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Differential endophenotypic markers of narcissistic and antisocial personality features: A psychophysiological investigation

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ABSTRACT

This study investigated the differential psychophysiological correlates of narcissistic and antisocial personality features in a college student sample. Skin conductance (SC), respiratory sinus arrhythmia (RSA), and pre-ejection period (PEP) were monitored while participants watched a countdown to an aversive noise blast and viewed emotionally valenced slides. Results indicated that narcissistic personality features were unrelated to SC reactivity during the countdown, whereas antisocial personality features were negatively related to SC reactivity. Narcissistic personality features were also related to RSA decreases and PEP shortening while viewing happy slides, whereas antisocial personality features were not. Taken together, these findings suggest differential endophenotypic markers of narcissistic and antisocial personality features despite their clinical similarities.

1. Introduction

The causes and correlates of narcissistic personality disorder (NPD) traits remain mysterious. Nevertheless, there is broad consensus that NPD traits covary with several personality disorder traits, especially those of antisocial personality disorder (ASPD; Gunderson & Ronningstam, 2001; Gunderson, Ronningstam, & Smith, 1991; Hart & Hare, 1998; Widiger & Corbitt, 1993), a disorder characterized by pathological levels of antisocial behavior. In a sample of 106 psychiatric inpatients, Oldham and colleagues (1992) found that 29% (5 out of 17) of individuals meeting criteria for NPD, characterized by pervasive and pathological narcissistic personality features, also met criteria for ASPD, whereas only 2% (2 out of 89) of individuals without NPD met criteria for ASPD. The significant covariance between these disorders also occurs in nonclinical samples (e.g., Watson & Sinha, 1998). Similar to Oldham and colleagues' inpatient findings, Watson and Sinha (1998) examined a sample of 1729 college students and found that 23% (17 out of 76) of those meeting criteria for NPD also met criteria for ASPD, whereas only 4% (59 out of 1653) of those without NPD met criteria for ASPD. To better understand the nature of this covariance, numerous authors (e.g., Gunderson & Ronningstam, 2001; Holdwick, Hilsenroth, Castlebury, & Blais, 1998; Paulhus, Robins, Trzesniewski, & Tracy, 2004) have investigated the affective and interpersonal correlates of NPD and ASPD traits, although none has examined the differential psychophysiological markers of these traits. The present study seeks to investigate these markers in a non-clinical sample.

The Diagnostic and Statistical Manual for Mental Disorders 4th edition (DSM-IV; American Psychiatric Association, 2000) attempted to differentiate the disorders by making the criteria for ASPD primarily behavioral and those for NPD primarily affective and interpersonal. Moreover, an ASPD diagnosis requires a childhood history of antisocial behavior, whereas an NPD diagnosis does not. However, researchers in the DSM-IV field trials noted that completely separating the disorders would have resulted in artificially narrow constructs with little convergent validity (Widiger, Cadoret, Hare, & Robins,

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1996). As a result, NPD and ASPD were characterized as separate disorders within DSM-IV's personality disorder Cluster B (the "dramatic, emotional, erratic" cluster).

In addition to creating a somewhat artificial distinction between the disorders, the DSM-IV assigned somewhat arbitrary criterion cutoffs under the assumption that NPD and ASPD represented discrete phenomena. Taxometric analyses of NPD are mixed (Fossati et al., 2005; Foster & Campbell, 2007), whereas taxometric analyses of ASPD (e.g., Marcus, Lilienfeld, Edens, & Poythress, 2006) suggest a dimensional rather than a discrete class (taxonic) solution. As authors have similarly found dimensional solutions for most other DSM-IV personality disorders (e.g., borderline personality disorder; Rothschild, Cleland, Haslam, & Zimmerman, 2003), researchers have discussed the utility of conceptualizing personality disorders within a dimensional framework (e.g., Krueger & Tackett, 2005). Therefore, we conceptualize the features of narcissistic and antisocial personality disorders as continuous phenomena (e.g., narcissistic personality disorder features as marking the extreme end of a narcissism dimension).

The central features of narcissistic personality disorder include unwarranted feelings of grandiosity, an excessive need for admiration, and a lack of empathy for others occurring across a variety of contexts. This socially noxious constellation of personality traits may manifest as an unreasonable sense of entitlement, manipulation of others for personal gain, oversensitivity to criticism, and externalization of blame. Despite lack of empathy being a central characteristic of narcissistic personality disorder, the literature investigating empathy and narcissm is equivocal. Although some researchers have found that narcissistic personality features correlate negatively with empathy (Munro, Bore, & Powis, 2005), others have found that this correlation is only evident for some, but not all, measures of empathy (Watson, Grisham, Trotter, & Biderman, 1984). Specifically, narcissistic personality features were negatively related to the emotional experience of empathy, but unrelated to the intellectual understanding of other's experiences.

A lack of empathy is also a core affective deficit of antisocial personality disorder. In addition, antisocial personality features include a failure to conform to social norms; repeated impulsive, aggressive, and irresponsible behavior; repeated lying; disregard for others; and lack of remorse. Antisocial personality disorder may manifest as persistent criminal behavior, conning others for personal gain, violence, and other reckless behaviors. Despite their descriptive differences, narcissistic and antisocial personality disorders share several core affective and interpersonal deficits.

Livesley, Jackson, and Schroeder (1992) found that narcissistic and antisocial personality features load highly on an "interpersonal disesteem" factor, characterized by a disregard for other people and neglect of personal obligations. Similarly, Holdwick et al. (1998) found that interpersonal exploitativeness, lack of empathy, disregard for others, and envy characterized narcissistic and antisocial personality personality disorders. According to Gunderson and Ronningstam (2001), the grandiosity characteristic of narcissism is the primary discriminating feature between narcissistic and antisocial personality disorders. By all accounts, the constructs are difficult to disentangle in terms of affective and interpersonal deficits. Moreover, no previous research has attempted to differentiate these personality types in terms of their endophenotypic markers, which are internal and not obvious indicators of an observable phenomenon (Gottesman & Shields, 1972). Such differentiation may help to shed light on distinct affective and interpersonal components of these personality constructs.

The primary physiological constructs investigated in studies of narcissistic and antisocial personality features have been skin conductance responding (SCR) and heart rate (HR). SCR is a gross index of autonomic nervous system activation. A major strength of SCR is the plethora of research investigating its psychological correlates in healthy individuals. The primary weakness of SCR is that it is not particularly sensitive to the valence of stimuli. In other words, increases in SCR occur during both positive and negative emotional experiences in psychologically healthy individuals (Fowles, 1980, 1988). Despite increased SCR activity during both positive and negative emotional experiences, SCR is a well-replicated indicator of the activity of the behavioral inhibition system (BIS; Gray, 1982), a cognitive and physiological system that inhibits behavior,in response to threat (Fowles, 1988).

HR is also a gross index of autonomic activation. The primary limitation of using HR as an index of autonomic influence on the heart is that it is greatly influenced by both branches, sympathetic and parasympathetic, of the autonomic nervous system (Beauchaine, 2001). This dual influence makes HR difficult to interpret. However, there are more sophisticated measures to help isolate sympathetic and parasympathetic influences on HR. Pre-ejection period (PEP; Sherwood, Allen, Obrist, & Langer, 1986), the time between left ventricular depolarization and ejection into the aorta, is a relatively recently developed means of measuring sympathetic nervous system influence on HR. PEP is an inverse indicator of behavioral activation system (BAS; Fowles, 1988), a cognitive and physiological system that facilitates behavior in response to potential reward. In other words, PEP shortening (decrease in time between left ventricular depolarization and ejection into the aorta) is indicative of increases in sympathetic influence on the heart or BAS activation. Conversely, respiratory sinus arrhythmia (RSA), an index of the influence of the vagus nerve on HR, is largely mediated by the parasympathetic nervous system. As parasympathetic influence on HR increases, RSA increases and HR slows.

Porges (1995) posited that RSA is an index of coping with the social world in mammals. RSA reactivity in response to environmental stimuli appears to be a marker of emotion regulation (Beauchaine, 2001; Butler, Wilhelm, & Gross, 2006). Increases in RSA are associated with positive mood (Ingjaldsson, Laberg, & Thayer, 2003) and empathetic responding (Eisenberg et al., 1996), whereas decreases in RSA are associated with negative affect (Thayer, Friedman, & Borkovec, 1996; Wilhelm & Roth, 1998) and active responses to task demands (Bernston, Cacioppo, & Quigley, 1995; Iani, Gopher, & Lavie, 2004).

Only two studies (Kelsey, Ornduff, McCann, & Reiff, 2001; Kelsey, Ornduff, Reiff, & Arthur, 2002) have investigated the physiological correlates of self-reported narcissism. Kelsey and colleagues (2001) examined the psychophysiological correlates of narcissism in 40 undergraduate men, whereas Kelsey and colleagues (2002) investigated the relationship in 57 female undergraduates. Both studies used self-report questionnaires to assess symptoms of narcissism. Kelsey and colleagues (2001) separated the sample into low- and high-narcissism groups by their scores on the Narcissistic Personality Inventory (Raskin & Terry, 1988), a measure of the grandiosity and charm (''overt features'') characteristic of narcissism that does not emphasize the hypersensitivity and envy (''covert features'') that also characterize narcissism (Rose, 2002). Multiple analysis of variance (MANOVA) revealed greater PEP shortening (increased sympathetic activity) for the high narcissism group in response to a passive coping task, and faster SCR habituation across trials. These findings suggest that narcissism in men is characterized by hyperactive cardiac sympathetic nervous system activity during threat.

Kelsey and colleagues (2002) measured narcissism using the alienation (ALN) and egocentricity (EGO) scales of the Bell Objects Relations and Reality Testing Inventory (Bell, 1995). The authors posited that these two scales were sufficient proxy measures of narcissism, although the validity remains untested. Results indicated that the ALN scale correlated negatively with overall SCR reactivity, but not overall PEP reactivity during a story-telling and vocal arithmetic task. In contrast, the EGO scale correlated with PEP shortening (increased sympathetic activity) during the tasks, but not SCR reactivity. The authors concluded that autonomic underarousal may underpin social alienation, whereas hyperactive cardiac sympathetic activation may underpin the egocentricity characteristic of narcissism in women. Nevertheless, the extent to which both of these studies generalize to features of narcissistic personality disorder is unclear, particular because traits of this disorder include covert features in addition to overt features.

In contrast, a wealth of studies has investigated the psychophysiological correlates of antisocial personality features in both criminal and community populations. One consistent finding is SCR hyporeactivity in individuals with antisocial personality features during stress or threat inducing tasks (e.g., Dinn & Harris, 2000; Gatzle-Kopp, Raine, Loeber, Stouthamer-Loeber, & Steinhauer, 2002; Raine, Lencz, Bihrle, LaCasse, & Colletti, 2000), suggestive of autonomic hypoarousal (Fowles, 1980, 1988). There is mixed evidence regarding the relationship between sympathetic cardiac activation during stress or threat inducing tasks and antisocial personality features (e.g., Bare, Hopko, & Armento, 2004; Hare, Frazelle, & Cox, 1978; House & Milligan, 1976). However, many of these studies were designed to assess the relationship between sympathetic cardiac activation and features of psychopathy, an overlapping but separable disorder (Blair, 2003), rather than antisocial personality disorder. Moreover, all of these studies used HR as an indicator of sympathetic cardiac activation and did not assess PEP.

1.1. The present study

The present study extended previous research by examining endophenotypic markers of narcissistic and antisocial personality features using several indicators of autonomic functioning in a non-clinical population. This study also used semi-structured interviews and self-report questionnaires to quantify the levels of narcissistic and antisocial personality features rather than relying solely on self-report questionnaires. Most personality disorder features, especially those associated with narcissistic personality disorder, are largely ego-syntonic (concordant with one's self-image), reflecting little insight into one's pathology. In an empirical demonstration of this lack of insight in individuals with high levels of narcissistic features, John and Robins (1994) examined 102 individuals, in groups of 6, who completed self-report measures of narcissistic features and participated in a weekend-long simulation of a business committee meeting. At the end of the weekend, participants' levels of narcissistic features were rated by fellow participants and 11 trained assessors. Johns and Robins found that participants with high levels of narcissistic features systematically overestimated their performance as gauged by outside observers.

Therefore, the use of a well-validated semi-structured interview measure may offer additional insight into individuals' levels of personality dysfunction by allowing interviewers to probe ambiguous answers, question contradictory statements, and render their own judgments concerning participants' pathology. Moreover, the low levels of agreement between most questionnaire and interview measures of personality disorders (Perry, 1992) highlights the importance of not relying exclusively on self-report indices of narcissistic personality features.

Measuring multiple indices of autonomic reactivity may allow for a more nuanced picture of the psychophysiological correlates of narcissistic and antisocial personality features. The concurrent assessment of these multiple indices may also help to differentiate the endophenotypic markers of narcissistic from antisocial personality features. Moreover, it allows for the examination of the incremental contribution of features of each disorder above and beyond the other in predicting psychophysiological reactivity. Because of the significant overlap among all four Cluster B conditions, we also conducted exploratory analyses to determine whether narcissistic personality features demonstrated incremental value over features of borderline and histrionic personality disorder, two other Cluster B conditions, in the prediction of psychophysiological reactivity. We included both men and women in the sample, allowing for separate exploratory analyses by gender.

We tested three main hypotheses. Within each of these hypotheses, exploratory analyses investigated gender differences and the potential incremental contribution of narcissistic personality features beyond features of other Cluster B conditions.

Hypothesis 1: We predicted that PEP shortening (increased cardiac sympathetic activity) would characterize narcissistic and antisocial personality features during a threat task. Conceptually, the self-aggrandizement and reward-seeking of narcissistic personality disorder suggests an overactive behavioral approach system (BAS). Previous literature (Kelsey et al., 2001) supports this position. For similar reasons, the impulsive and reckless behaviors accompanying antisocial personality suggest an overactive BAS. Studies investigating antisocial personality and BAS activation, using HR as an index, have reported mixed results (e.g., Bare et al., 2004). However, these results may reflect the methodological shortcomings of using HR as an index of BAS activation (i.e., HR is influenced by both branches of the autonomic nervous system) rather than true differences in BAS functioning.

Hypothesis 2: We predicted a positive association between narcissistic personality features and behavioral inhibition system (BIS) activation, as measured by skin conductance, during a threat task. This is a departure from previous literature (Kelsey et al., 2001); however, the hypersensitivity to criticism and exaggerated self-concern characteristic of narcissistic personality disorder may suggest an overactive BIS during self-referent threatening situations, especially because criticism is perceived by many people as a social threat. Indeed, of the Cluster B personality disorders, NPD has the highest comorbidity with generalized anxiety disorder (Zuckerman, APA, 1991), a disorder presumably characterized by an overactive BIS (Gray, 1982). Moreover, the self-report measure used by Kelsey and colleagues focuses primarily on the grandiosity and egocentricity characteristic of narcissistic personality features without assessing its anxious components. In line with previous literature (e.g., Dinn & Harris, 2000), we predicted a negative association between antisocial personality features and skin conductance activity during a threat task. The insensitivity to punishment cues characteristic of antisocial personality disorder dovetails with the well-replicated finding of an underactive BIS in this condition (e.g., Lorber, 2004). The BIS analyses may provide a discriminating endophenotypic marker between narcissistic and antisocial personality features.

Hypothesis 3: Lastly, we predicted that narcissistic and antisocial personality features will be negatively associated with RSA reactivity, as an indicator of parasympathetic influence on heart rate, during emotionally evocative tasks. Given the lack of empathy characteristic of both conditions (American Psychiatric Association, 2000), we hypothesized an association between both narcissistic and antisocial personality features and negative affect during empathy-inducing tasks. As RSA is positively correlated with empathetic responding during emotional tasks (Eisenberg et al., 1996), we expected a negative association between RSA and both narcissistic and antisocial personality features.

2. Methods

2.1. Participants

Participants were 120 undergraduate students, ranging in age from 18 to 21, at a private Southeastern university. The sample consisted of 70 females (59%) and 50 males (41%). Full participation in the study consisted of two phases, the first comprising the interview and questionnaire measures and the second comprising the laboratory and psychophysiological measures. Of the 120 participants, only 100 (51 females and 49 males) returned for the second phase of the study. Seven more participants were excluded from the analyses due to equipment failure. Participants who dropped out did not differ significantly from study completers on NPD traits ($t(115) = .1.03$, $p = .30$, $d = .19$), but endorsed significantly fewer ASPD traits ($t(115) = .1.9$, $p = .02$, $d = .36$) than completers. The ethnic composition of the sample included in the analyses was 68 Caucasian, 16 Asian/Pacific Islander, 8 African-American, and 1 Hispanic/Latino. Students received partial course credit and $10 for completing both phases of the study.

2.2. Interview measure

Structured clinical interview for DSM-IV axis II personality disorders (SCID II) cluster B disorders—The SCID-II (First, Spitzer, Benjamin, Williams, & Gibbon, 1997) is a well-validated and widely used semi-structured interview measure of personality disorders. The interview consists of a screening protocol, which is a list of questions assessing DSM-IV Axis II criteria. The questions representing these criteria, however, are low-threshold and intended to capture many false-positive endorsements. Any items endorsed are followed with more specific questions about the criterion. SCID-II items are scored on a 1–3 ordinal scale. A "1" indicates that the criterion in question is not present, a "2" indicates that it is present at sub-clinical levels, and a "3" indicates that it is clearly present at the clinical level.

The interview assessed traits of the four DSM-IV Cluster B personality disorders: antisocial, borderline, histrionic, and narcissistic. For the analyses reported here, criteria from the SCID-II were entered as either present or absent. Criteria scored as 2 or 3 were entered as present, whereas criteria scored as 1 were entered as absent. Analyses were also conducted scoring the SCID-II in the traditional fashion, in which criteria scored as 3 were entered as present and criteria entered as 2 or 1 were entered as absent. These subsidiary analyses produced similar results to those reported here. Clinical psychology graduate students were trained to administer the SCID-II with the SCID-II training tape (Biometrics Research) and SCID-II training manual under the supervision of a Ph.D. level psychologist.

2.3. Questionnaire measure

Short Coolidge axis II inventory (SCATI; Coolidge, 2001) assesses the features of 10 personality disorders from the DSM-IV. The SCATI is a 70-item measure, scored on a 4-point Likert-type scale (1 = strongly false to 4 = strongly true). The SCATI is a shortened version of the 225-item Coolidge Axis II Inventory and displays comparable psychometric properties to its parent instrument (Watson & Sinha, 2007). Studies investigating the convergent validity of the SCATI and the Millon Clinical Multiaxial Inventory (MCMI; Millon, Davis, & Millon, 1997) have found low to moderate correlations between SCATI and MCMI histrionic personality scores, moderate correlations for narcissistic personality scores, and high correlations for antisocial and borderline personality scores (Coolidge & Merwin, 1992; Silbern, Roth, Segal, & Burns, 1997). Cronbach's αs for the Cluster B disorders in this sample were moderate for narcissistic (α = .61), borderline (α = .69), and histrionic (α = .61) features in this sample, but relatively low for antisocial features (α = .46).

2.4. Laboratory tasks

Countdown to aversive stimuli: The countdown to aversive stimuli task has produced well-documented results in the psychopathy literature (see Lorber, 2004, for a review). Prior to the task, participants were informed that they would watch the screen "count" to 12, one count per second, and upon reaching the 12th-s they would hear a white noise blast (1-s, 105 dB (A), gated at minimal rise/fall time through an RCA SA-155 Integrated Audio Amplifier). The task consisted of five trials, lasting 13 s/trial. Between each trial, the subjects rested for a 2.5-min baseline. The countdown procedure was designed to elicit passive coping in response to threat.

International affective picture system (IAPS): The IAPS (Lang, Bradley, & Cuthbert, 1999) is a collection of well-normed emotionally valenced photographs. Sets of slides were presented in four trials: one positive, one fear, one sad, and one emotionally neutral. Each trial lasted one minute and consisted of 10 slides. Between each trial, participants rested for a 2.5-min baseline. The slides measured participants' reactivity to others' distress and their ability to discriminate emotional stimuli. Emotional slides were matched for intensity, and all slides included a human face in the foreground.[1] Happy slides included such items as people smiling together. Fear slides included such items as an individual holding a knife to someone's throat. Sad slides included such items as an individual mourning the death of a loved one. Neutral slides included such items as a factory worker marking a piece of paper.

Dziobek et al. (2008) used social IAPS slides to measure self-reported empathetic reactions. In the present study, we measured RSA, which is positively correlated with empathetic responding (Eisenberg et al., 1996), while participants viewed social IAPS slides.

2.5. Psychophysiological data

Skin conductance level (SCL) and responding (SCR): SCL was measured using the Biopac GSR 100C amplifier. Prior to affixing the electrodes, participants were asked to wash their hands using Ivory handsoap and warm water to remove excess oils and dirt. Ag/AgCl electrodes were filled with .05 M NaCl electrode paste and affixed to the medial phalanges of the 1st and 2nd fingers of the subject's non-dominant hand with velcro straps. The Biopac GSR 100C outputs a constant 0.5 V current between the two electrodes. SCL during the countdown task was measured as the mean level of all intra-epoch activity, in μS/mm, whereas SCR during the slideshows was calculated by summing intra-epoch fluctuations greater than 0.05 μS/mm. SCR was scored using Mindware SCL 2.56 physiological data analysis software.

Pre-ejection period: PEP was measured using the a spot electrode configuration described by Qu, Zhang, Webster, and Tompkins (1986). This configuration included the placement of four electrodes: two affixed three vertical centimeters apart at the back of the neck and two affixed three vertical centimeters apart at the lower back. The experimenter cleaned the contact area using rubbing alcohol and a cotton swab prior to affixing the electrodes. The ECG Q and d*Z*/d*t* B waveforms were ensemble-averaged using Biopac Acquisition v3.9 software, and PEP was measured as the time elapsed, in milliseconds, between the onset of the cardiac Q wave and the point of deflection of the d*Z*/d*t* B wave. Sherwood and colleagues (1986) established the validity of PEP as an indicator of cardiac sympathetic tone.

Respiratory sinus arrhythmia: RSA data were calculated using ECG and respiratory data. ECG signals were acquired using a two lead configuration: one electrode placed 5 cm to the left of the sternum and the other placed 5 cm to the right. Because the impedance cardiograph configuration affixed a ground electrode placed at participants' lower back, a ground lead is not appropriate for the ECG signal. Respiration signals were acquired using a respiratory effort transducer belt placed around participants' waists. The ECG and respiratory data used to calculate RSA were acquired using the Biopac ECG 100C electrocardiogram amplifier and the Biopac RESP 100C respiratory transducer. RSA was scored using Mindware HRV 2.33 physiological data analysis software.

Psychophysiological data reduction: For the countdown to aversive stimuli task, SCL and PEP were measured during ten 12-s epochs: five baseline epochs and five countdown epochs. PEP waveforms were ensemble-averaged for each of the 10 epochs. The mean of the baseline and countdown epochs were calculated for both SCL and PEP. For the IAPS task, SCR, PEP, and RSA were measured during 1-min baseline periods preceding each slide presentation and during each 1-min slide presentation. PEP waveforms were ensemble-averaged for each of the epochs.

2.6. Procedure: Interview and questionnaire measures

Participants completed the SCID-II and the SCATI measures during the first phase of the study along with a battery of other questionnaires assessing alcohol use, aggression, and psychopathy. After completing the questionnaires, participants

[1] IAPS slide numbers included: #2040, 2050, 2095, 2141, 2165, 2190, 2214, 2270, 2276, 2311, 2340, 2372, 2383, 2393, 2394, 2395, 2455, 2550, 2800, 2900, 6230, 6250, 6313, 6510, 6540, 6560, 6571, 8380, 8497, 9415, 9421, 9435, and 9530.

were administered the SCID-II. Trained graduate students administered all questionnaire and semi-structured interview measures, and were blind to all psychophysiological data collected on respondents. The first phase of the study took approximately 45 min–1 h to complete.

2.7. Procedure: Laboratory tasks

During the second phase, participants were exposed to the countdown to aversive stimuli task and the IAPS task while their heart rate, cardiac output, skin conductance and respiration were monitored by a non-invasive physiological system (Biopac MP 100, Santa Barbara, California). Participants were tested in a 10 ft × 8 ft darkened, sound-attenuated room. During the acquisition, participants sat in a cushioned, leather chair approximately 5 ft from the stimulus screen, a 27″ television screen. Participants also wore fitted, cushioned stereo headphones throughout the acquisition. Prior to the first task, subjects sat quietly for a 5-min baseline. Trained research assistants, blind to the questionnaire and interview data, ran the second phase of the study. The second phase of the study took approximately 1.5–2 h to complete. Participants completed the countdown task followed by the emotional slideshow task.

2.8. Data analyses

SCID-II antisocial, borderline, histrionic, and narcissistic personality scores were skewed positively. To reduce this skew, the data were base-10 logarithm-transformed reducing the SPSS v. 14.0 skewness statistic to within ±1. Moreover, the transformation reduced the SPSS v. 14.0 kurtosis statistic to within ±1. Narcissistic personality scores correlated moderately with antisocial ($r = .26$, $p < .01$), BPD ($r = .46$, $p < .01$), and histrionic ($r = .30$, $p < .01$) personality scores. Similarly, narcissistic personality scores on the SCATI correlated moderately with antisocial ($r = .37$, $p < .01$) and borderline ($r = .37$, $p < .01$) personality scores, and highly with histrionic ($r = .61$, $p < .01$) personality scores. Therefore, all analyses are reported with and without controlling for features of these disorders. SCATI narcissistic personality scores correlated moderately ($r = .47$, $p < .01$) with SCID-II narcissistic personality scores. Similarly, SCATI antisocial personality scores correlated moderately ($r = .38$, $p < .01$) with SCID-II antisocial personality scores.

3. Results

Descriptive statistics for all questionnaire and interview measures are reported in Table 1 and for all psychophysiological measures in Table 2. Men ($M = 1.62$, $SD = 1.90$) scored significantly higher ($t(118) = 3.55$, $p < .001$, $d = .65$) on SCID II narcissistic personality features than women ($M = .62$, $SD = 1.16$). Men ($M = 1.04$, $SD = 1.11$) also scored significantly higher ($t(117) = 3.51$, $p < .001$, $d = .65$) on number of SCID II antisocial personality features than women ($M = .40$, $SD = .88$). There were no significant gender differences on the number of SCID II borderline ($t(118) = .29$, $p = .77$, $d = .05$) or histrionic ($t(118) = .51$, $p = .61$, $d = .09$) personality features. Seven individuals met full criteria for DSM-IV NPD using the SCID-II and 8 individuals met criteria for DSM-IV ASPD. Only 1 individual met DSM-IV criteria for both SCID-II NPD and ASPD. There were no significant gender differences on SCATI narcissistic ($t(118) = 1.65$. $p = .10$, $d = .31$), borderline ($t(118) = 0.47$, $p = .66$, $d = .09$), and histrionic ($t(118) = 1.12$, $p = .26$, $d = .21$) personality features. However, men ($M = 9.32$, $SD = 2.44$) scored significantly higher ($t(118) = 2.630$, $p < .01$, $d = .51$) on SCATI antisocial personality features than women ($M = 7.77$, $SD = 3.58$).

Hypothesis 1 predicted that PEP shortening (increased cardiac sympathetic activity or BAS activation) would characterize narcissistic and antisocial personality features during a threat task. Hierarchical multiple regression analyses tested Hypothesis 1. The difference in ms between countdown PEP and baseline PEP was entered as the dependent variable, such that a negative value would indicate PEP shortening, and the number of narcissistic personality features was entered in Step 1. Three subsequent analyses examined the incremental validity of narcissistic personality features above and beyond symptoms of individual Cluster B features taken one at a time, by adding each set of disorder features as Step 1.

Results indicated that SCID-II narcissistic personality features did not significantly predict PEP reactivity ($F(1,92) = 2.34$, $\beta = .16$, $\Delta R^2 = .03$, $p = .13$), although SCATI narcissistic personality features predicted PEP reactivity at the level of a statistical

Table 1
Means and standard deviations for self-report measures

Measure	*M*	*SD*	Min	Max
SCID II ASPD Symptoms	.67	1.03	0	5
SCID II BPD Symptoms	.88	1.63	0	8
SCID II HPD Symptoms	.71	1.14	0	7
SCID II NPD Symptoms	1.05	1.60	0	6
SCATI ASPD	8.45	3.21	5	28
SCATI BPD	8.77	2.95	5	20
SCATI HPD	10.97	1.14	5	19
SCATI NPD	10.90	2.65	5	17

Note. N for each measure ranged from 101 to 120.

Table 2
Means and standard deviations for physiological measures

Measure	*M*	*SD*
Baseline SCL (μMho)	7.95	5.89
Countdown SCL (μMho)	8.38	6.33
Fear SCR (Count)	3.53	2.92
Happy SCR (Count)	1.93	2.02
Sad SCR (Count)	1.57	1.75
Neutral SCR (Count)	1.79	1.80
Baseline PEP (ms)	112.42	13.88
Countdown PEP (ms)	111.35	14.66
Neutral RSA	7.05	1.23
Fear RSA	7.23	1.11
Happy RSA	7.05	1.24
Sad RSA	7.01	1.19

Note. N for each measure equaled 93.

trend ($F(1,92) = 3.64$, $\beta = .20$, $\Delta R^2 = .04$, $p = .06$). Partially supporting our hypothesis, SCID-II antisocial personality features were significantly negatively associated with PEP reactivity ($F(1,96) = 5.20$, $\beta = .22$, $\Delta R^2 = .05$, $p = .03$), whereas SCATI antisocial personality features were not ($F(1,92) = 0.73$, $\beta = .09$, $R^2 = .01$, $p = .08$). SCID-II narcissistic personality features did not provide incremental validity above and beyond antisocial ($F(1,91) = 1.29$, $\beta = .12$, $\Delta R^2 = .01$, $p = .26$), borderline ($F(1,91) = 3.15$, $\beta = .20$, $\Delta R^2 = .03$, $p = .08$), or histrionic personality features ($F(1,91) = 1.35$, $\beta = .12$, $\Delta R^2 = .01$, $p = .25$) in predicting PEP reactivity. Conversely, there was a statistical trend for SCID-II antisocial personality features providing incremental validity above and beyond narcissistic personality features ($F(1,91) = 1.35$, $\beta = .19$, $\Delta R^2 = .03$, $p = .07$) in predicting PEP reactivity. SCATI narcissistic personality features did not demonstrate incremental validity in predicting PEP above and beyond antisocial ($F(1,91) = 3.07$, $\beta = .19$, $\Delta R^2 = .03$, $p = .08$), borderline ($F(1,91) = 3.46$, $\beta = .21$, $\Delta R^2 = .04$, $p = .07$), or histrionic ($F(1,91) = 0.36$, $\beta = .08$, $\Delta R^2 = .00$, $p = .55$) personality features. Similarly, SCATI antisocial personality features did not provide incremental validity in predicting PEP over SCATI narcissistic personality features ($F(1,91) = 0.05$, $\beta = .03$, $\Delta R^2 = .00$, $p = .82$). Moderated multiple regression analyses adding a narcissistic personality features by gender interaction term in Step 2 indicated that gender was not a significant moderator between PEP reactivity and SCID II ($F(1,91) = .01$, $\beta = .04$, $\Delta R^2 = .00$, $p = .91$) or SCATI ($F(1,91) = 1.25$, $\beta = .60$, $\Delta R^2 = .01$, $p = .27$) narcissistic personality features.

Hypothesis 2 predicted that SCL activity during the countdown task would be positively associated with narcissistic personality features and negatively associated with antisocial personality features. The difference in μMho between countdown SCL and baseline SCL was entered as the dependent variable (where a positive value indicates SCL activation) and narcissistic personality features were entered in Step 1. As with Hypothesis 1, we also investigated the incremental contribution of narcissistic personality features over features of other Cluster B personality disorders using hierarchical multiple regression analyses. Inconsistent with hypothesis 1, neither SCID-II ($F(1,92) = .99$, $\beta = .10$, $R^2 = .01$, $p = .32$) or SCATI ($F(1,92) = 2.19$, $\beta = .15$, $R^2 = .02$, $p = .14$) narcissistic personality features significantly predicted changes in SCL from baseline to the countdown. Partially supporting our hypothesis, SCID-II antisocial personality features were negatively associated with SCL reactivity ($F(1,92) = 14.20$, $\beta = .37$, $\Delta R^2 = .14$, $p < .001$), whereas SCATI antisocial personality features were not ($F(1,92) = 2.31$, $\beta = .13$, $\Delta R^2 = .02$, $p = .13$). SCID-II narcissistic personality features did not provide incremental validity above and beyond antisocial ($F(1,91) = 1.02$, $\beta = .10$, $\Delta R^2 = .01$, $p = .32$), borderline ($F(1,91) = 0.20$, $\beta = .05$, $\Delta R^2 = .00$, $p = .66$), or histrionic ($F(1,91) = 0.01$, $\beta = .01$, $\Delta R^2 = .00$, $p = .91$) personality features in predicting SCL reactivity. Conversely, SCID-II antisocial personality features provided incremental validity above and beyond SCID-II narcissistic personality features in predicting changes in SCL from baseline to the countdown ($F(1,91) = 6.14$, $\beta = .35$, $\Delta R^2 = .09$, $p < .01$). SCATI narcissistic personality features did not provide incremental validity above and beyond antisocial ($F(1,91) = 0.12.$, $\beta = .04$, $\Delta R^2 = .00$, $p = .73$), borderline ($F(1,91) = 1.00$, $\beta = .11$, $\Delta R^2 = .01$, $p = .32$), or histrionic ($F(1,91) = 1.55$, $\beta = .17$, $\Delta R^2 = .02$, $p = .22$) personality features. Conversely, SCATI antisocial personality features provided incremental validity above and beyond SCATI narcissistic personality features in predicting changes in SCL from baseline to the countdown ($F(1,91) = 4.57$, $\beta = .24$, $\Delta R^2 = .05$, $p = .04$). Moderated multiple regression analyses adding a narcissistic personality features by gender interaction term in Step 2 indicated that gender was not a significant moderator between SCL reactivity and SCID-II ($F(1,91) = .00$, $\beta = .02$, $\Delta R^2 = .00$, $p = .97$) or SCATI ($F(1,91) = .85$, $\beta = .513$, $\Delta R^2 = .01$, $p = .36$) narcissistic personality features.

Hypothesis 3 predicted a negative association between narcissistic and antisocial personality features and RSA reactivity during emotionally evocative slide shows. Multiple regression analyses controlling for RSA reactivity during the neutral slides tested Hypothesis 3. RSA reactivity during the fear, happy, and sad slides (in individual analyses) were entered as the dependent variable, RSA reactivity during the neutral slides was entered in step 1, and narcissistic personality features were entered in Step 2. As illustrated in Table 3, SCID-II narcissistic personality features significantly negatively predicted RSA reactivity during the happy slides, but not the fear or sad slides. Moreover, SCID-II narcissistic personality features provided incremental validity above and beyond antisocial, borderline, and histrionic personality features in predicting RSA reactivity during the happy slides. Multiple regression analyses indicated that SCID-II antisocial personality features did not significantly predict RSA reactivity during the happy ($F(1,92) = .08$, $\beta = .03$, $\Delta R^2 = .00$, $p = .77$), sad ($F(1,92) = .22$, $\beta = .05$, $\Delta R^2 = .00$, $p = .64$), or fear ($F(1,92) = .63$, $\beta = .08$, $\Delta R^2 = .01$, $p = .43$) slides. Moderated multiple-regression analyses

Table 3
SCID II narcissistic personality features predicting physiological reactivity with and without controlling for those of other SCID II cluster B disorders during emotionally evocative slideshows

Controls:				ASPD Symptoms			BPD Symptoms			HPD Symptoms		
Measure	$F(1,92)$	β	ΔR^2	$F(1,91)$	β	ΔR^2	$F(1,91)$	β	ΔR^2	$F(1,91)$	β	ΔR^2
Fear RSA reactivity	0.32	−.06	.00	0.64	−.09	.01	0.34	−.07	.01	0.04	−.02	.00
Happy RSA reactivity	7.66**	−.29	.08	8.81**	−.33	.10	7.26**	−.30	.08	9.44**	−.36	.10
Sad RSA reactivity	0.01	−.01	.00	0.11	−.04	.00	0.08	−.03	.01	0.27	−.06	.00
Fear SCR reactivity	0.00	.01	.00	0.24	.06	.00	0.13	−.04	.00	0.05	.02	.00
Happy SCR reactivity	1.67	.12	.02	1.37	.12	.01	0.89	.10	.01	1.17	.11	.01
Sad SCR reactivity	0.01	.01	.00	0.39	.06	.00	0.24	.06	.00	0.58	.08	.01
Fear PEP reactivity	0.00	.00	.01	0.24	.06	.00	0.17	.05	.00	0.00	−.01	.00
Happy PEP reactivity	4.80*	.23	.05	2.53	.18	.03	5.63*	.28	.06	2.80	.20	.03
Sad PEP reactivity	4.04*	−.23	.05	2.91	−.21	.04	6.07*	−.30	.08	1.83	−.17	.02

Note.
* $p < .05$.
** $p < .01$.

Table 4
SCATI narcissistic personality features predicting physiological reactivity with and without controlling for those of other SCATI cluster B disorders during emotionally evocative slideshows

Controls:				ASPD Symptoms			BPD Symptoms			HPD Symptoms		
Measure	$F(1,92)$	β	ΔR^2	$F(1,91)$	β	ΔR^2	$F(1,91)$	β	ΔR^2	$F(1,91)$	β	ΔR^2
Fear RSA reactivity	1.83	−.20	.04	2.28	−.23	.05	2.80	−.26	.06	2.65	−.25	.06
Happy RSA reactivity	1.69	−.14	.02	0.70	−.09	.01	1.95	−.16	.02	1.87	−.19	.02
Sad RSA reactivity	0.82	−.10	.01	1.36	−.13	.01	0.48	−.08	.01	1.11	−.14	.01
Fear SCR reactivity	0.00	−.03	.00	0.13	−.04	.00	0.19	−.05	.00	0.38	.08	00
Happy SCR reactivity	0.78	.09	.01	1.33	.13	.01	0.87	.10	.01	0.40	.08	.00
Sad SCR reactivity	1.49	.12	.02	1.40	.13	.02	0.92	.11	.01	0.42	.09	.00
Fear PEP reactivity	0.85	.11	.01	0.94	.12	.01	1.33	.14	.02	0.02	.02	.00
Happy PEP reactivity	6.17*	.41	.07	3.11	.21	.04	4.51*	.26	.06	4.03*	.30	.05
Sad PEP reactivity	0.65	−.10	.01	0.76	−.11	.01	1.17	−.13	.02	5.20*	−.33	.07

Note. * $p < .05$.

adding a narcissistic personality features by gender interaction term in Step 3 indicated that gender did not moderate the relationship between narcissistic personality features and RSA reactivity during the happy slides ($F(1,91) = .07$, $\beta = .13$, $\Delta R^2 = .00$, $p = .79$). As illustrated in Tables 3 and 4, SCID-II and SCATI narcissistic personality features, respectively, significantly predicted PEP activation during the happy and sad slides. Neither SCID-II nor SCATI narcissistic personality features symptoms predicted SCR during the emotionally evocative slides.

4. Discussion

The extensive comorbidity among DSM-IV personality disorders, especially Cluster B disorders, raises questions regarding whether these disorders are separable phenomena or slightly different manifestations ("formes frustes") of the same underlying phenomenon (Lilienfeld, Waldman, & Israel, 1994). Of most relevance to the present investigation, several authors (e.g., Gunderson & Ronningstam, 2001) have noted significant comorbidity between narcissistic and antisocial personality disorders. This study extended previous research (Kelsey et al., 2002; Kelsey et al., 2001) by examining endophenotypic markers (i.e. psychophysiological reactivity) of narcissistic personality features, and was the first to investigate the incremental contribution of narcissistic personality features beyond those of other Cluster B personality disorders, especially antisocial personality disorder, in predicting psychophysiological reactivity. Moreover, the present study used both interview and questionnaire measures to assess personality pathology, whereas previous studies relied solely on questionnaire measures.

Supporting our predictions, antisocial personality features predicted pre-ejection period shortening (sympathetic cardiac activation) and skin conductance hyporeactivity during threat. Contrary to our predictions, neither pre-ejection period nor skin conductance reactivity was associated with narcissistic personality features during threat. Moreover, antisocial personality features provided incremental validity in predicting SCL hyporeactivity and yielded a statistical trend for predicting PEP shortening during threat above narcissistic personality features. These findings suggest that antisocial personality features are marked by less distress and increased ability to mobilize behavior during threat, whereas narcissistic personality features were largely unrelated to distress or the ability to mobilize during threat. Taken together, these findings suggest that narcissistic and antisocial personality features, despite their extensive comorbidity (Gunderson & Ronningstam, 2001), exhibit differential endophenotypic markers. In this respect, this finding suggests that these two conditions are not isomorphic. Nevertheless, the extent to which our findings apply to clinical samples that display high levels of these traits remains to be determined.

Overall, our psychophysiological findings were largely inconsistent with those of previous studies (Kelsey et al., 2001), which suggested that narcissism is characterized by PEP shortening and normal to underactive SCR during threat. However, these disparities could be due largely to methodological differences. For example, Kelsey and colleagues (2001) used the NPI, a measure focused primarily on the ‘‘overt" symptoms of narcissistic personality, such as a sense of entitlement and haughty behavior (Wink, 1991). Factor analyses of the NPI (Emmons, 1987) have yielded four factors, three of which are psychologically adaptive in nature. Conversely, the DSM-IV conception of narcissistic personality disorder, the features of which we measured in this study, includes symptoms of ‘‘covert" narcissism, such as pathological envy and hypersensitivity.

Analyses of emotional responding indicated that neither questionnaire nor interview measures of narcissistic personality features predicted RSA responses to fearful or sad stimuli, but that the interview predicted *negative* RSA responses to happy stimuli. Moreover, narcissistic personality features predicted negative emotional reactivity to happy stimuli above and beyond those of all other Cluster B personality disorders taken individually. The questionnaire and interview measures predicted PEP shortening (sympathetic activation) during the happy slides, and the interview measure predicted PEP lengthening (sympathetic withdrawal) during the sad slides.

Although we did not hypothesize *a priori* that narcissistic personality features would predict negative responding to happy faces, this finding dovetails with the phenomenology of narcissism. Two core characteristics of narcissistic personality disorder include excessive admiration and envying others (American Psychiatric Association, 2000), so one might expect that individuals with elevated narcissistic personality features may react negatively towards others' happiness, while not feeling badly about others' sadness. However, this provocative finding is preliminary and requires replication.

Our findings suggest that the psychophysiological markers of narcissistic personality features are similar across genders. However, these analyses were exploratory and should be interpreted cautiously given the sample size. Future research should investigate these relationships in laboratory tasks as well as social paradigms.

As noted earlier, the distinction between covert and overt narcissistic personality features also requires further investigation (Kernberg, 1975; Kohut, 1972). Wink (1991) found that two virtually uncorrelated factors underpin measures of narcissistic personality features: Vulnerability–Sensitivity (covert) and Grandiosity–Exhibition (overt). Vulnerability–Sensitivity correlates with hypersensitivity to criticism, envy of others, and fragile sense of self-worth, whereas Grandiosity–Exhibition correlates with power lust, manipulativeness, and self-dramatization. Despite these differences, Wink found that individuals scoring high on either scale shared the arrogance, self-centeredness, and disregard for others characteristic of narcissistic personality disorder (i.e., pathological narcissism). Despite the potential differences in the etiology and correlates of covert and overt narcissistic personality features, their psychophysiological differentiation remains unexamined.

Although this study added to preliminary research regarding the psychophysiological underpinnings of narcissistic personality features, several limitations should be noted. First, all psychophysiological studies of narcissistic personality features, including ours, relied on undergraduate samples, which may be characterized by a restricted range of narcissistic personality features. Future studies should examine the psychophysiological correlates of narcissism in samples presumably marked by pathological levels of narcissistic features, including psychiatric inpatients, prisoners, and even certain groups of high-functioning individuals, such as celebrities (Young & Pinsky, 2006). Second, the Cronbach's αs of the individual SCATI DSM-IV Cluster B personality disorder scales were modest or (in the case of ASPD, fairly low), suggesting that our self-report findings should be interpreted cautiously. Third, studies of the psychophysiological correlates of narcissistic personality features have all relied on laboratory paradigms that do not include potentially relevant social stressors (e.g., giving a public speech regarding one's faults). As a consequence, these paradigms may not adequately capture the severe interpersonal deficits associated with narcissistic personality features. Future studies should examine the psychophysiological correlates of narcissistic personality features during social stressor paradigms to better understand the psychophysiological correlates of this still mysterious condition.

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