



## Neuroticism, BIS, and reactivity to discrete negative mood inductions

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### ABSTRACT

Research has established relationships between the personality dimensions of neuroticism and BIS and broad negative emotional reactivity. However, few researchers have examined the relationships among neuroticism, BIS, and discrete negative emotional reactivities. The present study examined whether individuals scoring high on neuroticism and BIS were more reactive across four discrete negative mood inductions, relative to those scoring low on these traits. Participants ( $n = 166$ ) completed personality questionnaires, measures of current mood, viewed a specific mood-inducing film clip (sadness, anger, fear or disgust) and then reported their moods a second time. Results revealed that neuroticism/BIS was associated with high reactivity to the fear and sadness inductions. Neuroticism/BIS did not predict anger or disgust reactivity, but neuroticism/BIS and extraversion/BAS interacted in predicting anger. Although further research is needed to extend generalizability, it appears that neuroticism and BIS predict negative emotional reactivity broadly, but not ubiquitously.

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### 1. Introduction

Individuals clearly differ in how much they experience pleasant and unpleasant emotions and these differences are well predicted by the broad traits of extraversion and neuroticism. That is, people high in extraversion report more pleasant emotional experience, and people high in neuroticism report more unpleasant emotional experience (Costa & McCrae, 1980). Moreover, at least some of the variation in experience follows from differences in reactivity to positive and negative stimuli in the environment. As opposed to tonic mean level differences ('set points'), people high in extraversion and neuroticism react to positive and negative emotional events (respectively) with more intense emotions compared to people scoring low on these traits (e.g., Larsen & Ketelaar, 1989). Although many studies have demonstrated these effects, they typically assess emotional experience as broad dimensions of positive and negative affect. In this study, we examine neuroticism as a predictor of more discrete emotional reactivities. That is, we ask the question, does neuroticism predict responses to fear, sadness, disgust, and anger stimuli equally well?

Psychologists have taken two broad approaches to understanding emotion states. The *dimensional approach* has focused on the structure of emotions, primarily using statistical tools like factor analysis. This approach often yields two independent, orthogonal dimensions such as pleasantness and arousal (Larsen & Diener, 1992), or activated pleasant 'positive affect' (PA) and activated unpleasant 'negative affect' (NA; Watson & Tellegen, 1985). This

approach uses experiential similarity or co-occurrence to organize affects, often relying on self-reported experience (Larsen & Diener, 1992), though functional accounts have also been proposed (e.g., Cacioppo & Berntson, 1999). In contrast, the *categorical approach* has avoided statistical methods of data reduction, and instead relied more on theory and observation to discern which emotions are primary. Advocates of this approach, view basic (or discrete) emotions as irreducible, distinct states that rarely co-occur and are experientially unique (e.g., Izard, 1977; Plutchik, 1980; Tomkins, 1984). Psychologists do not always agree on the criteria that make an emotion primary, and have considered things such as facial expressions, peripheral physiological signatures, neural substrates, action tendencies, appraisal patterns, etc. (Ortony & Turner, 1990). Nonetheless, there appears to be consensus that sadness, fear, anger and disgust generally qualify as primary discrete emotions.

Although there are exceptions, personality research has typically taken a dimensional approach to emotions. For example, the dimensions of positive affect and negative affect are consistently related to the personality dimensions of extraversion and neuroticism, respectively. With correlational methods, negative affect and neuroticism have been strongly linked in both brief studies of current mood and in longitudinal studies of average daily moods over time (Costa & McCrae, 1980; Emmons & Diener, 1985; Watson, Wiese, Vaidya, & Tellegen, 1999; Zelenski & Larsen, 1999).

More experimental methods have found that people high in neuroticism are particularly susceptible to negative mood inductions. That is, even when stimuli are carefully controlled in the laboratory, neuroticism predicts increased negative affect (e.g.,

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Gomez, Cooper, & Gomez, 2000; Gross, Sutton, & Ketelaar, 1998; Larsen & Ketelaar, 1989, 1991; Zelenski & Larsen, 1999), a finding that extends to physiological indicators (Canli et al., 2001; Norris, Larsen, & Cacioppo, 2007). Because the lab situation is controlled, we can infer that internal, temperamental differences explain these differences in emotional experience (as opposed to situational selection effects).

These temperamental differences are often understood using Gray's (1981) seminal Reinforcement Sensitivity Theory. Gray proposed that people differ from each other in their relative sensitivity to reward and punishment cues in the environment. Three systems underlie these differences; the behavioral activation system (BAS) is responsive to cues of reward and avoidance of punishment, the behavioral inhibition system (BIS) is responsive to cues of punishment and frustrative non-reward, and the fight or flight system (FFS) is a threat response system that mediates responses to unconditioned aversive stimuli, resulting in escape (flight) or defensive aggression (fight). Furthermore, differences in BAS and BIS strength may underlie the traits of extraversion and neuroticism, respectively, such that BAS creates greater positive (reward) reactivity among those scoring higher on extraversion and BIS creates greater negative (punishment) reactivity among those scoring higher on neuroticism (Larsen & Ketelaar, 1989; Zelenski & Larsen, 1999).

Revisions to Gray's theory (Gray & McNaughton, 2000) now parse the functions of the 'BIS' and 'FFS' a bit differently. The new FFFS (Fight, Flight or Freezing System) is now deemed responsible for some previous BIS functions, and more clearly linked to negative emotional reactions. The BIS is now viewed more as a conflict monitor or comparator that detects conflict between the BAS and new FFFS (e.g., in environments with both rewarding and punishing features; see review by Smillie, Pickering, & Jackson, 2006). This further emphasizes how behavior/experience often depends on both punishment and reward systems, particularly when situations are ambiguous or contain clear conflict between incentives and punishments (i.e., the joint subsystems hypothesis; Corr, 2002).

Despite this re-organization, popular assessment tools (e.g., Carver & White, 1994) still assess approach and avoidance tendencies and label these propensities as BAS and BIS more in line with Gray's original conception. At the level of psychological experience, these measures of broad sensitivities to reward and punishment are still useful in testing the motivational and emotional associates of extraversion and neuroticism even if they fail to capture some nuances of the revised RST.

Although both trait neuroticism and BIS have been linked to negative emotional reactivity, previous research has rarely considered discrete negative emotions. That is, the broad trait of neuroticism describes a propensity for general unpleasant experience, yet predictions of reactivity drawn from Gray's theory need not be so broad. Researchers have assumed that neuroticism promotes reactivity for the many unpleasant emotions (fear, sadness, anger, disgust, etc.) that tend to conglomerate in the broad negative affect dimension, and they have not taken care in isolating the potentially distinct reactivities. The fact that unpleasant affects cohere in a single factor at the trait level need not imply that a single process is responsible. For example, a temperamental susceptibility to fear might cause a person to make choices that ultimately create sadness (e.g., avoiding social situations). In the lab, this person might show high fear reactivity, but normal sadness reactivity, because their high trait sadness is due to lifestyle choices rather than temperamental sensitivity per se.

Although not always explicitly stated in the theory, we can use Gray's RST to make some more specific predictions. In a chapter addressing basic emotions, Gray (1994) identified anxiety as resulting from BIS and rage and panic as resulting from FFS, but

this predated his theoretical revisions to these systems. Nonetheless, the new FFFS, or the original BIS, seems clearly linked to fear as a primary output of the avoidance system. In addition, disgust includes elements of avoidance (e.g., moving away from bad smells), and thus disgust reactivity might be higher in people with a strong punishment system. Old and new versions of Gray's theory both suggest that anger ('fight') is related to the FFFS; however, this additional element is not included in our RST assessment tool, and thus anger reactivity will probably not correlate with our measure of original BIS functioning. Gray's theory does not provide a clear rationale to predict laboratory-based sadness reactivity among high BIS people – yet it is not a great jump to view sadness as stemming from sensitivity to punishment. For instance, past reactivity studies appear to have induced sadness through punishment-like stimuli, e.g., by using narratives about the death of a friend or failure feedback (Larsen & Ketelaar, 1989, 1991).

BAS may also play a role in negative emotional reactivity. Some have linked both anger and sadness to approach, rather than avoidance, systems (e.g., Harmon-Jones, 2003; Plutchik, 1980). For instance, Carver (2004) considered the BAS as underlying the approach behaviors involved with fighting and the frustration (anger) resulting from blocked rewards. Deficits in approach behavior associated with sadness may also result from a weak BAS. Although BIS clearly predicts depression, low BAS is also implicated (Hundt, Nelson-Gray, Kimbrel, Mitchell, & Kwapil, 2007; Kasch, Rottenberg, Arnow, & Gotlib, 2002). In addition, Corr (2002) found that high BIS strengthened reactions to fearful slides, but this effect was even stronger among low impulsivity participants (that is, the combination of high BIS, low BAS). Thus, we examine BAS as an additional contributor to negative reactivities.

### 1.1. The present study

The present study explored the relationships between BIS, neuroticism and reactivity to four distinct unpleasant emotions (fear, disgust, sadness and anger). Although many negative emotions (negative affect constituents) are similar in their levels of arousal and unpleasantness, neuroticism or BIS may relate to them differently because these emotions involve different antecedents and motivational properties. Moreover, these distinctions might be particularly evident in momentary reactivity because unpleasant affects likely become more diffuse or blended over longer periods of time (Zelenski & Larsen, 2000). To investigate discrete reactivities, we chose film clips to induce specific negative emotions (between-subjects), and then assessed emotional experience with self-report. Based on Gray's theory, we predicted that fear and possibly disgust reactivity would be linked with high neuroticism/BIS. Although less clearly derived from theory, past research also suggests the possibility of sadness reactivity. We predict anger reactivity will not be linked with BIS because this emotion is typically linked with FFS (not assessed here) or high BAS. We also explored BAS as a potential predictor, both individually and interacting with BIS. Recent attention to the joint subsystems hypothesis also motivates these analyses, but given that we employ relatively strong and unambiguously negative induction procedures, we predict that results will better fit the separable subsystems pattern (i.e., little influence of BAS or interactions).

## 2. Method

### 2.1. Participants

Data were collected from 166 students enrolled in introductory psychology courses (74.1% female) at Carleton University in Canada. Participants received course extra credit for participating.

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