Considering dimensions of motivational intensity within positive affects is important when examining attentional scope, and also cognitive scope more broadly [7]. The study of emotion-cognition interaction will benefit from examining the critical role of motivation within affective space. Importantly, attentional scope is a cognitive mechanism that may influence behavior. Understanding how motivational intensity affects attentional breadth may be important for understanding behavioral outcomes resulting from positive affect. A closer investigation of dimensional and discrete components of positive affect will lead to more precise predictions of positive affect on cognition and behavior ([49; see also Ref. 50]).

Conflict of interest statement

Nothing declared.

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