

Corresponding author:  
June Gruber, Ph.D.  
Assistant Professor  
Yale University, Department of Psychology  
P.O. Box 208205  
New Haven, CT 06520  
Phone: 203-432-9257  
Fax: 203-432-7172  
Email: [june.gruber@yale.edu](mailto:june.gruber@yale.edu)  
Word count: 2,476

RUNNING HEAD: POSITIVE EMOTION PERSISTENCE

When Feeling Good Can Be Bad:  
Positive Emotion Persistence (PEP) in Bipolar Disorder

June Gruber<sup>1</sup>

Yale University, Department of Psychology

In press, *Current Directions in Psychological Science*

**ABSTRACT**

Positive emotions are vital to attaining important goals, nurturing social bonds, and promoting cognitive flexibility. However, one question remains relatively untouched – can positive emotions also be bad, or a source of dysfunction and negative outcomes? An ideal point of entry to understand how positive emotion can go awry is bipolar disorder, a psychiatric disorder marked by abnormally elevated positive emotion. This review provides an overview of recent experimental evidence among individuals at risk for, and diagnosed with, bipolar disorder. A novel account of positive emotion disturbance in bipolar disorder is presented, referred to as Positive Emotion Persistence (PEP), and potential mechanisms are considered. The central thesis guiding PEP is that persistent activation of positive emotion across contexts and not solely in response to positive or rewarding stimuli is a marker of emotion dysfunction in bipolar disorder. Implications are discussed for the study of bipolar disorder and positive emotion generally. (Word count: 149)

**KEYWORDS:** bipolar disorder; mania; positive emotion, happiness

*“When you’re high it’s tremendous...feelings of ease, intensity, power, well-being, financial omnipotence, and euphoria pervade one’s marrow”* (Jamison, 2004, p. 67).

Work in affective science reveals critical insights regarding associated dysfunctions of negative emotions like sadness in major depression and fear in anxiety disorders. However, research has failed to delineate dysfunctions associated with positive emotion. Can feeling too good also be bad? In other words, can an extreme degree of pleasant feelings lead to suffering or dysfunction in daily life? An ideal point of entry to explore how positive emotion might go awry is bipolar disorder (BD), also referred to as manic-depressive illness. BD is a severe and chronic psychiatric disorder, and is ranked as one of the top 10 leading causes of worldwide disability. Identifying factors to understand this pernicious disorder are crucial. Both qualitative accounts (e.g., Jamison, 2004) and diagnostic criteria (American Psychiatric Association, 2000) for BD centrally feature abnormally elevated or positive mood during periods of mania, which also includes racing thoughts, increased self-confidence, and decreased sleep. BD thus provides a rich context to explore positive emotion disturbance.

In this paper, I first describe a novel account of positive emotion disturbance in BD, referred to as Positive Emotion Persistence (PEP) along three dimensions regarding the degree, type, and context of positive emotion disturbance. I also discuss the relation of PEP to existing theories of emotion dysfunction. Second, I consider potential driving and maintaining mechanisms that might initiate and maintain PEP. Third, I discuss future directions and implications for BD and positive emotion.

### **POSITIVE EMOTION PERSISTENCE (PEP)**

An emotion is defined as a brief response to salient environmental events that includes changes in subjective experience, behavior, and physiology (Watson, 2000).

Emerging work using a variety of methodological approaches converges on the claim that people at risk for, and diagnosed with, BD exhibit heightened positive emotion responses (Johnson, Gruber, & Eisner, 2007). However, there is a need for an integrated model synthesizing this literature and elucidating potential mechanisms. Such a model yields promise to elucidate potential mechanisms and refine psychological treatments for BD. I propose a novel account referred to as ‘Positive Emotion Persistence’ (PEP) that posits that BD is associated with greater increases in positive emotion responses (reward and achievement-specific) that are activated across different types of emotional contexts. PEP further holds that BD involves three domains of positive emotion disturbance: the degree of positive emotion response, specific type of positive emotions, and context in which positive emotion response occurs.

### **Greater Degree of Positive Emotion?**

Does experimental work confirm that elevated degree of positive emotion uniquely characterizes BD? And can this be observed even outside periods of mania in BD? The first tenet of PEP is that BD is associated with a greater magnitude of positive emotion responses in response to (i.e., liking), and in anticipation of (i.e., wanting), positive or rewarding stimuli. These increases in positive emotion are evident after controlling for baseline mood, suggesting that PEP may be a trait-like marker of BD evident even during remission (i.e., not currently manic or depressed). For example, individuals with BD in remission and at risk for developing BD (determined using a self-report measure), report greater positive emotion in anticipation of and response to pleasant stimuli in laboratory settings and in their daily lives using experience-sampling methodologies (cf. Johnson, Gruber, & Eisner, 2007). We have found that BD is associated with greater positive emotion experience and physiological correlates of positive emotion (i.e., respiratory sinus arrhythmia) in response to a variety of positive

stimuli, ranging from emotion-eliciting films and photographs to autobiographical memory tasks (Gruber, Johnson, & Harvey, 2009; Gruber, Johnson, Oveis, & Keltner, 2008). Importantly, BD individuals do *not* report greater negative emotion or exhibit increased heart rate or skin conductance, commonly associated with cardiovascular arousal. This suggests BD is associated with greater experiential and physiological indicators of positive emotion reactivity, and not of negative emotion or arousal.

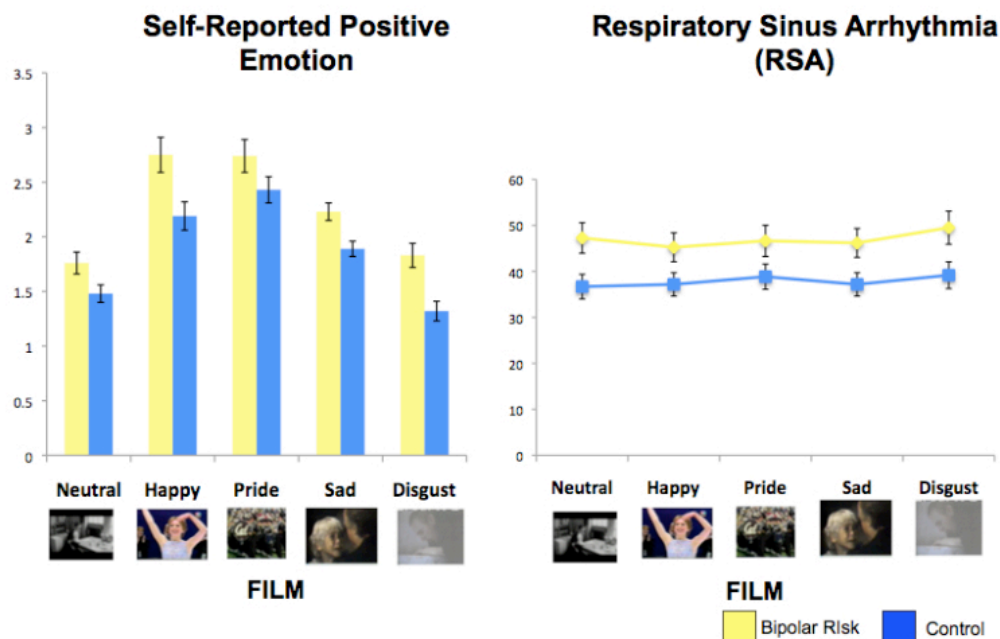
### **Are All Positive Emotions Alike?**

Positive emotions were traditionally studied in terms of a global concept of ‘positive affect’ or ‘happiness.’ Recent work has uncovered more a more nuanced landscape suggesting not all positive emotions are alike, including those associated with reward consummation and pursuit (joy), achievement (pride), and prosocial emotions fostering social connection (love, compassion) (Shiota, Keltner, & John, 2006). Is BD associated with similar increases across all positive emotions? PEP would argue ‘no,’ with second tenet of PEP stating that BD is associated with specific increases in reward and achievement-related emotions. For example, those with BD report greater feelings of joy and pride across different contexts in their daily lives (Gruber & Johnson, 2009) and in the laboratory when viewing a variety of positive, negative, and neutral types of films (Gruber et al., 2008). These findings dovetail with literature suggesting that BD involves a heightened focus on the pursuit and attainment of rewards and ambitious goals (Johnson, 2005). BD may also be more strongly associated with self-focused, as compared to other-focused, positive emotions that could contribute to social strain and impairment.

### **Does Positive Emotion Persist across Contexts?**

Emotion responses are viewed as flexibly adapting in response to challenges and opportunities in the environment. When emotions (including positive) are experienced

without the appropriate external inputs or in the appropriate context, this signals dysfunction in the emotion response (Wakefield, 2007). The third tenet of PEP states that BD is associated with dysfunction in positive emotion activation across contexts. That is, BD is associated with an increased degree of positive emotion not just in response to positive (or rewarding) stimuli, but also to negative and neutral stimuli that don't appropriately call for positive feelings. As seen in Figure 1, our work has shown that BD risk is associated with increased self-reported positive emotion and RSA – a autonomic nervous system correlate of positive emotion - across positive (happy, pride), negative (sad, disgust), and neutral films (Gruber et al., 2008). In dyadic interactions, those at risk for BD also over-attribute positive emotion in response to positive (warm) and even negative (hostile) physical gestures from a stranger (Piff, Purcell, Gruber, Hertenstein, & Keltner, 2011). This suggests that positive emotion activation persists across contexts, is most strongly evident via subjective and physiological measures, and is not an artifact of heightened activation or arousal.



### ISOLATING MECHANISMS IN PEP

The work above suggests that BD involves heightened and persistent reward- and achievement-focused positive emotions that are present across contexts, even inappropriate ones. A next step involves isolating mechanisms that underlie and maintain PEP, including those that drive the elicitation of positive emotion ('driving mechanisms') and those that foster the maintenance of positive emotions over time ('maintaining mechanisms').

### **Driving Mechanisms**

Driving mechanisms are defined here as processes that occur prior to, and fuel the onset of positive emotions. Here, I suggest that persistent positive emotions in BD are driven by bottom-up processing attention biases towards positive stimuli and top-down processing towards positive emotional goals. I define and describe both of these below.

*Bottom-up attention biases.* Do people with BD automatically and selectively attend to positive stimuli features? Emotional disorders such as depression and anxiety are associated with increased attention towards negative emotional cue which contribute to increased negative emotion reactivity in these disorders. Extending this logic, PEP posits that BD is associated with increased attention towards positive emotional cues. Supportive research includes an increased ability to recognize positive facial cues and positive words in those at risk for, and diagnosed with, BD (for review, see Johnson et al., 2007). Extending this work using visual attention tasks and measures of implicit (i.e., automatic and relatively non-conscious) measures of emotion is critical.

*Top-down emotion goals.* Is BD associated with a motivation to feel persistently good which then influences how emotional information is selected and perceived? Two lines of evidence suggests those with BD have emotional goals focused on experiencing positive feelings. First, BD may be associated with short-term hedonic goals to feel good, including the desire to maximize immediate pleasure in the moment (Tamir, Mitchell, &



Gross, 2008). In other words, people with BD may preferentially seek out situations that will evoke pleasure. Second, BD may be associated with a focus on short-term hedonic goals at the expense of long-term costs and appropriateness of matching the goal with the current context. This second component signals maladaptive features of seeking for positive emotion in contexts where doing so could lead to impairment (e.g., finding pleasure in harmful stimuli that should be aversive and avoided; Gruber et al., 2008).

### **Maintaining Mechanisms**

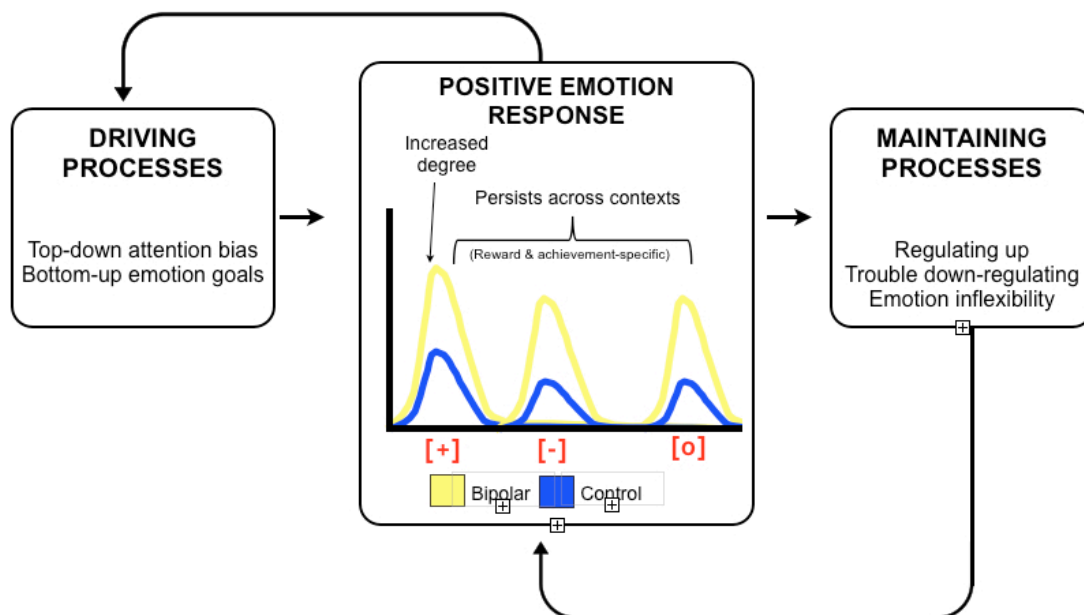
Maintaining mechanisms are here defined as processes that occur during or after an emotion response has been elicited, and help maintain this response over time. As applied to PEP, this includes emotion regulatory tendencies that increase (but fail to decrease) positive emotion.

*Up-regulating positive emotions.* BD involves a tendency to increase or amplify positive emotions. For example, BD is associated more frequent positive rumination, defined as dwelling on the content, causes and consequences of positive feelings (e.g., Johnson, McKenzie, & McMurrich, 2008). Indeed, people with BD more frequently engage in positive rumination compared to controls (Gruber, Harvey, & Johnson, 2009). Once an emotion is triggered, those with BD may latch onto and prolong the duration and intensity of positive feelings. This tendency to focus on one's internal positive state might interfere with attending to relevant external stimuli that could assist in tuning down an overly positive emotional state, such as the worried countenance of a family member. As such, positive rumination may sustain positive feelings and interfere with the ability to flexibly respond to external information.

*Difficulty down-regulating positive emotions.* BD is associated with ineffective attempts at decreasing positive emotions (Gruber, Eidelman, & Harvey, 2008; Johnson, McKenzie, & McMurrich, 2008). Yet those with BD exhibit the capacity to cognitively

regulate positive emotions when instructed (Gruber, Johnson, & Harvey, 2009). Why do they still experience trouble regulating positive emotions? Those with BD might exhibit a less nuanced skillset regarding which strategy to use and in what context to implement it. People with BD report recruiting the same strategies regardless of stimuli valence (e.g., suppressing positive emotions across neutral, positive, and negative stimuli) (Gruber, Harvey, & Gross, 2011) and attempt to decrease and increase positive emotion simultaneously (Johnson, McMurrich, & McKenzie, 2008). This could result in a positive emotion “over-drive” with trouble flexibly modifying how they regulate emotions across different situations (see Figure 2).

## PEP Model of Bipolar Disorder



### Distinction from Existing Theories

In this section, I clarify how PEP is related to and distinct from two existing theories regarding emotion and mood disorders. First, is the Emotion Context Insensitivity (ECI) view that posits that depression is associated with reductions in positive emotion to positive stimuli and negative emotion to negative stimuli (Rottenberg,

2005). Both ECI and PEP converge on the claim that mood disorders are associated with patterns of context-independent patterns of emotion related deficits. However, while ECI portrays a pattern of diminished positive and negative emotional responses across contexts in unipolar depression, PEP provides an account of increased positive (but not negative) emotional responses across contexts in BD.

Second, the Behavioral Approach System (BAS) dysregulation model states that BD is associated with increased motivation to pursue rewards and heightened sensitivity to reward stimuli specifically (Alloy & Abramson, 2010; Johnson, 2005). Both BAS and PEP posit that BD is associated with increased reactivity to positive stimuli. However, PEP extends this reasoning more broadly to suggest that an even more unique feature of BD is continued increases in positive emotion not just in response to positive stimuli, but across a variety of contexts, including negative and even neutral ones. Thus, PEP stresses the importance of increased positive emotion responses across a broader horizon of stimuli. PEP also posits unique driving and maintaining mechanisms for positive emotion disturbance.

### **FUTURE DIRECTIONS**

Emotions are adaptive in some contexts, but not in others, and positive emotion is no exception. This review suggests disturbance of positive emotion in BD includes an extreme degree of positive emotion across contexts, even those that might not be suitable. I conclude with four questions to guide future research.

First, further investigations directly linking PEP with negative behavioral outcomes such as functional impairment and relapse are much needed. Preliminary work indicates that greater trait reports of reward-relevant positive emotions predict increased mania severity over time (Gruber et al., 2009). It will be important for longitudinal

studies to ascertain more direct links between PEP and clinical outcome, and clarify how PEP is related to mania and depressive mood relapse.

Second, work discussed here has focused on examining PEP in individuals at risk for developing BD and clinically diagnosed BD patients in remission. As such, this work suggests that PEP is a marker of risk for the onset of BD *and* a trait like marker of BD when mood symptoms are not present. Given that BD also includes periods of mania and often depression, future work should determine whether periods of mania in BD amplify the intensity and degree of PEP, while periods of depression attenuate PEP.

Second, it is important to ascertain the degree to which anger influences PEP. Although negatively valenced, anger and is associated with similar left hemispheric activation as positive emotion states and approach behavior in the pursuit of goals (Carver & Harmon-Jones, 2009). Importantly, increased anger across contexts is evident in BD (Gruber et al., 2008; Johnson, 2005). These conceptual similarities suggest anger may covary with the emotion profile of PEP.

Third, recent neurobiological models of BD implicate abnormal patterns of hyperactivation in reward-related brain regions including the ventral striatum (Phillips & Vieta, 2007). Future work understanding pathophysiological processes is needed.

Finally, it will be important to examine PEP across other populations. We know that heightened positive emotion is also associated with binge eating, drug use, and risk taking. It will be important to explore whether the persistence of even mild positive feelings is disadvantageous. Indeed, continued work will hopefully uncover when feeling too good can be bad, in BD and beyond.

**NOTES**

<sup>1</sup> Address correspondence to June Gruber at Yale University, Department of Psychology,

2 Hillhouse Avenue, P.O. Box 208205, New Haven, CT 06520. Email to:

[june.gruber@yale.edu](mailto:june.gruber@yale.edu)

<sup>2</sup> The author thanks George Bonanno, James Gross, Sheri Johnson, Hedy Kober, Iris Mauss, and Doug Mennin for helpful comments.

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**FIGURE CAPTIONS**

**Fig 1.** Graph depicting elevations in positive emotion experience and physiological response (respiratory sinus arrhythmia or RSA) across positive, negative, and neutral stimuli contexts in bipolar disorder risk group relative to healthy controls (data reprinted from Gruber, Johnson, Oveis, & Keltner, 2008).

**Fig 2.** The Positive Emotion Persistence (PEP) model of bipolar disorder. Driving process such as positive attention biases and emotional goals focused on seeking pleasure increase the likelihood of activating positive emotion responses. These responses are experienced at a heightened degree, consist primarily of reward and achievement-specific flavors of positive emotion, and persist across positive [+], negative [-], and neutral [-] stimuli contexts. Once a positive emotion is elicited, maintaining processes foster the persistence over time through emotion regulatory processes including a tendency to up-regulate positive emotion, difficulty down-regulating positive emotion, and emotional inflexibility associated shifting out of positive emotions. This feeds back into activating subsequent positive emotion responses in a recursive cycle.