

## BRIEF REPORTS

# The Effects of Extraverted Temperament on Agoraphobia in Panic Disorder

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Although situational avoidance is viewed as the most disabling aspect of panic disorder, few studies have evaluated how dimensions of neurotic (i.e., neuroticism, behavioral inhibition) and extraverted (i.e., extraversion, behavioral activation) temperament may influence the presence and severity of agoraphobia. Using logistic regression and structural equation modeling, we examined the unique effects of extraverted temperament on situational avoidance in a sample of 274 outpatients with a diagnosis of panic disorder with and without agoraphobia. Results showed low extraverted temperament (i.e., introversion) to be associated with both the presence and the severity of situational avoidance. Findings are discussed in regard to conceptualizations of conditioned avoidance, activity levels, sociability, and positive emotions within the context of panic disorder with agoraphobia.

*Keywords:* agoraphobia, panic disorder, personality, temperament, situational avoidance

Panic disorder (PD) involves various maladaptive cognitive and behavioral responses. Among the most impairing behavioral responses to panic are interoceptive, experiential, and situational avoidance tactics. Interoceptive avoidance involves refusing substances (e.g., caffeine) or activities (e.g., exercise) that elicit panic-like symptoms. Experiential avoidance refers to attempts to control panic via medications or distraction. Situational avoidance, which has been described as “the most palpable and impairing aspect of PD” (White, Brown, Somers, & Barlow, 2006, p. 148), involves a refusal to enter or tendency to escape from feared environments (e.g., bridges, crowds, elevators).

The *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) describes agoraphobia (AG) as anxiety linked to situations from which escape might be difficult or help may be unavailable in the event of panic symptoms. As fear of being in certain situations is often accompanied by a refusal to enter situations, situational avoidance is an important AG criterion. Because AG is most frequently diagnosed as comorbid with PD in clinical settings (i.e., PD with AG; Brown, Campbell, Lehman, Grisham, & Mancill, 2001), it is no surprise that conceptual models of AG have been strongly influenced by PD theories (e.g., Barlow, 2002).

## Temperament, Anxiety Sensitivity, and AG

Research and theory has implicated genetically based dimensions of neurotic temperament (NT) and extraverted temperament (ET) as being instrumental in the etiology and maintenance of anxiety and mood disorders (e.g., Barlow, 2002; Clark, Watson, & Mineka, 1994). Theories of emotion and personality vulnerabilities have described NT and ET by constructs such as neuroticism and extraversion (Digman, 1990; Eysenck & Eysenck, 1985), negative and positive affect (Tellegen, 1985), and behavioral inhibition and activation (Gray, 1987). Although their interrelationships are not yet fully understood, evidence suggests that neuroticism is closely related to negative affect and behavioral inhibition, whereas extraversion shares many characteristics with positive affect and behavioral activation (Barlow, 2002; Brown, 2007; Campbell-Sills, Liverant, & Brown, 2004). Whereas NT influences the experience of negative emotional states (i.e., anxiety, sadness), ET is related to sociability, levels of activity, reward-seeking behaviors, and positive emotions (i.e., excitement, joy).

Contemporary conceptualizations of the relationships between temperament and the emotional disorders stem from the tripartite model, which posited that NT (i.e., negative affect, neuroticism) is relevant to both the anxiety and the mood disorders, whereas ET (i.e., positive affect, extraversion) is uniquely related to depression (Clark & Watson, 1991). Although research has consistently found strong positive correlations between NT and the full range of emotional disorders (Bienvenu et al., 2001, 2004; Brown, 2007; Brown, Chorpita, & Barlow, 1998), findings regarding ET have been limited and mixed. For example, although initial support for the unique association between ET and depression was found in some nonclinical samples (Joiner, 1996) and samples with low rates of anxiety (Watson et al., 1995), examinations of outpatient and epidemiological data also found significant inverse relationships between ET (i.e., high introversion) and social phobia (e.g.,

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Bienvenu et al., 2001; Brown et al., 1998). As subsequent research further supported this relationship (for a meta-analytic review, see Kashdan, 2007), leading conceptual models of the emotional disorders have been revised to reflect such findings (e.g., Mineka, Watson, & Clark, 1998).

Although the evidence is sparse, significant associations have been found between dimensions of ET and AG. For example, Bienvenu et al. (2001) used logistic regression to examine if ET (i.e., extraversion) predicted lifetime prevalence of various *DSM* anxiety and mood disorders. Results showed that ET was a significant predictor of AG, whereby lower levels ET (i.e., high introversion) were associated with increased odds of a lifetime AG diagnosis. Significant associations between ET and PD were not found. Although studies have had success in replicating and extending these findings (e.g., Bienvenu et al., 2004), few have accounted for the occurrence of AG secondary to PD (e.g., PD with AG). A notable exception is Carrera et al.'s (2006) study of personality traits among patients in the early phases of PD, which controlled for comorbidity between PD and AG. Results showed that ET (i.e., introversion) predicted a diagnosis of PD with AG but not PD without AG. The authors interpreted this finding to indicate that low levels of ET may contribute to the development of AG within PD but not PD itself.

Although compelling, these studies provide limited information about the relationship between ET and AG by exclusively examining *DSM* diagnostic status. The degree of impairment assumed to be caused by situational avoidance (e.g., White et al., 2006) suggests it may be more important to study avoidance behaviors within AG rather than broadly studying the presence of the disorder. Moreover, exclusively examining dichotomous representations of dimensional phenomena (i.e., diagnoses) provides limited utility by not capturing important information (cf. Brown & Barlow, 2005; MacCallum, Zhang, Preacher, & Rucker, 2002) such as individual differences in AG severity.

Preliminary evidence regarding the relationship between ET and AG has been useful in examining genetic relationships between ET and AG. Recently, Bienvenu, Hettema, Neale, Prescott, and Kendler (2007) used a large twin sample to test the independent genetic contributions of ET and NT (i.e., extraversion and neuroticism) on heritable influences (i.e., genetic vs. shared environmental factors) of AG. Analyses found significant negative within-person correlations between extraversion and AG and that monozygotic twins had higher cross-twin correlations than did dizygotic twins. In other words, the genetic factors that influence extraversion are the same as those affecting a lifetime diagnosis of AG.

In addition to ET and NT, conceptualizations of PD and AG also emphasize the construct of anxiety sensitivity (AS), or the fear of anxiety and anxiety-related physical symptoms. Much like ET and NT, AS may be a heritable vulnerability playing an important role in PD and AG (Stein, Jang, & Livesley, 1999). It is posited that high AS may develop early in life and, coexisting with high levels of NT, may lead to the onset and maintenance of PD with or without AG (Barlow, 2002). This model has received support, as individuals with heightened levels of AS experience a greater degree of panic symptoms (Zinbarg, Brown, Barlow, & Rapee, 2001) and agoraphobic fear and avoidance (Taylor & Rachman, 1992; White et al., 2006). Unfortunately, these studies have not evaluated the unique contributions of AS while controlling for NT.

Although the negative consequences of AG within PD have been well documented, relatively few studies have focused on the relationship between ET and situational apprehension and avoidance. Extant studies have rarely examined ET and AG in clinical samples or contained AG symptom information beyond diagnostic status (e.g., Bienvenu et al., 2001, 2004; Carrera et al., 2006). Moreover, much of the literature examining PD and AG has not controlled for levels of NT and AS (e.g., Taylor & Rachman, 1992; White et al., 2006). The present study aims to examine the unique effects of ET on agoraphobic avoidance in PD within a clinical sample. ET was hypothesized to predict the presence and severity of agoraphobic avoidance while controlling for NT and AS. It was also hypothesized that ET would predict the severity of AG but not be associated with the severity of PD.

## Method

### Participants

The sample consisted of 274 patients presenting for assessment and treatment at the Center for Anxiety and Related Disorders at Boston University. The sample was predominantly female (60.2%) and the average age was 32.88 years ( $SD = 10.56$ , range = 18–77). The majority of participants self-identified as Caucasian (85.8%). Individuals were assessed by doctoral students or doctoral-level clinical psychologists using the Anxiety Disorders Interview Schedule for *DSM-IV*: Lifetime Version (ADIS-IV-L; Di Nardo, Brown, & Barlow, 1994). The ADIS-IV-L is a semi-structured interview that assesses *DSM-IV* (American Psychiatric Association, 2000) anxiety, mood, somatoform, and substance use disorders. When administering the ADIS-IV-L, clinicians assign each diagnosis a 0–8 clinical severity rating that represents the degree of distress or impairment in functioning associated with specific diagnoses. The disorder receiving the highest clinical severity rating is considered an individual's principal diagnosis. Patients were included in the study if they met criteria for a principal diagnosis of PD with AG ( $n = 260$ ) or PD without AG ( $n = 14$ ). The ADIS-IV-L has shown good to excellent reliability for the majority of anxiety and mood disorders, including PD with AG ( $\kappa = .77$ ) and PD without AG ( $\kappa = .72$ ; Brown, Di Nardo, Lehman, & Campbell, 2001). Study exclusionary criteria were current suicidal or homicidal intent and/or plan, psychotic symptoms, or significant cognitive impairment (e.g., dementia, mental retardation).

### Regression and Structural Model Indicators

**ADIS-IV-L PD criteria ratings.** Clinicians made severity ratings for the following *DSM-IV* PD criteria on a 0 (*absent*) to 8 (*very severely disturbing/disabling*) scale: (a) recurrent and unexpected panic attacks, (b) fear of having additional attacks, (c) worry about the consequences of panic, and (d) change in behavior related to the panic. A composite score composed of ratings of items (a) through (c) was generated for each participant. Rating (d) was omitted from the composite score because of redundancy with indicators of AG (i.e., situational avoidance would be considered a significant change in behavior).

**ADIS-IV-L situational avoidance ratings.** The AG section of the ADIS-IV-L contains a subsection in which clinicians assess

and rate the patient's avoidance of 22 situations associated with PD (e.g., public transportation, theaters) from 0 (*no avoidance*) to 8 (*very severe avoidance*). The AG rating score has been associated with excellent interrater reliability (Brown, Di Nardo, et al., 2001). The AG scale structure was evaluated using exploratory factor analysis. Although the exploratory factor analysis confirmed unidimensionality, one item had a factor loading that was less than .30 (Item 14, "Being home alone") and was removed from the composite rating.

**Albany Panic and Phobia Questionnaire (APPQ; Rapee, Craske, & Barlow, 1994–1995).** The APPQ is a 27-item questionnaire measuring interoceptive, situational, and social fears. Respondents rate how much fear they would experience in certain activities and situations on a 0 (*no fear*) to 8 (*extreme fear*) scale. The nine-item Agoraphobia subscale (APPQ-A), measuring situational apprehension commonly associated with panic (e.g., driving, theaters), and the five-item Interoceptive subscale (APPQ-I), assessing fear associated with activities or objects that may mimic panic symptoms, were used in this study. Evaluation of the APPQ supports its factor structure, reliability, and validity in clinical samples (Brown, White, & Barlow, 2005).

**Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1992).** The ASI is a 16-item measure in which patients rate each item on a 0 (*very little*) to 4 (*very much*) scale. The ASI has adequate reliability and validity and is composed of a hierarchical factor structure, with three lower order factors (i.e., Physical Concerns, Mental Incapacitation, and Social Concerns) and a single general higher order factor (Zinbarg, Barlow, & Brown, 1997).

**Behavioral Inhibition Scale/Behavioral Activation Scale (BIS/BAS; Carver & White, 1994).** The BIS/BAS is a 20-item self-report instrument designed to assess Gray's (1987) personality constructs of behavioral inhibition and activation. Items are rated on a 4-point Likert-type scale, ranging from 1 (*quite untrue of you*) to 4 (*quite true of you*). The BIS/BAS has demonstrated excellent psychometric properties in clinical samples (Campbell-Sills et al., 2004).

**NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992).** The NEO-FFI is a 60-item self-report inventory that assesses dimensions of the five-factor model of personality: Neuro-

ticism, Extraversion, Openness, Agreeableness, and Conscientiousness. Items are rated on 5-point Likert-type scale, which ranges from 0 (*strongly disagree*) to 4 (*strongly agree*). The NEO-FFI is the abbreviated form the NEO-PI-R, a widely used self-report personality measure that has demonstrated excellent reliability and validity (Costa & McCrae, 1992).

**Analytic plan.** Logistic regression and structural models were evaluated in Mplus 5.2 (Muthén & Muthén, 1998–2009). Missing data were handled by direct maximum likelihood estimation. Model fit was examined using the root mean square error of approximation (RMSEA) and its test of close fit (C-Fit), the Tucker–Lewis index (TLI), the comparative fit index (CFI), and the standardized root mean square residual (SRMR). Guidelines defined by Hu and Bentler (1999) were used in determining acceptable fit (i.e., RMSEA near or below .06, C-Fit above .05, TLI and CFI near or above .95, SRMR near or below .08). Multiple goodness-of-fit parameters were evaluated to examine various aspects of model fit (i.e., absolute fit, parsimonious fit, fit relative to the null). Unstandardized and completely standardized solutions were examined to evaluate the significance and strength of parameter estimates. Standardized residuals and modification indices were used to determine the presence of any localized areas of strain in the solution.

## Results

### Logistic Regression Models

We conducted logistic regression analyses to examine if ET uniquely predicted the presence of situational avoidance within PD patients while controlling for NT and AS. Situational avoidance was defined as having a secondary AG diagnosis and an ADIS–IV–L situational avoidance rating above 0 ( $n = 222$ ) or not ( $n = 29$ ; 23 cases were excluded because of missing questionnaires). Two regression models were examined such that the presence of situational avoidance was regressed onto constructs representing dimensions of temperament (i.e., NEO-FFI and BIS/BAS) and AS. As shown in Table 1, only the Extraversion subscale was found to

Table 1  
*Logistic Regression Models Evaluating the Relationship Between Temperament Constructs and the Presence of Situational Agoraphobic Avoidance*

Model and predictor variable	Presence of situational agoraphobic avoidance			
	<i>B</i>	<i>t</i>	OR	95% CI
NEO-FFI				
ASI–P	0.020	0.694	1.02	0.96–1.08
Neuroticism	–0.039	1.527	0.96	0.91–1.01
Extraversion	–0.065	2.296*	0.94	0.89–0.99
Constant	–4.497	3.643***		
BIS/BAS				
ASI–P	0.01	0.04	0.99	0.94–1.06
Behavioral inhibition	0.04	0.72	1.04	0.93–1.17
Behavioral activation	–0.06	1.67	0.95	0.89–1.01
Constant	–3.31	1.74		

*Note.* OR = odds ratio; 95% CI = confidence interval; NEO-FFI = NEO Five-Factor Inventory; BIS/BAS = Behavioral Inhibition Scale/Behavioral Activation Scale; ASI–P = Anxiety Sensitivity Index—Physical Concerns scale.

\*  $p < .05$ . \*\*\*  $p < .001$ .

significantly predict the presence of situational avoidance ( $B = -0.07, p < .05$ ) in the NEO-FFI and AS model. Lower levels of ET (i.e., higher introversion) were associated with increased odds of agoraphobic avoidance (odds ratio = .94, 95% confidence interval [.87–.99]). The regression coefficient for the BAS scale approached statistical significance ( $B = -0.06, p = .10$ ) in the BIS/BAS and AS model.

### Structural Equation Models

Structural regression models were fit to the data to examine the unique association between dimensions of ET and AG. The BAS and NEO-Extraversion subscales were used as indicators for a latent variable representing ET, whereas BIS and NEO-Neuroticism were specified to load on the NT factor. AS was defined solely by ASI-Physical Concerns because of its theoretical relevance specific to PD and AG (Zinbarg et al., 2001). A latent variable representing dimensions of AG was composed of the APPQ-A subscale and ADIS-IV-L AG situational avoidance rating. The APPQ-I subscale and ADIS-IV-L PD criteria composite rating (see the Method section) were used as indicators to represent the latent variable of PD.

Two structural models were evaluated, whereby latent representations of AG (Model 1) and PD (Model 2) were regressed onto dimensions of NT, ET, and AS. Measurement models of the temperament and disorder constructs were not separately evaluated because both models were structurally just identified. Initial inspections of the models revealed that model fit could be improved if a correlated error was estimated between the NEO-Extraversion and NEO-Neuroticism subscales (Model 1 and 2 modification indices = 14.16 and 13.79, respectively). The models were subsequently specified to reflect this method variance shared between the NEO subscales.

It was predicted that when NT and AS were held constant, ET would demonstrate an inverse and statistically significant structural path to AG but not PD. Model 1 fit the data well,  $\chi^2(8) = 18.286, p < .05$ , SRMR = 0.03, RMSEA = 0.06 (C-Fit  $p = .20$ ), TLI = 0.94, CFI = .97. Figure 1A shows the completely standardized estimates from this solution. In total, AS, NT, and ET explained 29% of the variance in AG. ET uniquely explained a significant portion of the variance in AG ( $\gamma = -.31, p < .001$ ) while controlling for AS and NT. The regression paths for AS and NT were also significant; both predictors demonstrated a positive relationship with AG ( $\gamma_s = .21$  and  $.26$ , respectively;  $ps < .01$ ).

Figure 1B shows the completely standardized estimations from Model 2, which also fit the data well,  $\chi^2(8) = 13.681, p = .09$ , SRMR = 0.03, RMSEA = 0.05 (C-Fit  $p = .43$ ), TLI = 0.96, CFI = .98. AS, NT, and ET accounted for 69% of the variance in PD. Consistent with prediction, there was not a significant path between ET and PD ( $\gamma = -.14, ns$ ). However, AS and NT each uniquely predicted a significant portion of the variance in PD ( $\gamma_s = .63$  and  $.31, ps < .001$  and  $< .01$ , respectively).

### Discussion

Consistent with hypotheses and prior research (i.e., Bienvenu et al., 2001; Carrera et al., 2006), results from the logistic regression analyses showed ET constructs to uniquely predict (NEO-Extraversion) or have trends toward predicting (BAS) the presence

of situational avoidance among PD patients while controlling for NT and AS. Structural modeling confirmed that ET was inversely and significantly related to dimensions of AG but not PD. The present study adds to literature on ET and AG conducted at the diagnostic level (i.e., Bienvenu et al., 2001; Carrera et al., 2006) by specifically examining the presence and severity of situational agoraphobic avoidance, arguably the most disabling aspect of PD with AG (White et al., 2006).

In general, ET was associated with both the presence and the severity of situational avoidance among individuals with PD. These results add to the findings of Carrera et al. (2006) by showing that ET may have a more circumscribed relationship with situational avoidance rather than being broadly related to a diagnosis of AG. In line with a predispositional relationship between ET and AG (cf. Brown, 2007; Clark et al., 1994), theory on temperament and aversive conditioning has posited that introverted individuals perceive unconditioned stimuli as subjectively stronger and consequently more reinforcing (Eysenck & Eysenck, 1985). In other words, introverted individuals who experience recurrent and unexpected panic attacks may be more prone to associate their panic symptoms with concurrent stimuli (i.e., the environment), leading them to develop AG characterized by greater situational avoidance. Activation levels, reward-seeking behaviors, and sociability may also play a role; AG may reflect a premorbid disposition toward low activity or reward seeking (i.e., low ET) expressed in the context of unexpected panic, or discomfort or disinterest (i.e., low ET) in being around others when experiencing a vulnerable emotional state like panic. Indeed, the relevance of ET in approach-avoidance motivation and reward-seeking behaviors has been theorized (i.e., introverts are less likely to find novel environments exciting or enjoyable; Eysenck & Eysenck, 1985) and supported in laboratory studies (cf. Robinson, Meier, & Vargas, 2005). Positive emotionality may also have an influence on AG, as individuals prone to experiencing low levels of positive emotions (i.e., low levels of ET) may have difficulty distinguishing the source of the similar physiological symptoms of panic and positive emotions (i.e., increased heart rate due to panic vs. excitement). Through interoceptive fear conditioning principles (i.e., McNally, 1990), the physiological symptoms of positive emotions may serve as a panic trigger. Along these lines, Williams, Chambless, and Ahrens (1997) found that fears of positive emotions (and anger) predicted fear of laboratory-induced bodily sensations in a nonclinical sample.

Conversely, the present findings may also reflect other types of relationships between ET and AG. For instance, according to a complication/scar model (cf. Brown, 2007; Clark et al., 1994), the presence of AG may cause reductions in ET. In other words, developing increasingly severe situational avoidance may lead individuals to be less active and sociable, seek fewer rewards, and experience fewer positive emotions. It is also possible that low ET and AG reflect similar underlying processes, regardless of one's experience of panic. Perhaps introversion is avoidant behavior, with AG serving as expression of this temperament in the context of unexpected panic. Unfortunately, the cross-sectional and correlational nature of the present study precluded our ability to disentangle predispositional, complication/scar, or tautological interpretations.

Although not an a priori aim of the study, findings supporting the effects of AS and NT on PD and AG are consistent with theory

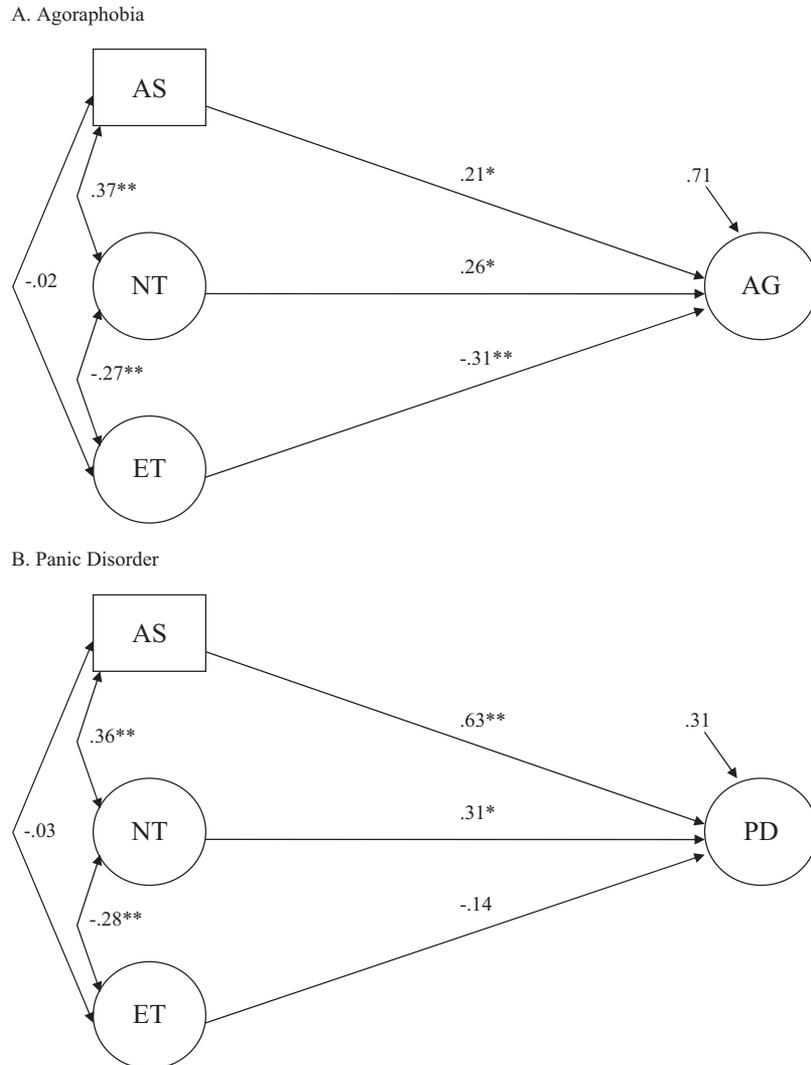


Figure 1. Latent structural models of the relationship between dimensions of agoraphobia, panic disorder, temperament, and anxiety sensitivity. A: Model 1. B: Model 2. AG = agoraphobia; PD = panic disorder; ET = extraverted temperament; NT = neurotic temperament; AS = anxiety sensitivity. Completely standardized estimates are shown. \*  $p < .01$ . \*\*  $p < .001$ .

(i.e., Barlow, 2002) and add to the extant literature on these vulnerabilities, which has rarely examined either AS or NT while controlling for the other (e.g., White et al., 2006). Given the past debate over the discriminant and incremental validity of AS over NT (Lilienfeld, Jacob, & Turner 1989), it is interesting that both NT and AS significantly predicted dimensions of AG and PD in the structural models. Thus, despite any phenotypic overlap in NT and AS among patients with AG and PD (e.g., experiencing negative affect in response to negative affect, or anxiety focused on fear), both constructs explain a unique portion of the variance in AG and PD.

Despite strengths in methodology (i.e., analyses conducted in a latent variable framework, use of self-report and clinician-rated indicators) and sampling (i.e., large clinical sample), the present study has some limitations. For example, the APPQ-I provides limited information about a single dimension of PD. Although the

APPQ-I assesses common behavioral changes related to PD (i.e., avoidance of caffeine), a questionnaire assessing broader dimensions of panic, such as panic frequency and fear (e.g., the Panic Disorder Severity Scale—Self-Report; Houck, Spiegel, Shear, & Rucci, 2002), may have been more appropriate. Another limitation is the predominate representation of Caucasians in the study. Additional research on more diverse samples is needed to examine whether the relationship between ET and AG generalizes to other cultural groups. Finally, the sample may have benefited from additional cases with a diagnosis of PD without AG. Further study of PD without AG may aid in distinguishing features uniquely associated with the development of AG within the context of PD.

Many individuals with PD experience profound disability through persistent avoidance of the situations they associate with panic. Although results of the present study provide meaningful information to the body of literature examining ET and AG,

additional research is needed to further examine etiological and maintenance factors of AG. For example, longitudinal research following individuals from premorbid periods to early phases of PD is needed to clarify the relationship between ET and AG (e.g., does low ET cause AG or vice versa?). In addition, experimental research examining the experience of positive emotions in anxiety disorders may aid in the understanding of ET's relevance to disorders such as social phobia and AG.

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