



Brief Report

On the relationship of trait PANAS positive activation and trait anger: Evidence of a suppressor relationship

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ABSTRACT

This article presents evidence that trait anger is directly associated with trait positive activation (PA) as measured by the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), when controlling for happiness. This supports previous state findings suggesting that PA taps both positivity and approach motivation, which can be negative in valence. These results also suggest the importance of considering motivational direction separately from affective valence, and the importance of including both motivational direction and valence in models of affective experience.

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1. Introduction

Building on recent *state anger* research (Harmon-Jones, Harmon-Jones, Abramson, & Peterson, 2009), the present work examines how *trait anger*, an approach-oriented, negatively valenced affect, relates to trait positive activation (PA), which has also been linked to approach motivation (Watson, 2000). The current research converges with other evidence demonstrating that approach motivation is associated with anger (Carver & Harmon-Jones, 2009). This contrasts with models that postulate that positive affect is directly associated with approach motivation, whereas negative affect (NA) is directly associated with withdrawal motivation (Watson, 2000).

The current research focuses on the PA measured by the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), one of the primary measures used in models that assume valence is directly related to motivational direction. The items on the PANAS PA scale, selected by means of principal components analysis (Watson et al., 1988) are: *active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, and strong*; and the items on the NA scale are: *afraid, scared, nervous, jittery, irritable, hostile, guilty, ashamed, upset, distressed*. Watson, Wiese, Vaidya, and Tellegen (1999, p. 827) wrote, "...we now view these dimensions as reflecting two basic biobehavioral systems of activation." They re-labeled these constructs *positive and negative activation*. The items are intended to include positive and negative affects with high levels of motivation (Watson, 2000), and omit affects with lower levels of motivation such as happiness.

The idea that positive (vs. negative) affect directly relates to approach (vs. withdrawal) motivation has been advanced in the conceptual model for the PANAS. Watson (2000) wrote, "...a growing body of evidence has suggested that negative mood experience is part of a larger Behavioral Inhibition System (BIS), whereas positive mood experience is linked to what has variously been called the Behavioral Activation System, Behavioral Engagement System, or Behavioral Facilitation System." (Watson, 2000, p. 22–23).

However, recent research has shown that anger is a negative affect associated with approach motivation (Carver & Harmon-Jones, 2009). For example, studies have found that trait approach motivation, as measured by the Behavioral Activation Sensitivity scale (BAS; Carver & White, 1994), relates directly with trait (Harmon-Jones, 2003) and state anger (Carver, 2004). Moreover, trait BAS predicts aggressive inclinations even more strongly when approach motivation has been primed (Harmon-Jones & Peterson, 2008). Also, Anger-Out relates directly to BAS, whereas Anger-In relates directly to behavioral inhibition sensitivity (BIS; Smits & Kuppens, 2005). Anger has been theorized to relate to approach motivation because anger often occurs when access to expected rewards is blocked, and because anger impels engagement with the environment rather than retreat from it (Carver & Harmon-Jones, 2009; Harmon-Jones, 2003).

Following from research showing that both PA and anger reflect the activation of approach motivation (Carver & Harmon-Jones, 2009), we generated the counter-intuitive hypothesis that PA may be associated with anger. As an initial test of this hypothesis, we conducted four studies on *state or situationally-aroused anger* (Harmon-Jones et al., 2009). In two studies, students were exposed to a radio editorial that evoked anger: the editorialist argued that today's students weren't as good as students used to be. The anger induction evoked more anger and PA than a neutral radio editorial

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(see also Harmon-Jones, Vaughn-Scott, Mohr, Sigelman, & Harmon-Jones, 2004). In addition, anger and PA were directly correlated, anger and happiness were inversely correlated, and happiness and PA were directly correlated. Two subsequent studies replicated this pattern of results and eliminated alternative explanations that suggested that the anger–PA relationship was simply due to arousal and that the anger–PA relationship was due to anger being experienced as a positive feeling. In these studies, statistically controlling for happiness increased the size of the correlation between PA and anger. In other words, when the positivity of PA was removed by controlling for happiness and only the approach motivation remained, anger correlated even more strongly with PA.

The previous state anger studies demonstrate that PA is activated by anger-evoking situations and is directly related to subjective anger. These results are inconsistent with the conceptual view that PA is composed of “enthusiasm, energy, interest, pleasure, confidence, and feelings of affiliation...” (Gray & Watson, 2007, p. 173). The results of these studies that manipulated state anger suggest that the PA scale of the PANAS assesses approach motivation rather than purely *positive* activation, and such explains why PA relates to anger even though PA and anger have different valences. Because the PANAS is widely used, it is important to know what it is measuring and whether this matches the conceptual model that proposes that PANAS PA taps *pleasurable* engagement (Watson, 2000).

These results of these five past studies (Harmon-Jones et al., 2004; Harmon-Jones et al., 2009) differ from studies validating the PANAS, which did not examine PA during strong bouts of anger but instead administered the PANAS questionnaire to individuals and asked them to indicate how they felt over longer periods of time or as a trait (i.e., participants rated how they felt “during the past few weeks” or “in general, that is, on the average;” Watson & Clark, 1994; Watson et al., 1988). This past research did not observe a direct correlation of PA and anger because explicit manipulations of anger were not used. That is, the relationship of PA and anger may emerge in angry situations because the approach-motivational aspects of the affective experiences are apparent. In other words, PA and anger, when reported over the last few weeks or in general, may not be as strongly associated with approach motivational tendencies as compared to when those affects are experienced during anger-evoking situations. Moreover, trait affective “memories” are likely to be of lower intensity when averaged over extended periods of time, because strong affective experiences do not last for long periods of time. However, we hypothesized that, even as traits, PA and anger may be associated after controlling for the positive valence part of PA (e.g., happiness is a good marker of positive valence) so that only the approach motivation is left in the equation. Such would be consistent with our past state anger studies that found that statistically controlling for happiness increased the size of the correlation between PA and anger.

Because most past PANAS research has measured PANAS with these more trait-like instructions, we thought it important to examine the relationship between PA and anger at the trait level. This extends our past research on anger and PA, which only examined state affects. Based on past work suggesting that trait anger and trait PA are not correlated and our recent work suggesting that state anger and state PA are correlated, and that this correlation is stronger when statistical controls for positive valence are implemented, we predicted that trait anger and trait PA would be correlated once statistical controls for positive valence are implemented. In other words, once we account for the relatively pure valence part of PA by controlling for happiness, the residual approach motivational part of PA should relate to anger.

In addition, we tested a hypothesis regarding type of anger expression. Based on past research on anger and approach motivation (Carver, 2004; Harmon-Jones, 2003), anger is most often asso-

ciated with approach motivation. However, some experiences of anger can be associated with withdrawal motivation, though these experiences may be relatively rare and are difficult to evoke in the lab (Wacker, Heldmann, & Stemmler, 2003; Zinner, Brodish, Devine, & Harmon-Jones, 2008). Different motivational directions associated with anger may be captured by the concepts of Anger-Out and Anger-In. Anger-Out is associated with approach motivation and aggression, while Anger-In is associated with fear, brooding, and withdrawal-oriented behavior. We predict that anger would be associated with PA to the extent that the brooding, anxious, withdrawal-oriented type of anger was removed from the relationship.

Another purpose of the present study was to examine a possible alternative explanation for the predicted results. One might argue that PANAS PA and anger are positively related to each other because some individuals enjoy anger. If this alternative explanation were correct, then statically controlling for the enjoyment of anger should eliminate the relationship between PANAS PA and anger. A similar alternative explanation had been proposed to explain the relationship of anger with relative left frontal cortical activity (Harmon-Jones & Sigelman, 2001; Jensen-Campbell, Knack, Waldrip, & Campbell, 2007). To address this alternative, a reliable and valid attitude toward anger measure was created (Harmon-Jones, 2004). Then the relationships of trait anger, attitude toward anger, and relative left frontal cortical activity were examined. Trait anger related to greater liking for anger (attitudes toward anger were universally negative, however, individuals differed in how much they disliked anger). In addition, trait anger related to relative left frontal cortical activity. However, attitude toward anger did not relate to relative left frontal cortical activity and attitude toward anger did not mediate the relationship between trait anger and relative left frontal activity. Using the same logic, we included the attitude toward anger scale to examine whether attitude toward anger would explain why anger relates to PANAS PA.

2. Method

Participants were 513 introductory psychology students who participated in exchange for course credit. Participants completed the following questionnaires on-line and in random orders: PANAS (Watson et al., 1988); Buss and Perry's (1992) Aggression Questionnaire; the Anger-Out, Anger-In, and Anger-Control scale from the State-Trait Anger Expression Inventory (Spielberger, 1988); and the Attitude toward Anger scale (Harmon-Jones, 2004).

The PANAS assesses positive and negative activation (Watson et al., 1988; Cronbach's $\alpha = .86$ and $.84$). The PANAS hostility subscale was also included and is measured with the following words: angry, hostile, irritable, scornful, disgusted, loathing (Watson & Clark, 1994). Because the 10-item NA scale contains two anger words, those anger words were omitted in analyses concerning NA. In addition to the items from the PANAS, other items were included in a similar format, as in Harmon-Jones et al. (2009). Anger was measured with angry, hostile, frustrated, mad, and irritated (Cronbach's $\alpha = .86$). Happiness was measured with cheerful, delighted, happy, and joyful (Cronbach's $\alpha = .87$). Instructions asked participants to indicate to what extent they feel the listed emotions “in general, that is, on the average.” Extent was measured using a five-point scale (1 = very slightly or not at all to 5 = extremely).

For the above affect items, a principle components analysis with varimax rotation revealed four factors with eigenvalues greater than 1.0. The happiness items loaded on the first factor (loadings $> .74$; eigenvalue = 7.18) and did not load on any other factors (loadings $< .18$). The anger items loaded on a second factor (loadings $> .64$; eigenvalue = 5.49) and did not load on any other factors

(loadings < .27). The PANAS PA items mostly loaded on a third factor (loadings > .42; eigenvalue = 1.63), but interested, active, and proud loaded on both the happiness factor and this factor (loadings > .40 on each factor). PANAS PA items excited, enthusiastic, and inspired only loaded on the happiness factor (loadings > .60; cross-loadings = .08, .20, .36). The PANAS NA items mostly loaded on a fourth factor (loadings > .40; eigenvalue = 1.17), but ashamed, guilty, and distressed loaded on both this factor and anger (loadings > .40). PANAS NA items jittery and upset loaded on the anger factor (loadings > .49; both cross-loadings with NA = .29). Because of our focus on the established PANAS measure, we left it intact, and used the items described in the previous paragraph to measure happiness and anger.

The anger subscale of the Buss and Perry (1992) Aggression Questionnaire was administered to assess trait anger. Sample items include “When frustrated, I let my irritation show” and “Some of my friends think I am a hothead.” Responses were measured using a five-point scale (1 = extremely uncharacteristic of me to 5 extremely characteristic of me).

The Anger-Out, Anger-In, and Anger-Control scales from the State-Trait Anger Expression Inventory (Spielberger, 1988) were administered to assess different ways of expressing anger. Anger-Out measures the degree to which the respondent expresses anger (e.g., “When angry or furious, I lose my temper”); Anger-In measures the degree to which the respondent holds anger in (e.g., “When angry or furious, I keep things in”); and Anger-Control measures the degree to which the respondent controls anger (e.g., “When angry or furious, I control my angry feelings.”). Responses were measured using a four-point scale (1 = strongly disagree to 4 = strongly agree).

The Attitude toward Anger scale (ATA; Harmon-Jones, 2004) was included to measure individual differences in liking for anger. Sample items include, “I like how it feels when I am furious” and “When I feel like a powder keg ready to explode, I like that feeling.” Responses to each item were indicated on a 1 (strongly disagree) to 5 (strongly agree) scale.

3. Results

Trait PA was not significantly associated with any trait anger measure at the zero-order correlation level, except PA was inversely associated with Anger-In ($r = -.16, p < .001$) and directly associated with Anger-Control ($r = .13, p < .01$). Trait PA was also associated with happiness ($r = .71, p < .001$). Trait NA was associated with most anger measures: our anger adjectives, $r = .69, p < .01$; PANAS hostility, $r = .70, p < .01$; Buss-Perry trait anger, $r = .37, p < .01$; Anger-Out, $r = .29, p < .01$; Anger-In, $r = .39, p < .01$. Trait NA was inversely associated with Anger-Control ($r = -.16, p < .01$) and happiness ($r = -.15, p < .01$), but not associated with PA ($r = -.03$).

Because of the inter-relationships among trait affects and because of our prediction that PA involves both pleasantness and approach motivation (that can be negative), a simultaneous regression analysis was conducted in which all measured affects (anger, NA, happiness) predicted PA. In these regressions, PA was predicted by anger and happiness (see Table 1), but not NA ($p > .15$). This pattern of results occurred for all anger measures except those that do not reflect approach motivation, Anger-In and Anger-Control (p 's > .30). In all of these regressions, happiness predicted PA (β 's > .70, *S.E.* β 's = .03, p 's < .01).

When only happiness and anger were used to predict PA in simultaneous regression analyses, PA was directly correlated with approach-related anger. See Table 2. These results suggest, consistent with our interpretation, that trait PA is tapping both pleasant-

Table 1

Regression results of various anger measures, NA, and happiness on PA.

Anger measure	β	<i>S.E.</i> β	<i>p</i>
Our anger items	.20	.04	.01
PANAS hostility	.22	.04	.01
Buss-Perry trait anger	.07	.03	.04
Anger-Out	.10	.03	.01
Anger-In	-.03	.03	.32
Anger-Control	.05	.03	.86

Note: Results from simultaneous regressions in which one anger measure, NA, and happiness were used to predict PA.

Table 2

Regression results of various anger measures and happiness on PA.

Anger measure	β	<i>S.E.</i> β	<i>p</i>
Our anger items	.16	.03	.01
PANAS hostility	.17	.03	.01
Buss-Perry trait anger	.09	.03	.02
Anger-Out	.12	.03	.01
Anger-In	-.002	.03	.95
Anger-Control	-.004	.03	.89

Note: Results from simultaneous regressions in which one anger measure and happiness were used to predict PA.

ness and approach motivation, and that happiness acts as a suppressor in the relationship of PA and anger.

In another analysis designed to examine whether approach-related anger may be suppressed by other constructs in predicting trait PA, the three anger expression styles were examined. That is, Anger-In, Anger-Out, and Anger-Control were used to predict PA in a simultaneous regression analysis. Results indicated that Anger-Out was directly related to PA, $\beta = .12, S.E. \beta = .05, p < .03$; Anger-In was inversely related to PA, $\beta = -.18, S.E. \beta = .04, p < .01$; and Anger-Control was directly related to PA, $\beta = .18, S.E. \beta = .05, p < .01$.

Next, we addressed an alternative explanation for the relationship between PA and anger. We tested whether positive attitudes toward anger explained why PA and anger were directly associated. Entering ATA into the regression in which (each) trait anger and happiness simultaneously predicted PANAS PA did not reduce the significance of the anger and PA correlations, and ATA did not relate to PA in these regressions. Thus, these results suggest that the relationship between trait PA and trait anger is not due to trait anger being experienced as enjoyable.

4. Discussion

Using a fully individual differences approach, results from the present study conceptually replicated previous results that demonstrated that situations that increase anger also increase PA and that anger is directly associated with PA within those situations (Harmon-Jones et al., 2009). The present results extend this past work by showing that trait anger is directly correlated with trait PA when statistical controls for positive valence are implemented, thus leaving the approach motivational part of PA to correlate with anger. These results suggest that our recent findings of a direct association between state PANAS PA and state anger extend to the individual differences realm. Moreover, they further support the idea that PA taps both positivity and approach motivation, which can be negative in valence.

The current results also suggest that the relationship of trait anger and trait PA is unlikely to be due to anger being experienced as a positive feeling. That is, entering attitudes toward anger as a control variable into the regression equation did not eliminate the

relation of anger and PA. Anger is similar to certain positive affects but this similarity is not due to anger being felt as positive. Rather, anger and PA are similar because both are associated with approach motivation.

The relations between trait PA and anger observed in the present study were of low-to-moderate magnitude. However, the current results, along with results from five other studies on state anger (Harmon-Jones et al., 2004; Harmon-Jones et al., 2009), suggest that the observed effects are meaningful and likely important. Any degree of positive correlation between anger and PA is inconsistent with models of emotion that posit approach motivation to always be associated with positive valence. In addition, self-reports of affective experience are imperfect measures, and we would suggest that the observation of direct associations between anger and PA measures when they relate in opposing directions to social desirability and implicit theories of affective experience is impressive and may improve the theoretical understanding of affective experience.

Taken together with other research, the present research suggests that the conceptual model underlying the PA scale needs to incorporate the idea that approach motivation can be positive or negative in valence. We are not suggesting that a focus on positive vs. negative affect be replaced by a focus on approach vs. withdrawal motivation. Instead, we are suggesting that motivational direction be considered separate from affective valence, and that both constructs need to be considered carefully in conceptual models of affect.

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