

PANAS Positive Activation Is Associated With Anger

Eddie Harmon-Jones and Cindy Harmon-Jones
Texas A&M University

Lyn Abramson
University of Wisconsin–Madison

Carly K. Peterson
Texas A&M University

As a prototypic negative emotion, anger would seem to have little in common with positive activation, as measured by the Positive and Negative Affect Schedule (PANAS; D. Watson, L. A. Clark, & A. Tellegen, 1988). However, growing evidence suggests that both anger and positive affect are associated with approach motivation. This suggests the counterintuitive hypotheses that positive affect should be increased by anger-evoking situations, and that positive affect and anger should be directly correlated in such situations. Four studies tested and supported these hypotheses. Discussion focuses on the implications of these results.

Keywords: anger, approach motivation, positive affect, PANAS

Some dimensional models of emotion postulate that positive affect is directly associated with approach motivation, whereas negative affect is directly associated with withdrawal motivation (e.g., Watson, 2000). In this article, we examine how anger, an approach-oriented, negatively valenced affect, relates to positive activation (PA), which has also been linked to approach motivation (Watson, 2000). PA is measured by the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), one of the key measures used in tests of these dimensional models. More important, we tested the relationship during the experience of anger. If anger relates directly to PA, this would have implications for the structure of emotion and motivation. It would also suggest that the PANAS does not provide a pure measure of positivity, and this would have implications for the interpretation of research using the PANAS.

The linking of affective valence with motivational direction may be appropriate for most affects. Joy, interest, and enthusiasm are positive affects that appear to be associated with approach motivation. Similarly, disgust, fear, and anxiety are negative affects that appear to be associated with withdrawal motivation. Most past research has examined these affects.

Far less research has been conducted on anger, an affect that violates the direct linking of affective valence and approach mo-

tivation. Indeed, according to recent research, anger is a negative affect associated with approach motivational tendencies (for review, see Carver & Harmon-Jones, in press). Thus, in contrast to the theoretical idea that approach motivation is only associated with positive affect, we propose that approach motivation also involves certain negative affects, particularly anger. Consequently, if the PA measure of the PANAS taps approach motivation rather than purely positive activation, it should be related to anger even though PA and anger seem to have different valences.

Theoretical Views of Valence and Approach Motivation

Watson (2000) suggested that positive activation reflects activation of the approach motivational system. He 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, pp. 22–23)

These conceptual ideas are reflected in other theories (e.g., Cacioppo, Gardner, & Berntson, 1999; J. A. Gray, 1990; Lang, 1995; Lang, Bradley, & Cuthbert, 1990, 1992, 1998; Larsen, McGraw, & Cacioppo, 2001; Updegraff, Gable, & Taylor, 2004).

The measure that has been widely used in tests of this model is the PANAS (Watson et al., 1988). Its scales have been renamed positive activation (PA) and negative activation (NA) to convey the activated nature of these dimensions. According to Watson et al. (1988),

High PA is a state of high energy, full concentration, and pleasurable engagement, whereas low PA is characterized by sadness and lethargy. In contrast, Negative Affect (NA) is a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear, and nervousness. (p. 1063)

Eddie Harmon-Jones, Cindy Harmon-Jones, and Carly Peterson, Department of Psychology, Texas A&M University; Lyn Abramson, Department of Psychology, University of Wisconsin–Madison.

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Correspondence concerning this article should be addressed to Eddie Harmon-Jones, Department of Psychology, Texas A&M University, 4235 TAMU, College Station, TX 77843. E-mail: eddiehj@gmail.com

More recently, in describing the PANAS, E. K. Gray and Watson (2007, p. 173) wrote, "Positive Affect is composed of positively valenced mood states, including enthusiasm, energy, interest, pleasure, confidence, and feelings of affiliation . . . state positive affect reflects an individual's short-term, often context-specific, experience of positive emotions such as confidence or joy."

The PANAS has been used for diverse purposes in clinical (e.g., Clark & Watson, 1991), social (e.g., Schmeichel, Vohs, & Baumeister, 2003) and personality (e.g., Hemenover, 2003) psychology research. Indeed, the original article presenting the PANAS (Watson et al., 1988) has been cited more than 3,800 times (Web of Science, September, 2008), and in their review of self-report measures of affect, E. K. Gray and Watson (2007) suggested that "starting in the late 1980s, the Watson and Tellegen model—based on the dimensions of Positive and Negative Affect—gradually emerged as the most prominent structural/assessment scheme in research on self-rated affect" (p. 173).

Because the PANAS is so widely used, it is important to know whether it is conceptually valid. As we review below, much research has suggested that both PA and anger reflect the activation of approach motivation. This suggests the counterintuitive hypotheses that PA should be increased by anger-evoking situations, and that PA and anger should be directly correlated in such situations. If PA increases during approach motivational situations even when affective valence is negative, then the indiscriminate use of this instrument to measure positivity may continue to confound our understanding of the relationship between affective valence and motivational direction.

Review of Past Research on PA and NA

The items on the PANAS were selected from a large list of terms by means of principal components analysis. Watson et al. (1988, p. 1064) selected "terms that were relatively pure markers of either PA or NA; that is, terms that had a substantial loading on one factor but a near-zero loading on the other." This procedure resulted in the following items for the PA scale: *active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, and strong*; and the following items for the NA scale: *afraid, scared, nervous, jittery, irritable, hostile, guilty, ashamed, upset, and distressed*. Researchers are sometimes surprised to note that certain terms often used as labels for basic emotions are not found in the PANAS, including *happy* and *angry*.

For the most part, reliability and validity studies administered the PANAS questionnaire to large groups of individuals and asked them to indicate how they felt "right now (that is, at the present moment)"; "today"; "during the past few days"; "during the past week"; "during the past few weeks"; "during the past month"; "during the past year"; and "in general, that is, on the average" (Watson & Clark, 1994; Watson et al., 1988). Measuring affect with these instructions likely reveals information about relationships among affect words when individuals are not feeling strong bouts of affect.

The studies examining the validity and reliability of the PANAS did not address relationships among affect words during specific affective bouts. Examining situational affects may be particularly important during negative affective situations because negative

affects are presumed to last only a short period of time. For instance, Watson (2000) wrote,

negative moods should remain at relatively low, baseline levels during the bulk of everyday life. . . . However, when confronted with a threat or crisis, the individual should experience a sudden, sharp increase in negative mood that is designed to help resolve the crisis. . . . After the crisis has passed, negative mood should return quickly to its basal level. (pp. 81–82)

To our knowledge, no previous research has examined the relationship of the PANAS with other affects during the experience of anger. In past studies, anger was assumed to be located within NA and to be unrelated to PA (Watson & Clark, 1994). The past PANAS studies that examined the relationship of hostility (as a proxy for anger) and other affects did so in the absence of specific anger-inducing situations (Watson & Clark, 1994). In these studies, the mean level of hostility was approximately 11. Because there were six hostility items and a 5-point rating scale (where 1 = *very slightly or not at all* and 5 = *extremely*), participants' scores for hostility averaged 1.83. Thus, individuals in these studies were hardly hostile, as would be expected given the presumed time course of negative affects. Perhaps the relationships between these affect words are different during the experience of anger than during a more neutral state.

Approach Motivation and Anger

Anger may be particularly important to examine along with the PANAS during an angry situation because anger, unlike other negative affects, has been found to be associated with approach motivation. By examining anger along with the PANAS during an angry situation, we may arrive at a more complete conceptual understanding of the PANAS and the structure of self-rated affect.

Animal Behavior, Developmental, and Clinical Research on Anger and Approach

Theorists have long suggested that anger is an emotion that evokes behavioral tendencies of approach (e.g., Darwin, 1872/1965; Plutchik, 1980). Animal behavior theorists have suggested that irritable or offensive aggression is associated with anger, attack, and no attempts to escape, whereas defensive aggression is associated with fear, attempts to escape, and attack only if escape is impossible (Blanchard & Blanchard, 1984). Developmental psychologists have found angry facial expressions to be associated with approach motivation (Lewis, Alessandri, & Sullivan, 1990; Lewis, Sullivan, Ramsay, & Alessandri, 1992). One classic study demonstrated that infants who displayed angry facial expressions when a reward was withdrawn demonstrated the highest levels of joy, interest, and required behavior when presented with a second opportunity to obtain the reward (Lewis et al., 1990). In clinical research, evidence consistent with the idea that anger is associated with an approach orientation comes from research on bipolar disorder. The emotions of euphoria and anger often occur during manic phases of bipolar disorder (Depue & Iacono, 1989), and a dysregulated or hyperactive approach system may underlie mania (Depue & Iacono, 1989; Fowles, 1993).

Individual Differences Research on Anger and Approach

Individual differences in the sensitivities of the approach and withdrawal motivational systems, as measured by Carver and

White's (1994) behavioral inhibition/behavioral activation sensitivity (BIS/BAS) scales, are related to anger. In two studies, Harmon-Jones (2003) showed that trait approach motivation, as measured by the BAS scale, related positively to trait anger, as assessed by the Buss and Perry (1992) Anger subscale of the Aggression Questionnaire. The second study also revealed that BAS related positively to physical aggression. Smits and Kuppens (2005) have extended these results; they found that the tendency to express one's anger outwardly related directly to BAS scores, whereas the tendency to express one's anger inwardly related directly to BIS scores. Carver (2004) also found that individual differences in BAS were associated with self-reported frustration and anger in response to situational elicitors of these emotional responses. In these studies, reports of anger related to BIS, but when nervousness or anxiety was controlled, anger no longer related to BIS.

Asymmetrical Frontal Cortical Activity, Approach Motivation, and Anger

The above evidence using self-report and behavioral measures suggests that anger is associated with approach motivation. Guided by this past work, we have examined anger as a way to better understand the psychological and behavioral functions of asymmetrical frontal cortical activity. Much research has suggested that the left and right frontal cortical regions are asymmetrically involved in emotional and motivational processes.

Studies have examined the relationship between asymmetrical frontal cortical activity recorded during resting baseline and other measures of trait affect and motivation because baseline asymmetrical frontal cortical activity reflects a trait (Tomarken, Davidson, Wheeler, & Kinney, 1992). Trait BAS has been found to relate to greater left than right frontal brain activity (Amodio, Master, Yee, & Taylor, 2008; Harmon-Jones & Allen, 1997; Peterson, Gable, & Harmon-Jones, 2008; Sutton & Davidson, 1997). Trait PA is associated with greater left than right frontal brain activity, whereas trait NA is associated with greater right than left frontal brain activity (Jacobs & Snyder, 1996; Tomarken, Davidson, Wheeler, & Doss, 1992; Urry et al., 2004). In addition, manipulations of relative left frontal activation cause greater PA to mildly approach-oriented stimuli (Harmon-Jones, 2006). Because positivity versus negativity was confounded with approach versus withdrawal in this past work, it was impossible to determine whether the activity in the frontal hemispheres related to the valence of emotion (positive vs. negative) or the direction of motivation (approach vs. withdrawal).

Because anger is a negatively valenced, approach-motivated emotion, it presents an opportunity to examine the true relationship of asymmetrical frontal activity and emotional valence or motivational direction. In a test of these competing predictions, Harmon-Jones and Allen (1998) found that trait anger related to increased left frontal activity and decreased right frontal activity. Experiments in which anger is manipulated via interpersonal insult have shown that individuals who are insulted evidence greater relative left frontal activity than individuals who are not insulted (e.g., Harmon-Jones & Sigelman, 2001; Harmon-Jones, Vaughn-Scott, Mohr, Sigelman, & Harmon-Jones, 2004; Jensen-Campbell, Knack, Waldrip, & Campbell, 2007). Additional research has demonstrated that individuals with tendencies toward mania re-

spond with increased left frontal activity when confronted with an anger-producing event (Harmon-Jones et al., 2002). Other experiments have found that a manipulated increase in left frontal brain activity using repetitive transcranial magnetic stimulation causes approach motivational responses toward angry faces (d'Alfonso, van Honk, Hermans, Postma, & de Haan, 2000; van Honk & Schutter, 2006). Thus, the weight of evidence suggests that greater left frontal brain activity is associated with approach motivation, rather than positive affective valence.

The Present Research

Relative left frontal cortical activity has been related to greater PA, BAS, and anger. Also, BAS and anger are directly related, and BAS and PA are directly related. Might PA also be associated with increased anger? Although a theoretical focus on affective valence would not generate such a prediction because anger is considered a negative affect, a theoretical focus on motivational direction would. That is, because anger is an approach-oriented emotion, it might co-occur with positive activation, as both emotional experiences may relate to approach motivation. Thus, valence is the factor that makes PA and anger different, whereas approach motivation is the factor that makes them similar. Both factors (among several others) are integral parts of both measures. Situations that evoke the subjective experience of anger also likely evoke approach motivation at the same time. In other words, anger and approach motivation co-occur following an insult or frustration. The experience associated with the increased approach motivation caused by the insult or frustration may be described in terms traditionally linked with anger as well as by words found on the PANAS such as *active*, *alert*, *determined*, and *strong*.

Consistent with this idea, we have found an insult manipulation to cause an increase in self-reported anger as well as PA (Harmon-Jones et al., 2004). In this experiment, anger was induced via an interpersonal insult (i.e., negative feedback concerning one's personality and attitude toward a social issue that was expressed in an essay), and a number of self-reported emotions were measured following the insult. Results indicated that anger and PA were greater in the insult condition than in the no-insult condition. However, this observation was not the primary point of this previous investigation, and in fact the editor encouraged us to reduce the discussion of the finding because of its counterintuitive nature. We complied, but found the effect quite interesting and worthy of further investigation; hence, the current set of studies. Moreover, the effect fit with our conception of the relationship between anger and approach motivation. That is, if PA measures both pleasantness and approach motivation, which may be negative in valence, then ratings on this scale should be increased by an anger manipulation because anger is associated with approach motivation.

Based on the above ideas, we hypothesized that ratings on PA would increase during situations that evoke anger. To test this prediction, we conducted four studies. In the first two studies, we evoked anger and measured self-reported anger and PA (as well as other emotions) following the evocations. In the last two studies, we measured self-reported anger and PA while participants relived an angry experience. In all studies, we tested the degree to which anger and PA are correlated. Based on the preceding analysis, we predicted anger and PA to be directly (i.e., positively) correlated.

Study 1

In Study 1, we evoked anger using a laboratory manipulation and assessed its effects on self-reported anger and PANAS PA. Recent findings (Harmon-Jones et al., 2004) and our theoretical rationale led us to predict that the anger manipulation would increase PA as well as anger. Moreover, we predicted that anger and PA would be directly correlated with each other because they both reflect approach motivation. However, they should be correlated in different directions with happiness. That is, anger should be inversely correlated with happiness because anger and happiness have opposite valences. However, PA should be directly correlated with happiness because PA assesses both positive valence and approach motivation, the latter of which can be negative in valence.

Method

Participants

Participants were 155 introductory psychology students (42 men and 113 women) between ages 18 and 22 who participated in exchange for extra-credit points in their course.¹

Procedure

Participants were run individually. After being greeted by the experimenter and given informed consent, participants were informed orally by the experimenter and in written form that the study concerned reactions to pilot radio broadcasts and that they would be listening to two of several possible pilot radio broadcasts and giving their emotional and cognitive reactions to them. Afterward, they listened to the broadcasts and completed questionnaires about each one following its presentation. A cover story concerning emotional and cognitive reactions to pilot radio programs, conducted by a professor in psychology and communication studies, was used to reduce experimental demand.

Renovation broadcast. The first broadcast participants heard was neutral, and was used to bolster the cover story and reduce suspicion about the second, insulting broadcast. In this broadcast, a male speaker discussed the need to renovate a campus building. Following the completion of this broadcast, participants completed an emotion questionnaire and a broadcast evaluation form (to bolster the cover story).

Professor broadcast. Then, participants heard the second broadcast, which was intended to be anger-evoking. In this broadcast, a male speaker argued against decreasing graduation requirements and claimed that students of recent years were not as good as students once were. The exact speech, made by a retired professor, is reproduced in the Appendix. Both audiotaped broadcasts were approximately 4 min in length and were presented via headphones. Following the completion of this broadcast, participants completed an emotion questionnaire and a broadcast evaluation form. Before listening to each broadcast, participants were told that their evaluations would be given to the radio station as well as the speaker.

Measures

Self-reported emotions were measured immediately after each broadcast. Each questionnaire included words to assess anger

(*hostile, angry, irritated, agitated, and frustrated*), sadness (*sad, hopeless, down, depressed, guilty, ashamed*), PA (Watson et al., 1988; *attentive* was not included), and happiness (*happy*). Participants were instructed to indicate how they felt "while listening to the broadcast" using a 0 (*not at all*) to 8 (*the most in my life*) scale.

The broadcast evaluation form first asked participants to indicate what was discussed in the broadcast they heard, and then asked a few questions consistent with the cover story (e.g., how worthwhile they thought programs of this kind were, how likely they would be to listen to a program like this). Following the completion of these questionnaires, participants were interviewed and the experimenter assessed whether the participants doubted any aspects of the cover story. Then, participants were debriefed. None reported suspicions.

To the insulting professor broadcast, we performed a maximum-likelihood factor analysis with varimax rotation. Three factors had eigenvalues greater than 1.0. The PANAS PA items loaded on one factor (loadings > .52; Cronbach's alpha = .89). In addition, all sad items loaded on one factor (> .61; Cronbach's alpha = .88), all anger items loaded on another factor (> .71; Cronbach's alpha = .91), and happiness loaded on the factor with eight items of the PANAS PA (.72).

The same factor analysis was applied to the emotion words in response to the neutral renovation broadcast. Two factors with eigenvalues greater than 1.0 emerged. All negative words loaded on one factor (> .57; Cronbach's alpha = .89) and all positive words loaded on another factor (> .51; Cronbach's alpha = .92). Because happiness is not included on the PANAS, it was analyzed separately below. Moreover, because anger and sadness loaded on separate factors in response to the insulting professor broadcast, they are analyzed separately below.

Results and Discussion

Differences Between Broadcasts

To assess the effects of broadcast type on self-reported emotions, we conducted *t* tests. Replicating Harmon-Jones et al. (2004), the insulting professor broadcast, as compared with the neutral renovation broadcast, evoked greater anger. It also evoked greater PA. Also, significant effects of broadcast emerged for sadness and happiness. That is, the insulting professor broadcast caused more sadness and less happiness than the neutral renovation broadcast. It is possible that the more information provided in this insult caused a more complex emotional reaction than the one evoked in Harmon-Jones et al. (2004). However, even with this change, the insult evoked more PA than the neutral condition. See Table 1.

To further understand the effect of insult on PA, we examined responses to the three subscales identified by Egloff, Schmukle,

¹ In all studies, gender of participant was examined in all analyses, and it produced no significant effects that altered the interpretation of the effects. That is, the effects that were produced were not meaningful in regard to the conceptual points made in this article. In Study 1, gender interacted with situation in predicting anger, but the difference between genders occurred in response to the neutral broadcast, where men reported slightly more anger than women. However, men and women did not differ in anger in response to the professor broadcast. Moreover, all of the key correlations (regressions) were in the same direction for men and women.

Table 1
Study 1: Means, Standard Deviations, and Difference Statistics for Emotions Following Each Broadcast as a Function of Neutral Versus Insulting Broadcast

Emotion	Broadcast		<i>t</i>	<i>d</i>	<i>r</i>
	Renovation	Professor			
Mean (<i>SD</i>) anger	1.59 (1.31)	3.67 (1.97)	12.40	1.24	.53
Mean (<i>SD</i>) sad	1.01 (1.07)	1.72 (1.52)	6.58	0.54	.26
Mean (<i>SD</i>) PA	3.13 (1.58)	3.54 (1.53)	3.40	0.26	.13
Mean (<i>SD</i>) happy	3.17 (2.06)	2.52 (2.08)	3.97	0.31	.16

Note. PA = positive activation.

Burns, Kohlmann, and Hock (2003): Joy (*enthusiastic, excited, proud*), Interest (*interested, strong, determined*), and Activation (*active, attentive, inspired, alert*). The insult increased Interest and Activation ($ts > 3.40$) but not Joy ($t < 1.0$). We also examined each word of the PA scale and found greater intensity following insult on the following: *active, alert, determined, interested, and strong* ($ts > 2.66$). Only enthusiastic was greater in response to the neutral than insulting broadcast ($t = 2.32$). These single-item results are consistent with the results of Harmon-Jones et al. (2004) who found insult to increase *active, alert, determined, proud, and strong*. Because a factor analysis of the PA scale revealed only one factor, further analyses are for the full PA scale.

Within-Condition Correlations

In response to the insulting professor broadcast, anger correlated directly with PA ($r = .18, p < .03$) and sadness ($r = .29, p < .03$), but anger correlated inversely with happiness ($r = -.18, p < .03$). PA correlated directly with happiness ($r = .65, p < .001$), but PA did not correlate significantly with sadness ($r = .09, p = .24$).

In response to the neutral broadcast, anger correlated directly with PA ($r = .18, p < .03$) and sadness ($r = .66, p < .001$); anger did not significantly correlate with happiness ($r = .06, p = .47$). PA correlated directly with happiness ($r = .78, p < .001$) and sadness ($r = .22, p < .01$).

Multiple Regressions

Because PA and anger correlated with other emotions, and because we suspected PA to measure both pleasantness as well as approach motivation (which can be negative), we performed regression analyses to examine whether PA correlated with anger when controlling for other emotional reactions. For the insulting professor broadcast, the overall model was significant, $R^2 = .52, F(3, 151) = 53.16, p < .001$. Moreover, PA was independently predicted by anger (partial $r = .38, p < .001$) and happiness (partial $r = .70, p < .001$) but not sadness (partial $r = .00, p = .97$). Additional regressions were conducted in which anger and happiness (or sadness) predicted PA. In the regression with anger and sadness, PA was predicted by anger (partial $r = .16, p < .05$) but not sadness (partial $r = .04, p > .50$). In the one with anger and happiness, PA was predicted by anger (partial $r = .40, p < .001$) and happiness (partial $r = .71, p < .001$). The fact that the anger-PA correlation increased when controlling for happiness but not sadness suggests that happiness but not sadness was acting as

a suppressor of the anger and PA relationship. We suspect that these results occurred because the happy-PA correlation is over twice the magnitude of the anger-sadness correlation. Happiness is assessing PA's positive valence better than sadness is assessing anger's negative valence. This may be because individuals differentiate negative emotions more than positive emotions. In sum, these regression results are consistent with the idea that PA taps both positivity and approach motivation, which can be negatively valenced. These results suggest that once we account for the relatively pure valence part of PA with happiness, the residual approach motivational part of PA relates to anger even more strongly than when happiness is not in the regression equation.

The same regression was conducted within the neutral renovation broadcast condition. The overall model was significant, $R^2 = .63, F(3, 150) = 83.55, p < .001$.² However, in this condition, only happiness emerged as a significant predictor of PA (partial $r = .78, p < .001$). PA was not significantly predicted by anger (partial $r = .12, p = .13$) or sadness (partial $r = .07, p = .39$). In the neutral situation, anger and PA were not significantly related when accounting for other emotions because approach motivation was not engaged in this situation.

Summary

Results from the current study replicated the results of Harmon-Jones et al. (2004) by showing that an anger-inducing event not only increased self-reports of anger but also increased self-reported PA. This conceptual replication is important because the present results occurred in response to a different type of insult than used in Harmon-Jones et al. (2004). Thus, different anger-evoking events both produced increased scores on PA. Moreover, anger and PA were directly associated with each other, particularly following an anger-evoking event (see regression results) when approach motivational tendencies should be heightened. Taken together with the results of Harmon-Jones et al. (2004), the current results suggest that PA assesses approach motivation as well as positivity, as revealed by its association with happiness.

² Slight differences in degrees of freedom here and elsewhere are the result of some participants not completing all of the items on particular questionnaires.

Study 2

In Study 2, we attempted to replicate the results of Study 1 and to address a concern raised about the previous study: the lack of negative correlations among emotions, particularly within the neutral broadcast condition. We suspected that these correlational results differed from past results on the relationships among affective words for two reasons. First, in the current study, participants reported their emotional reactions to the broadcasts. In contrast, in most past studies examining interrelationships among emotions, participants reported how they were feeling in general or over some wide period of time (at the moment to over the past year; Green, Goldman, & Salovey, 1993; Watson et al., 1988; Watson, Wiese, Vaidya, & Tellegen, 1999). Other work examining interrelationships among emotions simply asked participants to categorize emotion words without asking for reports of experienced emotions (Russell, 1980; Russell, Lewicka, & Niit, 1989). In these past studies, participants were not asked to report their emotional reactions in response to a specific event, particularly a neutral event. It is important to note that the PANAS is often used to assess responses to specific events as most theories do not posit major differences in interrelationships among emotions as a function of reporting occasion (e.g., Wildschut, Sedikides, Arndt, & Routledge, 2006). Second, as a result of the instructions and cover story of Study 1, in response to the neutral broadcast, many participants reported feeling little or no emotion. Thus, emotional reactions within this condition, regardless of valence or motivational direction, tended to be positively associated. That is, if an individual felt any emotions at all to the neutral broadcast, s/he tended to feel other ones, even if ever so slightly. Thus, these emotional reactions correlated positively.

Method

The current study was designed exactly as the previous one. This study was conducted on a different sample of 37 introductory psychology students between ages 18 and 22. Cronbach's alphas for all scales were $> .84$.

Results and Discussion

Differences Between Broadcasts

Results indicated that the insulting professor broadcast caused more anger, sadness, and PA than the neutral renovation broadcast. Happiness did not differ between broadcasts. Thus, these between-

broadcasts results conceptually replicate the previous study's results. See Table 2 for results.

Within-Condition Correlations

Regarding within-broadcast correlations, the key results were replicated. That is, in response to the insulting professor broadcast, anger correlated directly with PA ($r = .45, p < .01$). In addition, PA correlated directly with happiness ($r = .56, p < .01$). Finally, anger did not significantly correlate with happiness ($r = .00, p = .98$) or sadness ($r = .21, p = .21$). PA did not correlate with sadness ($r = .08, p = .65$).

In response to the neutral renovation broadcast, anger correlated directly with sadness ($r = .67, p < .01$) but did not correlate significantly with PA ($r = .23, p = .17$) or happiness ($r = .17, p = .31$). PA correlated with happiness ($r = .77, p < .01$) but not sadness ($r = .30, p = .07$). The three PA subscales did not correlate with anger ($r_s < .28, p_s > .09$) but did correlate directly with happiness ($r_s > .66, p < .01$).

Multiple Regressions

To further examine the relationships among emotions and examine the degree to which anger and PA were correlated without the influence of other variables, we performed regression analyses in which anger, sadness, and happiness were used to predict PA. For the insulting professor broadcast, the overall model was significant, $R^2 = .52, F(3, 33) = 11.70, p < .001$. Moreover, PA was predicted by anger (partial $r = .53, p < .001$) and happiness (partial $r = .63, p < .001$) but not sadness (partial $r = .04, p = .82$).

Additional regressions were conducted in which anger and happiness (or sadness) predicted PA. In the regression with anger and sadness, PA was predicted by anger (partial $r = .44, p < .05$) but not sadness (partial $r = -.02, p > .50$). In the one with anger and happiness, PA was predicted by anger (partial $r = .54, p < .001$) and happiness (partial $r = .63, p < .001$). These results conceptually replicate those of Study 1, and are consistent with the idea that PA taps both positivity and approach motivation, which can be negatively valenced.

The same regression was conducted within the neutral broadcast condition. The overall model was significant, $R^2 = .63, F(3, 33) = 18.76, p < .001$. However, in this condition, only happiness emerged as a significant predictor of PA (partial $r = .77, p < .001$).

Table 2
Study 2: Means, Standard Deviations, and Difference Statistics for Emotions Following Each Broadcast as a Function of Neutral Versus Insulting Broadcast

Emotion	Broadcast		<i>t</i>	<i>d</i>	<i>r</i>
	Renovation	Professor			
Mean (<i>SD</i>) anger	1.38 (1.31)	3.25 (1.87)	5.41	1.16	.50
Mean (<i>SD</i>) sad	0.87 (1.00)	1.27 (1.14)	2.54	0.37	.18
Mean (<i>SD</i>) PA	2.71 (1.52)	3.44 (1.33)	3.02	0.51	.25
Mean (<i>SD</i>) happy	3.03 (2.23)	2.65 (2.03)	1.39	0.18	.09

Note. PA = positive activation.

.001). PA was not significantly predicted by anger (partial $r = -.02$, $p = .91$) or sadness (partial $r = .21$, $p = .23$).

Summary

Results from the current study conceptually replicated results from Study 1 and suggest that the results obtained in Study 1 are not spurious. The present results provide further evidence for the idea that both self-reported anger and PANAS PA scores are directly related to each other. It is important that, in both studies, anger and PA were intercorrelated even more strongly when happiness was in the regression equation, suggesting that pleasant valence may partially suppress the anger and PA relationship.

Study 3

The previous studies provide evidence supportive of the idea that anger manipulations increase PA. In the next study, we examined whether PA would relate to an assessment of anger measured in a different context and response format. In Harmon-Jones et al. (2004) and in the current Studies 1 and 2, anger occurred in response to a manipulated interpersonal insult, and anger was measured using words used in past research on insults and state anger (Harmon-Jones & Sigelman, 2001; Harmon-Jones, Sigelman, Bohlig, & Harmon-Jones, 2003). In the current study, we assessed anger by asking individuals to recall a time they felt really angry and to report their emotional reactions to that event.

PANAS NA was included to measure general negative activation and assess its relationship with anger. NA might relate to anger but not to approach motivation because anger is associated with general negative affect (Berkowitz, 1999, 2000; Watson, 2000), but general NA is not related to approach motivation (Carver & White, 1994). That is, the affect of anger has two subcomponents: a nonspecific component that reflects the contribution of general negative affect (Berkowitz, 1999; Watson, 2000) and a more specific component that reflects the approach motivational character of anger (Harmon-Jones & Sigelman, 2001).

Finally, we included a measure of individual differences in attitudes toward anger (ATA; Harmon-Jones, 2004) to assess whether the relationship between anger and PA could be explained by positive attitudes toward anger. When defining affects as negative or positive, scientists have used one of three bases (Lazarus, 1991). First, an affect can be positive or negative according to the evaluation of the situation that caused the affect. Positive affects occur in response to goal-congruent events, whereas negative affects occur in response to goal-incongruent events. Second, the valence of an affect can be determined by the subjective evaluation of the feeling state. Positive affects feel good and negative affects feel bad. Third, affective valence can be determined by the consequences of the affect; positive affects produce desirable consequences and negative affects produce undesirable consequences. This latter definition is rarely used, whereas the first is used in stimulus-based definitions of emotions (e.g., appraisal theories) and the second is used in response-based definitions of emotions.

In past research, we developed a measure of ATA to assess the subjective evaluation of the anger experience (Harmon-Jones, 2004). After developing a valid and reliable assessment of ATA, we conducted a study to assess whether resting baseline asymmetrical activity related to trait anger and ATA. Relative left frontal

activity related to anger but not ATA. Moreover, partial correlation analyses revealed that the relationship between trait anger and left frontal activity was not due to anger being associated with a positive ATA. Individuals differ in their ATA, such that some individuals report less negative attitudes toward the experience of anger than other individuals. In these studies, means on the 5-point ATA scale hover around 1.5, where 1 is *strongly disagree* and 5 is *strongly agree*. Also, rarely do individuals score greater than 3.0, the midpoint of the scale, confirming that the experience of anger is negatively valenced, although less negative for some individuals than for others. Thus, individuals evaluate anger negatively, but there are individual differences in these evaluations of anger. In the present study, we included this measure of ATA to test whether it explained the relationship between anger and PA. That is, does anger relate to PA because some individuals evaluate anger positively?

Method

Participants were 720 introductory psychology participants who participated in an online study in exchange for course credit. Participants were provided the following instructions: "Please think of a time you were REALLY ANGRY. People often experience a range of feelings when angry. Then, indicate how you felt at that exact time (while you were still really angry) by checking the appropriate response option for each word below." Other participants who reported less than 2 on anger in response to the recalled anger event were removed from analyses (3% of total) because they did not follow instructions to report a time they were really angry.

Anger was measured using the items from Studies 1 and 2. PA and NA were measured using the PANAS (Watson et al., 1988). An additional three anger items (*furious*, *enraged*, *mad*) were included to assess whether the results of Studies 1 and 2 would replicate with other anger words. Happiness was measured using the words *glad*, *content*, *pleasant*, *pleased*, *tranquil*, *well*, *calm*, *good mood*, *joyful*, *satisfied*, and *happy*. All of the emotion measures were completed on the basis of how participants felt during the angry event, and responses to the affect words were given on a 5-point scale (1 = *very slightly or not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, and 5 = *extremely*). Because NA contains two anger words (*irritated* and *hostile*) that are on the anger measure, these items were removed from the NA composite.

The affect words were subjected to a maximum-likelihood factor analysis with varimax rotation. Four factors had eigenvalues greater than 1.0. Inspection of factor loadings revealed that the expected structure was for the most part supported. All PA items loaded on one factor ($> .49$; Cronbach's alpha = .84), all anger items loaded on another factor ($> .57$; Cronbach's alpha = .78), and all happy items loaded on a factor ($> .59$; Cronbach's alpha = .94). For these items, no cross-loadings emerged. In contrast, the NA items did not all load on the same factor. *Afraid*, *scared*, *nervous*, *guilty*, and *ashamed* loaded on one factor ($> .45$; Cronbach's alpha = .80), *upset* loaded on the Anger factor and did not cross-load (.55, with all other loadings $< .17$), and *distressed* (.32 and .41) and *jittery* (.33 and .34) cross-loaded on NA and Anger. As expected, *hostile* and *irritated*, which are part of the NA scale, loaded only on the Anger factor ($> .60$, with other loadings $< .14$). To be consistent with our previous studies and facilitate

comparisons with them, we used the 5-item Anger scale of past studies to measure anger. Also, we used the 8-item NA scale (Cronbach's $\alpha = .77$), but we also report results with the 5-item NA scale (assessed with the 5 NA items that loaded strongly on one factor). We refer to this latter scale as *NA Fear* because of its items. A similar factor analysis was performed on the original 10-item NA only. It revealed a structure similar to the above analysis, with some items loading on a Fear factor, some on an Anger factor, and some cross-loading between these two factors.

Results and Discussion

Emotion Differences

Participants reported relatively high levels of anger ($M = 4.00$, $SD = 0.70$) and fury ($M = 4.00$, $SD = 0.89$), moderate levels of PA ($M = 2.86$, $SD = 0.77$) and NA ($M = 2.66$, $SD = 0.69$), and relatively low levels of fear ($M = 2.19$, $SD = 0.83$) and happiness ($M = 1.46$, $SD = 0.67$). As expected, anger and fury were more intense than all other emotions, $t_s > 27.57$, $p_s < .001$, $d_s > 1.36$, effect size $r_s > .56$. In addition, PA was more intense than NA, happiness, and fear, $t_s > 5.10$, $p_s < .001$, $d_s > 0.27$, effect size $r_s > .14$.² The mean and standard deviation for ATA were $M = 2.04$, $SD = 0.67$.

Correlations

As shown in Table 3, PA correlated directly with anger and happiness. Anger correlated inversely with happiness. In addition, anger correlated directly with the eight-item NA scale, presumably because of the NA items that cross-loaded with the Anger factor. Consistent with this idea, anger was not significantly associated with NA as measured by the five-item NA Fear scale, which did not contain any cross-loading items.

The new anger items (*furious*, *enraged*, and *mad*) correlated highly with the Anger scale from previous studies. This new anger index was correlated with all other indices in directions and magnitudes similar to the Anger scale, suggesting that the observed relationships with anger generalize to a wider range of anger words.

ATA correlated directly with PA and happiness but inversely with anger. These bivariate relationships suggest that individuals

who have relatively more positive attitudes toward anger feel more PA and happiness but less anger when in an angering situation.

Multiple Regressions

Because of the interrelationships among emotions and because of our prediction that PA involves both pleasantness and approach motivation (which can be negative), we conducted a regression analysis in which all emotions predicted PA. The overall model was significant, $R^2 = .24$, $F(3, 716) = 74.47$, $p < .001$. PA was predicted by anger (partial $r = .31$, $p < .001$) and happiness (partial $r = .48$, $p < .001$) but not NA ($p > .23$). When just happiness and anger were used to predict PA, anger became a stronger predictor of PA (partial $r = .31$, $p < .001$). As in the previous studies, when happiness was entered into the equation with anger and PA, the anger-PA relationship increased. These results suggest, consistent with our interpretation, that PA is tapping both pleasantness and approach motivation, and that happiness works as a suppressor in the relationship of PA and anger.

To further test whether the PA and anger relationship was due to a positive attitude toward angry experiences, we performed a regression analysis in which PA was predicted by anger and ATA. Results revealed that both anger and ATA independently and directly predicted PA. The overall model was significant, $R^2 = .05$, $F(2, 717) = 19.60$, $p < .001$. PA was predicted by anger (partial $r = .13$, $p < .001$) and ATA (partial $r = .20$, $p < .001$).

Adding happiness to the above model caused ATA to become a nonsignificant predictor (partial $r = .04$, $p = .34$). In this analysis, the overall model was significant, $R^2 = .24$, $F(3, 716) = 74.26$, $p < .001$. PA was predicted by anger (partial $r = .31$, $p < .001$) and happiness (partial $r = .44$, $p < .001$). An additional regression analysis tested whether ATA and anger interacted to predict PA; it was not significant, $p > .30$. These results suggest that ATA was related to PA because of its association with happiness. In other words, individuals who report being more happy while angry have relatively more positive attitudes toward anger. More important, anger continued to be a significant predictor of PA when controlling for ATA.

Study 4

Study 4 was designed to replicate Study 3 and also investigate whether the results were due to undifferentiated or nonvalenced arousal. That is, PA may relate to anger because they are both related to undifferentiated or nonvalenced arousal, measured by words such as *aroused* or *stimulated*. However, when arousal words are used to measure emotional reactions to specific emotional situations, the words are often found to correlate with pleasantness (Amodio, Harmon-Jones, & Devine, 2003). Similarly, Watson et al. (1999) found that arousal words aligned more closely with pleasantness than unpleasantness in a circumplex model. Thus, we might expect arousal words to relate to both anger and PA but to more strongly relate with PA than anger. Most important, we expected that anger and PA would remain correlated even when statistically controlling for arousal.

A second purpose of Study 4 was to reexamine the ideas concerning the positivity of anger using a different measure of ATA. Whereas Study 3 used a trait measure of ATA, Study 4 asked individuals to report their attitudes toward anger as they

Table 3
Study 3: Correlations Among Variables

Variable	PA	NA	NA5	Anger	Fury	Happy
NA	.05					
NA5	.01	.91***				
Anger	.10**	.25***	.00			
Fury	.12**	.16***	-.05	.77***		
Happy	.40***	.01	.15***	-.39***	-.40***	
ATA	.19***	-.06	-.01	-.13***	-.07	.38***

Note. PA = positive activation; NA = negative activation without hostile and irritable; NA5 is the five-item NA measure derived from factor analysis comprising fear items; ATA = attitudes toward anger.
** $p < .01$. *** $p < .001$.

recalled a time they felt intense anger. This was done to further explore whether ATA could explain the relationship of anger and PA. As such, Study 4 includes a state measure of ATA.

Method

The methods of Study 4 were identical to those used in Study 3 except for three changes. First, the words *aroused* and *stimulated*, selected from previous measures of subjective arousal (Bradley & Lang, 1994; Mehrabian & Russell, 1974), were added to the list of emotion words. Second, ATA was measured in a state rather than trait format. Third, another state anger measure was added, the State Anger scale from the State-Trait Anger Expression Inventory—2 (STAXI-2; Spielberger, 1999). The STAXI-2 State Anger scale was created to measure situationally determined anger, and it contains items such as “I am furious” and “I feel like swearing.” It is answered on a 4-point scale (1 = *not at all*, 2 = *somewhat*, 3 = *moderately so*, and 4 = *very much so*). Cronbach’s alphas were PA = .84, NA = .73, STAXI-2 State Anger = .92, ATA = .87, our anger scale = .88, our happiness scale = .94, our arousal scale = .67, and NA fear = .82.

Participants were 260 introductory psychology students who received course credit for completing the study. Other participants who scored less than 2 on anger in response to the recalled anger event were removed from analyses (3.8%) because they did not follow instructions correctly by reporting a time when they were intensely angry.

Results and Discussion

Emotion Differences

Participants reported relatively high levels of anger ($M = 3.93$, $SD = 0.75$); moderate levels of PA ($M = 2.79$, $SD = 0.74$), NA ($M = 2.54$, $SD = 0.62$), and arousal ($M = 2.68$, $SD = 1.10$); and relatively low levels of fear ($M = 2.09$, $SD = 0.77$) and happiness ($M = 1.44$, $SD = 0.69$). As expected, anger was more intense than all other emotions, $t_s > 18.25$, $p_s < .001$, $d_s > 1.53$, effect size $r_s > .60$. In addition, PA was more intense than NA, happiness, and fear, $t_s > 4.34$, $p_s < .001$, $d_s > 0.37$, effect size $r_s > .18$, but not different from arousal, $t = 1.80$, $p = .07$.² The means and standard deviations for STAXI-2 state anger and state ATA were, respectively, $M = 3.00$, $SD = 0.55$, and $M = 2.05$, $SD = 0.65$.

Correlations

As revealed in Table 4, the correlational results of the previous study were replicated. Moreover, arousal correlated directly with PA, happiness, and anger, but it did not correlate with NA. The direct correlation of arousal with happiness but not NA is consistent with past results suggesting that arousal words tend to be positively valenced and not undifferentiated (Amodio et al., 2003; Watson et al., 1999). Indeed, that is perhaps part of the reason the PA scale is referred to as positive. Of course, arousal as a biological measure is related to both active positive and negative emotional states (Lang, 1995), but past research suggests the words used to describe arousal have positive connotations. A factor analysis revealed that *aroused* and *stimulated* loaded on the PA factor.

Multiple Regressions

A regression analysis in which anger, arousal, and happiness were used to predict PA revealed that all three predictors uniquely explained variance in PA. For our state anger items, the overall model was significant, $R^2 = .31$, $F(3, 256) = 38.48$, $p < .001$. PA was predicted by anger (partial $r = .23$, $p < .01$), happiness (partial $r = .32$, $p < .01$), and arousal (partial $r = .36$, $p < .01$). In other words, anger and PA continued to be directly related even when controlling for arousal and happiness. Like PA, the arousal words tap both pleasure and approach motivation, and when the pleasantness is removed by using happiness, the results support our interpretation of the anger and PA relationship.

A similar regression analysis was conducted in which our anger index was replaced by the STAXI-2 State Anger scale. The overall model was significant, $R^2 = .31$, $F(3, 256) = 37.54$, $p < .001$. PA was predicted by STAXI-2 State Anger (partial $r = .21$, $p < .01$), happiness (partial $r = .28$, $p < .01$), and arousal (partial $r = .41$, $p < .01$). In addition, when just happiness and anger were used to predict PA, as in previous studies, anger became a stronger predictor of PA (for our anger items, partial $r = .37$, $p < .001$; for the STAXI-2, partial $r = .31$, $p < .001$).

To further test whether the PA-anger relationship was due to a positive attitude toward angry experiences, we performed a regression analysis in which PA was predicted by anger and ATA. Results revealed that both anger and ATA independently and directly predicted PA. The overall model was significant, $R^2 =$

Table 4
Study 4: Correlations Among Variables

Variable	PA	NA	NA5	Arousal	Anger	State anger	Happy
NA	.07						
NA5	.00	.89***					
Arousal	.48***	.11	-.05				
Anger	.14*	.19**	-.11	.25***			
State anger	.22***	.09	-.08	.23***	.58***		
Happy	.28***	.09	.29***	.17**	-.57***	-.24***	
ATA	.18**	-.04	.05	.19**	-.17**	.10	.43***

Note. PA = positive activation; NA = negative activation without hostile and irritable; NA5 is the five-item NA measure derived from factor analysis comprising fear items; ATA = attitudes toward anger.
* $p < .05$. ** $p < .01$. *** $p < .001$.

.06, $F(2, 257) = 8.47, p < .001$. PA was predicted by anger (partial $r = .17, p < .001$) and ATA (partial $r = .21, p < .001$). Adding happiness to this model caused ATA to become a nonsignificant predictor (partial $r = .03, p = .61$). In this analysis, the overall model was significant, $R^2 = .21, F(3, 256) = 22.35, p < .001$. PA was predicted by anger (partial $r = .37, p < .001$) and happiness (partial $r = .39, p < .001$). An additional regression analysis tested whether ATA and anger interacted to predict PA; it was not significant, $p > .30$. Similar results emerged with the STAXI-2 State Anger measure: In the regression with ATA alone, anger predicted PA (partial $r = .21, p < .01$); in the regression with happiness and ATA, anger predicted PA (partial $r = .30, p < .001$). Additional regressions tested whether ATA and anger interacted to predict PA; they were not significant, $ps > .30$. These results suggest that ATA was related to PA because of its association with happiness. In other words, individuals who report being more happy while angry have relatively more positive attitudes toward anger. More important, anger continued to be a significant predictor of PA when controlling for ATA.

General Discussion

The present studies suggest that experience of anger includes PANAS PA during responses to anger-evoking events. We suggest that these results indicate that PA taps positivity as well as approach motivation, and this approach-motivated affect can occur in negative situations. According to the conceptual model guiding the PANAS development and research, anger is a negative affect and should be associated with NA and not PA (Watson, 2000). The present results, however, are not in accord with this model. Instead, our results are congruent with evidence suggesting that anger and PANAS PA are associated with approach motivation.

Is Anger a Positive Affect?

The increase in PA and anger following an insult may lead one to wonder whether anger is experienced as a positive feeling. The results from the present studies do not support such an interpretation. Within the angering situations and conditions, anger and happiness were negatively correlated, whereas PA and anger were positively correlated. Moreover, anger was positively correlated with some negative affects. Past research on the positivity of the feeling or attitude toward anger revealed that mean attitudes toward anger were quite negative and no participants indicated that they liked anger (Harmon-Jones, 2004). Attitudes toward anger do not explain the relationship of anger with approach motivation indices (Harmon-Jones, 2004). Studies 3 and 4 of the current package concur with these past results, and show that attitudes toward anger do not explain the relationship between anger and PA. In the factor analyses of the present studies, anger loaded on a separate factor from other negative affects. Instead of suggesting that this result indicates that anger is not negative, we would suggest that anger loads on different factors than sadness (Study 1) and fear (Studies 3 and 4) because these other negative emotions are associated with different motivational orientations, with fear reflecting withdrawal and sadness reflecting low approach or withdrawal. Thus, anger may bear some similarity to certain positive affects, but this similarity is not due to anger being felt as positive.

Rather the similarity lies in the association with approach motivation of some indices of positive affect as well as anger.³

Considering Alternative Explanations

Some reviewers have suggested that because anger manipulations increase arousal, the increase in PA following the anger manipulation may be due to arousal per se. We evaluated this explanation in Study 4 by using the arousal terms *aroused* and *stimulated*, and found that responses to these words were more highly correlated with PA. Also, regression analyses suggested that even when controlling for these arousal terms, anger significantly predicted PA. In addition, in Studies 3 and 4, the fear-related NA index, which emerged from factor analyses, did not relate to anger. If anger was related to PA only because of nonvalenced arousal, anger should have also been related to fear, but it was not.

Similarly, one reviewer suggested that increases in fear, which is often placed near anger in circumplex models, might cause an increase in PA, and therefore our results are not due to approach motivation. Anger and fear are similar in that both are high arousal and negative, but they are different in that fear is related to withdrawal motivation, whereas anger is related to approach motivation. If PA is approach related, as we believe our results suggest, then fear should not cause increased PA. Our regression results in which NA, which is mostly composed of fear-related words, was entered with anger to predict PA revealed that only anger predicted PA. Moreover, when only the fear-related NA items that did not cross-load on other factors were used as an index in Studies 3 and 4, this fear index did not correlate significantly with anger.

If other arousing situations, particularly fear- or withdrawal-oriented ones, evoke more NA but less or no change in PA, then the concern about arousal for our present studies would not hold. Other experiments have also found that arousing withdrawal-oriented manipulations cause an increase in NA but no change or a decrease in PA. For example, Gadea, Gomez, González-Bono, Espert, and Salvador (2005) found that a negative affect induction (Velten statements concerned with low self-esteem and pessimism) caused an increase in NA and a decrease in PA. These effects were accompanied by an increase in cortisol. Moreover, NA and PA were inversely correlated after negative affect was induced but not when participants were in a neutral state. Bogdan and Pizzagalli (2006) found a threat-of-electric-shock manipulation to cause increases in self-reported anxiety and NA but no effect on PA. Schneider (2004) found that appraisals of threat in response to a math task directly related to NA but inversely with PA, whereas appraisals of challenge in response to the same task related directly to PA but inversely with NA. Mendes, Blascovich, Major, and Seery (2001) found that participants reported more PA

³ Occasionally, we are asked whether anger would be associated with withdrawal motivation in some cases (e.g., in response to a large, potentially lethal antagonist). We have investigated this issue and found that it is very difficult to arouse this type of anger in the laboratory. However, when it is aroused, it is mixed with anxiety and fear (Zinner, Brodish, Devine, & Harmon-Jones, 2008). Therefore, we would suggest that withdrawal motivation would only occur along with anger when the withdrawal-oriented emotion of fear or anxiety was also evoked.

following downward social comparisons than upward social comparisons. In contrast, participants reported more NA following upward social comparisons than downward social comparisons. Kahn, Tobin, Massey, and Anderson (2007) found that relative to a neutral film, a comedy film increased PA, whereas a funeral film increased NA. Cavallo and Pinto (2001) found that a film showing domestic violence caused greater NA but no effects on PA. In addition, when individuals with social phobia anticipated giving a public speech, they showed increased self-reported NA and anxiety, relatively greater right frontal cortical activation, and increased heart rate. They also showed decreased PA (Davidson, Marshall, Tomarken, & Henriques, 2000). Further showing the separation of PA and NA during "arousing" situations, Heponiemi, Ravaja, Elovainio, Näätänen, and Keltikangas-Järvinen (2006) found that participants experienced the highest levels of PA during a challenging mental arithmetic task and the lowest levels during a startle noise task, but they experienced the highest levels of NA during the startle task and lowest levels during the mental arithmetic task. Taken together, these experiments suggest that arousing, withdrawal-motivating situations increase NA but decrease or do not change PA. If PA were merely associated with undifferentiated arousal, then these studies should have found PA to increase in response to the withdrawal-motivating situations. That the studies do not support our contention that PA is associated with anger not because of undifferentiated arousal but instead because of approach motivation.

In addition, when PA, NA, anger, and arousal constructs are considered along with past research on physiological and behavioral aspects of approach and withdrawal motivation (reviewed earlier), we believe that the most accurate explanation for the current studies is that PA is correlated with anger because both are associated with approach motivation.

Interpreting the Relationship of PA and Anger

In discussing the present results with other colleagues, we have encountered a number of reactions. One is that our results help explain why some of their past affect manipulations failed to produce effects on PANAS PA. Thinking of PA as a measure of both positivity and approach motivation may help explain why PA may not be affected by all affect manipulations; for instance, a positive, postgoal, low approach manipulation may not arouse PA.

Another comment is of the form, "It appears that anger is more strongly related to negative affect than positive affect. Doesn't this suggest that you are wrong about the association between anger and PA? After all, anger is a negative affect and PA measures positive affect." To this, we respond that, yes, anger is a negative affect, but the present results show that it is related to PANAS PA. PA is a measure, not a construct. Based on the results of our studies, we suggest that PA does not solely assess positive feelings. PA was directly associated with anger and happiness, whereas anger was inversely associated with happiness. Thus, PA, as a measure, is related to some measures of positive feelings, but it is also related to measures of approach motivation, even when the approach motivation has a negative tone as in angry situations.

We have also heard that the present results are obvious. "Obviously, angry people feel more determined, alert, proud, and strong." In addition to wanting the individuals who raise this concern to talk with the ones who raise the second concern, we

respond that we know of no other published research showing these effects. Also, we believe that our current effects, although perhaps obvious to some individuals, are probably not obvious to individuals who believe that the PANAS PA scale only assesses positive feelings. For instance, many prominent theories of affect would not predict PA to be directly related to anger, but would instead predict PA to be inversely correlated with anger, a negative affect, during an angry episode. As Watson (2000, p. 27) noted in discussing the PANAS, "Specifically, extremely high levels of one type of mood tend to be associated with extremely low levels of the other. . . . Put another way, extremely high levels of negative mood are largely incompatible with high levels of positive mood, and vice versa. . . ." Research has supported these ideas with the PANAS measure, by revealing that stressful, withdrawal-oriented events caused an inverse correlation between PA and NA scales that are uncorrelated otherwise (e.g., Gadea et al., 2005; Zautra, Potter, & Reich, 1998). However, as much research has revealed, anger is very different from negative affects such as fear, which are primarily tapped by the NA of the PANAS.

A final concern voiced regards the size of the effect of anger on PA. In the experiments, effect size *ds* ranged from 0.26 to 0.51. Simple correlations ranged from .10 to .45. The anger-PA relationship increased from this low correlation of .10 to .31 when happiness was controlled, consistent with the idea that PA taps both positive valence and approach motivation, and when positivity is controlled, the PA-anger relationship increases because they share approach motivation. These results, together with the replicability of the findings across five studies (the present four and Harmon-Jones et al., 2004), suggest that the observed effects are meaningful and likely important. Self-reports of affective experience are imperfect measures, and observing replicable correlations between anger and PA measures when they relate in opposing directions to social desirability and implicit theories of affective experience, in our humble opinion, is impressive and may improve the theoretical understanding of affective experience.

Implications and Benefits of the Current Research

The research on the PANAS is vast, and it has been used to increase understanding of a number of outcomes. However, the dominant conceptual explanation of the PA scale was originally that it tapped positive affect. More recently, the conceptual model was revised to suggest that the PA scale taps positive activation or pleasurable engagement. The results of the present studies suggest, however, that the scale also taps approach motivation that is negative in valence. Thus, the conceptual model of the PA scale needs to be revised to indicate that the scale taps approach motivation that can be positive or negative in valence.

We are not suggesting that a focus on positive versus negative affect be replaced by a focus on approach versus withdrawal motivation. We are merely suggesting that motivational direction be considered separate from affective valence. Moreover, incorporation of motivational direction as a separate dimension (in addition to affective valence) may yield a more complete understanding of affective phenomena (Gable & Harmon-Jones, 2008).

In addition to affirming the importance of viewing valence and motivational direction as separable dimensions within emotions, the present research suggests that the factor structure of subjective emotional experience may differ dramatically depending on

whether tonic mood versus affect in response to a specific eliciting event is assessed. Past tonic mood research has suggested that the negative affect subscale of the PANAS is composed of one factor. However, the present research suggested that when anger is aroused, NA splits into at least two factors, one that assesses anger and another that assesses fear. Along similar lines, the present research suggests that the meaning of affect words may change depending on the context in which affect is aroused. The PA aroused in an anger situation may have different meanings from the PA aroused in an achievement situation.

Practically speaking, the current work suggests that using the PANAS PA as a measure of positive affect without inclusion of other measures is unwarranted. Currently, much research in clinical, social, and personality psychology uses the PANAS as a measure of positive and negative affect. However, this practice could be problematic, as we have shown that a clearly negative situation, such as an angering one, can increase PA.

Conclusion

The present studies suggest that a consideration of motivational direction in examinations of emotions is vital. The research also suggests the importance of continued study of the emotion of anger, as it, unlike many other negative emotions, often evokes approach motivation. Moreover, continued study of anger will not only enrich our understanding of emotion theories, but enhance our understanding of one of society's most harmful emotive states.

The present research suggests that a complete understanding of the structure and function of affects requires examination of the relationships among affects and other measures during situations where specific affects are evoked. Past research with the PANAS has not found anger words to correlate with PA, but in this past research, affective experience was measured as participants were in relatively low affect situations and reflected back on how they have felt over long periods of time. These measurement formats may reveal important information, but they are not likely to reveal the full picture of how affects relate with each other and function to produce behavior. Emotion theorists posit that negative affective states have short durations (E. K. Gray & Watson, 2007). Thus, it may be necessary to evoke these affective states in order to assess them. At a minimum, it may be necessary to ask participants to recall specific instances of those states.

We do not want to suggest that anger is unique in being approach-related and hedonically negative. Although approach motivations and positive emotions are often confounded, there may be many unpleasant approach situations. Unrequited love, like intense hunger, may be a highly unpleasant approach state. By the same token, withdrawal-related emotions may exist that are positive. A theoretical approach to emotion that takes into account approach and withdrawal, rather than only positivity and negativity, may improve our understanding of emotion and how it relates to cognition and behavior (see also Carver & Harmon-Jones, in press).

We end by suggesting that motivational direction needs to be considered seriously in emotion theory and research. Positive valence is not equivalent to approach motivation. The present studies provide strong support for such a claim by showing that one of the most widely used measures of positive affect, which has been found to be related to approach motivation, does not inevi-

tably measure positivity. The present studies show that it taps approach motivation, which can be negative.

References

- Amodio, D. M., Harmon-Jones, E., & Devine, P. G. (2003). Individual differences in the activation and control of affective race bias as assessed by startle eyeblink responses and self-report. *Journal of Personality and Social Psychology, 84*, 738–753.
- Amodio, D. M., Master, S. L., Yee, C. M., & Taylor, S. E. (2008). Neurocognitive components of the behavioral inhibition and activation systems: Implications for theories of self-regulation. *Psychophysiology, 45*, 11–19.
- Berkowitz, L. (1999). Anger. In T. Dalgleish & M. J. Power (Eds.), *Handbook of cognition and emotion* (pp. 411–428). New York: Wiley.
- Berkowitz, L. (2000). *Studies in emotion and social interaction*. New York: Cambridge University Press.
- Blanchard, D. C., & Blanchard, R. J. (1984). Affect and aggression: An animal model applied to human behavior. In R. J. Blanchard & D. C. Blanchard (Eds.), *Advances in the study of aggression* (Vol. 1, pp. 1–62). New York: Academic Press.
- Bogdan, R., & Pizzagalli, D. A. (2006). Acute stress reduces reward responsiveness: Implications for depression. *Biological Psychiatry, 60*, 1147–1154.
- Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry, 25*, 49–59.
- Buss, A. H., & Perry, M. (1992). The Aggression Questionnaire. *Journal of Personality and Social Psychology, 63*, 452–459.
- Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1999). The affect system has parallel and integrative processing components: Form follows function. *Journal of Personality and Social Psychology, 76*, 839–855.
- Carver, C. S. (2004). Negative affects deriving from the behavioral approach system. *Emotion, 4*, 3–22.
- Carver, C. S. & Harmon-Jones, E. (in press). Anger is an approach-related affect: Evidence and implications. *Psychological Bulletin*.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67*, 319–333.
- Cavallo, D. A., & Pinto, A. (2001). Effects of mood induction on eating behavior and cigarette craving in dietary restrainers. *Eating Behaviors, 2*, 113–127.
- Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100*, 316–336.
- Darwin, C. (1965). *The expressions of the emotions in man and animals*. New York: Oxford University Press. (Original published 1872).
- Davidson, R. J., Marshall, J. R., Tomarken, A. J., & Henriques, J. B. (2000). While a phobic waits: Regional brain electrical and autonomic activity in social phobics during anticipation of public speaking. *Biological Psychiatry, 47*, 85–95.
- d'Alfonso, A. A. L., van Honk, J., Hermans, E., Postma, A., & de Haan, E. H. F. (2000). Laterality effects in selective attention to threat after repetitive transcranial magnetic stimulation at the prefrontal cortex in female subjects. *Neuroscience Letters, 280*, 195–198.
- Depue, R. A., & Iacono, W. G. (1989). Neurobehavioral aspects of affective disorders. *Annual Review of Psychology, 40*, 457–492.
- Egloff, B., Schmukle, S. C., Burns, L. R., Kohlmann, C.-W., & Hock, M. (2003). Facets of dynamic positive affect: Differentiating joy, interest, and activation in the Positive and Negative Affect Schedule (PANAS). *Journal of Personality and Social Psychology, 85*, 528–554.
- Fowles, D. C. (1993). Biological variables in psychopathology: A psychological perspective. In P. B. Sutker & H. E. Adams (Eds.), *Compre-*

- hensive handbook of psychopathology* (2nd ed., pp. 57–82). New York: Plenum Press.
- Gable, P. A., & Harmon-Jones, E. (2008). Approach-motivated positive affect reduces breadth of attention. *Psychological Science, 19*, 476–482.
- Gadea, M., Gómez, C., González-Bono, E., Espert, R., & Salvador, A. (2005). Increased cortisol and decreased right ear advantage (REA) in dichotic listening following a negative mood induction. *Psychoneuroendocrinology, 30*, 129–138.
- Gray, E. K., & Watson, D. (2007). Assessing positive and negative affect via self-report. In J. A. Coan & J. J. B. Allen (Eds.), *Handbook of emotional elicitation and assessment* (pp. 171–183). New York: Oxford University Press.
- Gray, J. A. (1990). Brain systems that mediate both emotion and cognition. *Cognition & Emotion, 4*, 269–288.
- Green, D. P., Goldman, S. L., & Salovey, P. (1993). Measurement error masks bipolarity in affect ratings. *Journal of Personality and Social Psychology, 64*, 1029–1041.
- Harmon-Jones, E. (2003). Anger and the behavioral approach system. *Personality and Individual Differences, 35*, 995–1005.
- Harmon-Jones, E. (2004). On the relationship of anterior brain activity and anger: Examining the role of attitude toward anger. *Cognition and Emotion, 18*, 337–361.
- Harmon-Jones, E. (2006). Unilateral right-hand contractions cause contralateral alpha power suppression and approach motivational affective experience. *Psychophysiology, 43*, 598–603.
- Harmon-Jones, E., Abramson, L. Y., Sigelman, J., Bohlig, A., Hogan, M. E., & Harmon-Jones, C. (2002). Proneness to hypomania/mania or depression and asymmetrical frontal cortical responses to an anger-evoking event. *Journal of Personality and Social Psychology, 82*, 610–618.
- Harmon-Jones, E., & Allen, J. J. B. (1997). Behavioral activation sensitivity and resting frontal EEG asymmetry: Covariation of putative indicators related to risk for mood disorders. *Journal of Abnormal Psychology, 106*, 159–163.
- Harmon-Jones, E., & Allen, J. J. B. (1998). Anger and prefrontal brain activity: EEG asymmetry consistent with approach motivation despite negative affective valence. *Journal of Personality and Social Psychology, 74*, 1310–1316.
- Harmon-Jones, E., & Sigelman, J. (2001). State anger and prefrontal brain activity: Evidence that insult-related relative left prefrontal activation is associated with experienced anger and aggression. *Journal of Personality and Social Psychology, 80*, 797–803.
- Harmon-Jones, E., Sigelman, J. D., Bohlig, A., & Harmon-Jones, C. (2003). Anger, coping, and frontal cortical activity: The effect of coping potential on anger-induced left frontal activity. *Cognition and Emotion, 17*, 1–24.
- Harmon-Jones, E., Vaughn-Scott, K., Mohr, S., Sigelman, J., & Harmon-Jones, C. (2004). The effect of manipulated sympathy and anger on left and right frontal cortical activity. *Emotion, 4*, 95–101.
- Hemenover, S. H. (2003). Individual differences in rate of affect change: Studies in affective chronometry. *Journal of Personality and Social Psychology, 85*, 121–131.
- Heponiemi, T., Ravaja, N., Elovainio, M., Näätänen, P., & Keltikangas-Järvinen, L. (2006). Experiencing positive affect and negative affect during stress: Relationships to cardiac reactivity and to facial expressions. *Scandinavian Journal of Psychology, 47*, 327–337.
- Jacobs, G. D., & Snyder, D. (1996). Frontal brain asymmetry predicts affective style in men. *Behavioral Neuroscience, 110*, 3–6.
- Jensen-Campbell, L. A., Knack, J. M., Waldrip, A. M., & Campbell, S. D. (2007). Do Big Five personality traits associated with self-control influence the regulation of anger and aggression? *Journal of Research in Personality, 41*, 403–424.
- Kahn, J. H., Tobin, R. M., Massey, A. E., & Anderson, J. A. (2007). Measuring emotional expression with the Linguistic Inquiry and Word Count. *American Journal of Psychology, 120*, 263–286.
- Lang, P. J. (1995). The emotion probe—Studies of motivation and attention. *American Psychologist, 50*, 372–385.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1990). Emotion, attention, and the startle reflex. *Psychological Review, 97*, 377–395.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1992). A motivational analysis of emotion–reflex cortex connections. *Psychological Science, 3*, 44–49.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1998). Emotion, motivation, and anxiety: Brain mechanisms and psychophysiology. *Biological Psychiatry, 44*, 1248–1263.
- Larsen, J. T., McGraw, A. P., & Cacioppo, J. T. (2001). Can people feel happy and sad at the same time? *Journal of Personality and Social Psychology, 81*, 684–696.
- Lazarus, R. S. (1991). *Emotion and adaptation*. New York: Oxford University Press.
- Lewis, M., Alessandri, S. M., & Sullivan, M. W. (1990). Violation of expectancy, loss of control, and anger expressions in young infants. *Developmental Psychology, 26*, 745–751.
- Lewis, M., Sullivan, M. W., Ramsay, D. S., & Alessandri, S. M. (1992). Individual and anger and sad expressions during extinction: Antecedents and consequences. *Infant Behavior and Development, 15*, 443–452.
- Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. Cambridge, MA: MIT Press.
- Mendes, W. B., Blascovich, J., Major, B., & Seery, M. (2001). Challenge and threat responses during downward and upward social comparisons. *European Journal of Social Psychology, 31*, 477–497.
- Peterson, C. K., Gable, P., & Harmon-Jones, E. (2008). Asymmetrical frontal ERPs, emotion, and behavioral approach/inhibition sensitivity. *Social Neuroscience, 3*, 113–124.
- Plutchik, R. (1980). *Emotion: A psychoevolutionary synthesis*. New York: HarperCollins.
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39*, 1161–1178.
- Russell, J. A., Lewicka, M., & Niit, T. (1989). A cross-cultural study of a circumplex model of affect. *Journal of Personality and Social Psychology, 57*, 848–856.
- Schmeichel, B. J., Vohs, K. D., & Baumeister, R. F. (2003). Intellectual performance and ego depletion: Role of the self in logical reasoning and other information processing. *Journal of Personality and Social Psychology, 85*, 33–46.
- Schneider, T. R. (2004). The role of neuroticism on psychological and physiological stress responses. *Journal of Experimental Social Psychology, 40*, 795–804.
- Smits, D. J. M., & Kuppens, P. (2005). The relations between anger, coping with anger, and aggression, and the BIS/BAS system. *Personality and Individual Differences, 39*, 783–793.
- Spielberger, C. D. (1999). *STAXI-2: State-Trait Anger Expression Inventory—2, Professional manual*. Lutz, FL: Psychological Assessment Resources.
- Sutton, S. K., & Davidson, R. J. (1997). Prefrontal brain asymmetry: A biological substrate of the behavioral approach and inhibition systems. *Psychological Science, 8*, 204–221.
- Tomarken, A., Davidson, R. J., Wheeler, R. E., & Doss, R. C. (1992). Individual differences in anterior brain asymmetry and fundamental dimensions of emotion. *Journal of Personality and Social Psychology, 62*, 676–687.
- Tomarken, A. J., Davidson, R. J., Wheeler, R. E., & Kinney, L. (1992). Psychometric properties of resting anterior EEG asymmetry: Temporal stability and internal consistency. *Psychophysiology, 29*, 576–592.
- Updegraff, J. A., Gable, S. L., & Taylor, S. E. (2004). What makes experiences satisfying? The interaction of approach–avoidance motivations and emotions in well-being. *Journal of Personality and Social Psychology, 86*, 496–504.
- Urry, H. L., Nitschke, J. B., Dolski, I., Jackson, D. C., Dalton, K. M.,

- Mueller, C. J., et al. (2004). Making a life worth living. Neural correlates of well-being. *Psychological Science*, *15*, 367–372.
- van Honk, J., & Schutter, D. J. L. G. (2006). From affective valence to motivational direction: The frontal asymmetry of emotion revised. *Psychological Science*, *17*, 963–965.
- Watson, D. (2000). *Mood and temperament*. New York: Guilford Press.
- Watson, D., & Clark, L. A. (1994). *The PANAS-X: Manual for the Positive and Negative Affect Schedule—Expanded form*. Unpublished manuscript.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063–1107.
- Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1999). The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology*, *76*, 820–838.
- Wildschut, T., Sedikides, C., Arndt, J., & Routledge, C. (2006). Nostalgia: Content, triggers, functions. *Journal of Personality and Social Psychology*, *91*, 975–993.
- Zautra, A. J., Potter, P. T., & Reich, J. W. (1998). The independence of affects is context-dependent: An integrative model of the relationship between positive and negative affect. In K. W. Schaie, & M. P. Lawton (Eds.), *Penn State Conference on Emotion and Aging, October 1996, State College, PA* (pp. 75–103). New York: Springer Publishing Co.
- Zinner, L., Brodish, A., Devine, P. G., & Harmon-Jones, E. (2008). Anger and asymmetrical frontal cortical activity: Evidence for an anger-withdrawal relationship. *Cognition and Emotion*, *22*, 1081–1093.

Appendix

Professor Broadcast Used in Study 1 and Study 2

I have been a professor for over 30 years. As I'm sure you can imagine, I have had dealings with thousands of students at this university and consider myself an expert on students that have come through here in the last couple of decades. I would like to speak about the current proposal to continue decreasing graduation requirements.

I'll get right to the point. Maybe what I say seems arrogant and it certainly will seem old-fashioned, but frankly, in many areas, the current 20-something generation just doesn't seem to be as good as previous generations. Some people in their 20s think that they are better than the rest, but they are just fooling themselves. This generation isn't at all interested in what's going on in the world, unless something is happening that can affect their lives directly. Also, I think that, nowadays, people in their 20s are not as motivated as the young people used to be in the past. People in their 20s just want to take the easy way out and if they have a choice, do as little work as they can—be that in their courses or out in the work force. Or they put off for tomorrow work that they should be doing today. So I think that this 20-something generation is only willing to put in the minimal effort it takes, in general, and especially when it comes to fulfilling the requirements to graduate from this university, earning an advanced degree, or performing in the work world.

All this comes at a time when grade inflation is widespread, when students are receiving better grades than they deserve and then getting jobs for which they are under-qualified. If students don't receive As or Bs in my classes, they come whining to me and demand a higher grade. In reality, the quality of their work barely reaches the C level. There has been a definite decline in exam scores and term papers by students. I have talked to my colleagues about this issue and they are

also dissatisfied with students' performances. Furthermore, from what I hear from my friends in the community, the current crop of people in their 20s is not performing any better at the workplace. The young people today need to realize that they need to work hard in order to succeed in life. Not only do they need to demonstrate more motivation and competence, they need to become less selfish and inconsiderate. People in their 20s today are overconfident, selfish, and unwilling to help others. Trust me; this generation is hardly ready to truly succeed in the real world, where competence, motivation, and social skills are minimal requirements. When you get to know anyone in their 20s these days, their flaws are apparent right away. In my opinion, there should be more graduation requirements for students rather than fewer. It's the duty of my generation to make it harder rather than easier for people in their 20s to slack off.

I think I know why today's 20-something generation is performing so poorly within and outside the university. Many of them are mostly interested in partying or selfishly focusing on themselves and having a good time. But from what I've heard, this generation doesn't even know how to have a good time. They would rather party than work hard at receiving a good education, earning an advanced degree, or doing well on the job. All of this causes me to be gravely concerned about the future of our state and nation. Clearly, lowering graduation requirements will only have more detrimental effects on our future.

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