



Short Communication

Individual differences in the motivational direction of anger

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ABSTRACT

This study investigated individual differences in the motivational direction of anger. One-hundred thirty undergraduates completed the behavioral inhibition/activation system (BIS/BAS) scales, followed by a diary study wherein they rated their positive and negative affect (PA/NA) daily for seven days. We examined the within-person relations between anger and two classes of emotion—those associated with approach motivation (PA) and those associated with avoidance motivation (fear). We also examined individual differences in these relations and whether BIS/BAS sensitivities were differentially associated with these individual differences. Multi-level analyses revealed considerable and significant between-person variability in within-person relations. Approximately 95% of participants had a β for the relation between anger and PA ranging from -0.52 to 0.36 and approximately 95% of participants had a β for the relation between anger and fear ranging from -0.32 to 0.80 . Whereas moderating effects of BIS on the relations between anger and fear were relatively robust, moderating effects of BAS on the relations between anger and PA were inconsistent. Our findings reveal that some individuals experience anger as approach-related, whereas others, particularly those with high BIS sensitivity, experience anger as avoidance-related. Thus, the motivational direction of anger depends upon individual differences, particularly BIS sensitivity.

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1. Introduction

Dimensional theories of emotion posit that emotional experiences can be understood in terms of various continua. For example, according to the *valence theory*, two dimensions, termed positive and negative affect (PA/NA), best account for the correlations among self-reported judgments of emotional experiences (Watson, 2009). In recent years, however, researchers found that anger and fear—both negative in valence—were not very similar in terms of their neurobiological correlates (e.g., Carver & Harmon-Jones, 2009). Such evidence ultimately led to the *motivational direction theory*. According to this theory, PA and NA alone are insufficient to account for the variability between emotional experiences. To better account for the variability between emotional experiences, the motivational direction of an emotional experience, or the degree to which an emotion is associated with approach or avoidance motivational tendencies, should also be considered. Although PA, NA, and motivational direction share commonalities (e.g., most negative emotional experiences are avoidance-related), the valence and motivational direction theories differ with regard to their predictions about the motivational direction of anger. According to the valence theory, anger is similar to other negative emotions (e.g., anxiety and fear) and should be associated with avoidance tendencies. By

contrast, according to the motivational direction theory, anger is similar to arousing positive emotions (e.g., pride and enthusiasm) and should be associated with approach tendencies (e.g., Mneimne, Wellington, Walton, & Powers, 2015). The aim of this study was to test these hypotheses.

One commonality of most previous studies investigating the motivational direction of anger is the use of between-person approaches (e.g., Carver & Harmon-Jones, 2009). Aside from between-person approaches, researchers can also investigate the motivational direction of anger using within-person approaches. In contrast to between-person approaches that reveal variability between people in general or on a given occasion, within-person approaches reveal variability within people over time (Cattell, 1952). This study used such an approach to examine the motivational direction of anger. In particular, because most positive emotions are approach-related and fear-relevant emotions are avoidance-related (e.g., Carver & Harmon-Jones, 2009), we examined the day-to-day covariation between anger and these two types of emotions in order to evaluate anger's motivational direction. This within-person approach reveals how anger changes from day-to-day. According to the valence theory, we would expect anger to covary daily with avoidance-related negative emotions. By contrast, according to the motivational direction theory, we would expect anger to covary daily with approach-related positive emotions.

No studies have used such a within-person approach to investigate the motivational direction of anger. A few studies, however, have

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investigated the within-person factor structure of mood. Early studies utilized P-technique factor analysis, which is a factor analysis of one individual's repeated assessments over time (Cattell, 1952). These studies found that on days when peoples' anger increased in intensity, their other negative emotions also increased in intensity, while their positive emotions decreased in intensity (Lebo & Nesselroade, 1978; Zevon & Tellegen, 1982). Subsequent studies used chain-p factor analysis (Cattell & Sheier, 1961), in which each participant's repeated assessments are first centered within-person, removing information about mean levels. The resulting variables are therefore deviations from each person's mean on a given occasion. These deviations are then subjected to factor analysis across participants (i.e., occasions are "chained" together) rather than on an individual basis as in P-technique. Using chain-p factor analysis, recent studies revealed that on days when peoples' anger increased in intensity, their other negative emotions increased in intensity, and their positive emotions decreased in intensity (Watson, 2009). Thus, previous studies using within-person approaches similar to the one used in this study all found evidence supporting the valence theory.

Two limitations of P-technique and chain-p factor analysis are that these approaches can neither quantify individual differences in within-person relations nor determine whether individual differences occurred because of chance. However, given that individual differences in the motivational direction of anger may be one reason for the mixed findings in the literature (e.g., Carver & Harmon-Jones, 2009; Watson, 2009), it is important to use a statistical method capable of quantifying and evaluating the significance of individual differences. Thus, we used within-person multi-level modeling (WP-MLM; West, Ryu, Kwok, & Cham, 2011). Unlike P-technique and chain-p factor analysis, WP-MLM allows researchers to quantify and evaluate the significance of individual differences in within-person relations.

Researchers have demonstrated individual differences in the motivational direction of anger. For example, in developing the second edition of the State-Trait Anger Expression Inventory, Spielberger (1999) found that whereas some individuals reported a trait-like tendency to express their anger, other individuals reported a trait-like tendency to inhibit their anger. Similarly, some participants responded to unfair feedback on a test with self-reported anger toward the experimenters, whereas other participants responded to the same unfair feedback with self-reported anger toward themselves (Jäncke, 1996). Thus, we predicted that we would also find individual differences in the within-person relations between anger and other emotional experiences. Specifically, we predicted that anger and PA would covary positively for some individuals, but negatively for others; we also predicted that anger and fear would covary positively for some individuals, but negatively for others.

To examine these individual differences, we used the behavioral activation and inhibition system (BIS/BAS) scales (Carver & White, 1994). The BIS/BAS scales assess trait-like sensitivities of the BIS and BAS, which are considered neurobiological systems that mediate aversive and appetitive motivational processes, respectively (Gray, 1987). For example, trait BIS sensitivity has been associated positively with trait anger inhibition and higher right-than-left prefrontal cortical activity, which are associated with avoidance motivation; by contrast, trait BAS sensitivity has been associated positively with trait anger expression and higher left-than-right prefrontal cortical activity, which are associated with approach motivation (e.g., Shackman, McMenamin, Maxwell, Greischar, & Davidson, 2009; Smits & Kuppens, 2005). Thus, we predicted that people with high trait BAS sensitivity would exhibit positive relations between anger and PA, whereas people with high trait BIS sensitivity would exhibit positive relations between anger and fear. That is, individuals with high trait BAS sensitivity would experience anger as approach-related, whereas individuals with high trait BIS sensitivity would experience anger as avoidance-related.

2. Method

2.1. Participants

Participants included 148 undergraduates recruited from psychology courses at a university in the Northeastern United States. Eighteen participants without valid diary data were excluded, yielding a final sample of 130 participants. The mean age of these participants was 19.8 years ($SD = 4.37$), 75% were Female, and 86.4% were Caucasian. Descriptive statistics by sex are presented in Table 1.

2.2. Measures and procedure

2.2.1. BIS/BAS scales

The BIS/BAS scales (Carver & White, 1994) include 20 items measuring trait-like sensitivities of the BIS and BAS and four fillers. Ratings are made on a 5-point Likert-type scale (0 = quite untrue of you to 4 = quite true of you). Both the BAS scale ($\alpha = 0.85$) and the BIS scale ($\alpha = 0.81$) exhibited high internal consistency. Participants completed the BIS/BAS scales during a laboratory session prior to the diary portion of the study.

2.2.2. Positive and negative affect scale (PANAS)

The 20-item PANAS (Watson, Clark, & Tellegen, 1988) was used to assess current affect. Items are rated on a 5-point Likert-type scale (i.e., 1 = very slightly or not at all to 5 = extremely). Reports were excluded if they were completed in under 3 min (surveys included a total of 151 items) or > 12 h late, or all items were given the same response (Conner, Tennen, Fleeson, & Barrett, 2009). The average valid completion rate was 74.9% (682/910 reports). Participants completed the PANAS at the end of each day for 7 days via Qualtrics (Kutz, 2016).

Fit indices from an exploratory multi-level factor analysis with geomin rotation in Mplus revealed the best fit for a three-factor structure at the within-person level (Table 2). Using factor loadings > 0.35 (Table 3), we computed scales for PA (all ten items; $\alpha = 0.77$), fear-relevant NA (i.e., afraid, guilty, scared, ashamed, nervous, $\alpha = 0.69$), and

Table 1
Descriptive statistics by sex.

	Male ($n = 31$)	Female ($n = 99$)	p
1. Mean age (SD)	20.2 (5.2)	19.7 (4.1)	0.58
2. # Caucasians (%)	27 (87.1)	86 (86.9)	0.97
3. Mean BAS-total (SD)	41.1 (4.8)	40.8 (5.4)	0.77
4. Mean BAS-drive (SD)	11.2 (2.1)	10.9 (2.6)	0.50
5. Mean BAS-fun seeking (SD)	12.2 (1.9)	11.9 (2.4)	0.61
6. Mean BAS-RR (SD)	17.6 (2.2)	17.8 (1.9)	0.60
7. Mean BIS (SD)	17.4 (3.9)	22.0 (3.5)	0.00
8. Mean fear (SD)	1.3 (0.5)	1.4 (0.5)	0.72
9. Mean anger (SD)	1.4 (0.4)	1.6 (0.6)	0.02
10. Mean positive affect (SD)	2.3 (0.7)	2.1 (0.7)	0.11

Note. BAS = behavioral activation sensitivity; BIS = behavioral inhibition sensitivity; RR = reward responsiveness; SD = standard deviation. Equal variances were assumed for all significance tests, except for those corresponding to mean anger, for which the assumption of equal variances was violated as per Levene's test ($p = 0.04$), and # Caucasians, which used a chi-square significance test.

Table 2
Results of multi-level factor analysis: fit statistics.

Model	RMSEA	CFI	TLI
2 Between, 2 Within	0.057	0.693	0.613
2 Between, 3 Within	0.049	0.789	0.717
3 Between, 2 Within	0.059	0.692	0.587
3 Between, 3 Within	0.050	0.789	0.699

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; TLI = Tucker-Lewis Index. Best-fitting model is bolded.

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