

Abnormal Selective Attention in Psychopathic Female Offenders

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Research on psychopathy in women has generated equivocal laboratory findings. This study examined the performance of psychopathic women in 2 laboratory tasks designed to assess abnormal selective attention associated with response modulation deficits: a computerized picture–word (PW) task, and a picture–word Stroop (PW Stroop) task. Consistent with data from psychopathic men, women receiving high scores on the Psychopathy Checklist—Revised (Hare, 1991) displayed reduced Stroop interference on the PW and PW Stroop tasks. Results suggest that despite some differences in the expression of psychopathy across gender, psychopathic women are characterized by selective attention abnormalities predicted by the response modulation hypothesis and similar to those exhibited by psychopathic men.

Keywords: psychopathy, response modulation, women, attention

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Psychopathic individuals assessed using the Psychopathy Checklist—Revised (PCL-R; Hare, 1991) are characterized by callous, antisocial behaviors and attitudes; an apparent inability to forge or maintain emotional connections with others; and a failure to accept responsibility for their actions (Cleckley, 1976). Understanding the etiology of this syndrome has become a goal of researchers in both criminal justice and psychopathology (Hare, 1996).

The emergence of reliable and valid assessments of psychopathy in the past 20 years has enabled systematic investigation of the emotional, behavioral, and attentional abnormalities associated with this disorder (Hare, 1996). Such research has revealed emotion processing deficits in startle-probe paradigms (Levenston, Patrick, Bradley, & Lang, 2000; Patrick, 1994; Sutton, Vitale, & Newman, 2002), countdown to punishment paradigms measuring changes in electrodermal activity (Hare, Frazelle, & Cox, 1978; Ogloff & Wong, 1990), and lexical decision tasks assessing emotion facilitation (Lorenz & Newman, 2002a; Williamson, Harpur, & Hare, 1991). Further, research has shown that psychopathic males show deficient behavioral inhibition as assessed by response perseveration in the presence of punishment cues (Newman, Patterson, & Kosson, 1987) and by poor passive avoidance on go/no-go discrimination tasks involving rewards and punishments

(Lykken, 1957; Newman & Kosson, 1986; Newman & Schmitt, 1998; Thornquist & Zuckerman, 1995). Finally, psychopathic individuals exhibit abnormalities in attention processing, particularly when stimuli are secondary or peripheral to their primary focus of selective attention (Hare & Jutai, 1988; Hiatt, Schmitt, & Newman, 2004; Newman, Schmitt, & Voss, 1997).

The response modulation hypothesis (RMH; Gorenstein & Newman, 1980; Newman & Lorenz, 2003; Patterson & Newman, 1993) proposes that these abnormalities in psychopathic individuals' emotional and behavioral responding are associated with an underlying information processing deficit involving the relatively automatic shift of attention from the effortful organization and implementation of goal-directed behavior to the evaluation of that behavior. According to the model, a deficit in response modulation interferes with the psychopathic individual's ability to modify a dominant response set (i.e., the top-down focus of selective attention) in response to non-dominant, secondary, or contextual (i.e., unexpected bottom-up) information that may contraindicate an anticipated response (see MacCoon, Wallace, & Newman, 2003; Newman et al., in press).

This focus on attention processing distinguishes the RMH from other theories and models of psychopathy that have attributed psychopathic individuals' disinhibited behaviors to a lack of fear or insensitivity to punishment cues (e.g., Fowles, 1980; Lykken, 1957, 1995). According to these punishment-insensitivity or "low-fear" models, the dysregulated behavior of psychopathic individuals occurs because, without an adequate fear response, these individuals are less able to learn to inhibit these behaviors.

Although the RMH predicts a situation-specific deficit in processing threat and other emotion cues (see Lorenz & Newman, 2002a; Newman & Lorenz, 2003), tests of the RMH have focused on the two specifications of the model that are not predicted by alternative theories of psychopathy. First, according to the RMH, stimuli need not be emotionally or motivationally significant for the deficit to emerge (Patterson & Newman, 1993). In fact, according to the RMH, the abnormalities evidenced among psychopathic individuals should be exhibited in emotionally neutral contexts, as well as in emotionally

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significant ones. Second, the RMH holds that psychopathic individuals will show performance abnormalities when a situation requires them to process information that is secondary or peripheral to the dominant task (Patterson & Newman, 1993).

To test the first specification, Newman, Schmitt, and Voss (1997) used a computerized picture–word (PW) task. In this task, participants are presented with two consecutive pictures or words and are instructed to indicate whether or not the two pictures (or words) are conceptually related. On word trials, the first word is presented with a superimposed picture. On picture trials, the first picture is presented with a superimposed word. In each case, participants are instructed to ignore this secondary (i.e., superimposed) stimulus. However, on half of the trials in which the consecutively presented stimuli are conceptually unrelated, the superimposed picture (or word) presented over the first stimulus is conceptually related to the second stimulus. In these trials, the correct response is “unrelated,” but the response indicated by the secondary stimulus is incongruent with this response. Among healthy participants, responses on these incongruent trials are slower than responses to congruent trials (see Gernsbacher & Faust, 1991). Examples of congruent and incongruent trials are presented as supplemental materials online. Consistent with the performance of healthy participants, nonpsychopathic male offenders responded significantly more slowly in incongruent trials than in congruent trials (i.e., interference). However, this effect was significantly smaller in psychopathic male offenders, thus demonstrating significantly less sensitivity to the secondary stimulus among this group (Newman et al., 1997).

It is important to note that this finding was the result of differences in the performance of low-anxious, psychopathic participants versus low-anxious controls, suggesting that the attention abnormalities associated with psychopathy and predicted by the RMH may be relatively specific to a subgroup of psychopathic individuals characterized by good intelligence, low anxiety, and relatively extreme scores on the PCL-R. As a result, this subgroup has been the focus of subsequent tests of the RMH and theoretical conceptualizations of the model (e.g., Brinkley, Newman, Widiger, & Lynam, 2003; Hiatt, Schmitt, & Newman, 2004; Lorenz & Newman, 2002a; Newman & Lorenz, 2003; Vitale et al., 2005).

Hiatt et al. (2004) demonstrated reduced interference in response to emotionally neutral secondary stimuli among low-anxious, psychopathic male offenders using a PW Stroop task. The PW Stroop task consists of four cards. The first card is printed with a series of object words, which the participants are asked to read. The second card is printed with a series of line drawings of objects, which the participants are instructed to name. On the third card, the line drawings are presented with superimposed trigrams (three-letter, nonword combinations). On the fourth card, the line drawings are presented with superimposed incongruent words from Card 1 (i.e., the word *hen* over a line drawing of a frog). For Cards 3 and 4, participants are instructed to name the drawings and ignore the superimposed trigrams and words. Consistent with findings from the PW task (Newman et al., 1997), Hiatt et al. (2004) found that low-anxious, psychopathic men showed significantly less interference in response to the superimposed, incongruent words than did low-anxious, nonpsychopathic men.

This evidence supports the first specification of the RMH, which states that psychopathic individuals will demonstrate performance

abnormalities in response to emotionally neutral stimuli. The second specification holds that performance abnormalities are likely to occur when a situation arises in which the psychopathic individual must process information that is secondary or peripheral to the dominant task (Patterson & Newman, 1993). Recent restatements of the RMH (e.g., MacCoon et al., 2003; Newman et al., in press) have conceptualized this process as a deficit in the integration of bottom-up information with a top-down selective attention focus.

Evidence for this second specification of the model comes from studies of passive-avoidance learning tasks. *Passive avoidance* refers to the inhibition of responses that would otherwise result in punishment. Consistent with the prediction of the RMH, deficits in the performance of psychopathic individuals are relatively specific to circumstances that require participants to alter the top-down focus of selective attention to process bottom-up (i.e., punishment) cues (Newman & Kosson, 1986; Newman, Patterson, Howland, & Nichols, 1990; Newman & Schmitt, 1998). When this dependence was obviated by the use of a punishment-only task (Newman & Kosson, 1986) or by the use of a reward–punishment task that forced participants to attend to both the reward and punishment contingencies from the outset (Newman et al., 1990), psychopathic participants showed adequate response inhibition.

According to Hiatt et al. (2004), the relative insensitivity to secondary cues demonstrated by psychopathic individuals in the PW and PW Stroop tasks is also consistent with this specification. Specifically, the authors propose that the response interference experienced by the nonpsychopathic participants on the PW Stroop task results from the relatively automatic integration of bottom-up information (i.e., the incongruent, superimposed word) with the top-down mediated focus of selective attention (i.e., attending to the line drawing to be named). However, as a result of their response modulation deficits, the top-down mediated focus of selective attention adopted by psychopathic participants is relatively immune to the bottom-up information. Thus, no interference is experienced (Hiatt et al., 2004).

Despite clear advances in etiologically relevant research in the field of psychopathy over the past 20 years, and in the RMH specifically, this research has been limited by a reliance on samples of institutionalized, Caucasian, adult males. There is, however, an emerging literature examining the expression and correlates of psychopathy in other groups, particularly female offenders (e.g., Bolt, Hare, Vitale, & Newman, 2004; Cale & Lilienfeld, 2002; Rutherford, Cacciola, Alterman, & McKay, 1996; Salekin, Rogers, & Sewell, 1997; Weiler & Widom, 1996; Vitale, Smith, Brinkley, & Newman, 2002). The results of research in this area have been equivocal. Although evidence supports the generalizability of psychopathy assessments to female populations (e.g., Cale & Lilienfeld, 2002; Verona & Vitale, 2005; Vitale et al., 2002), there is limited evidence for the generalizability of laboratory-based, etiological-relevant correlates of psychopathy across gender.

For example, in a study of incarcerated females that tested the generalizability of deficits in response inhibition on a card-playing task, Vitale and Newman (2001) failed to find significant differences in the performance of psychopathic and nonpsychopathic participants. Similarly, psychopathic females do not display the behavioral disinhibition in passive-avoidance tasks or the deficient emotion facilitation in lexical decision tasks that characterize psy-

chopathic males (e.g., Lorenz & Newman, 2002b; Vitale et al., 2005). Conversely, like psychopathic men, psychopathic women do show anomalous startle modulation in a picture-viewing paradigm (Sutton et al., 2002).

Although these studies were not designed specifically to test the RMH in women, the results are inconsistent with the RMH for psychopathy and suggest two possibilities. The first possibility is that psychopathy in women is not associated with deficits in response modulation. The second is that psychopathic women are characterized by response-modulation deficits, but that these deficits are expressed differentially across gender (Vitale & Newman, 2001). For example, as a result of gender differences in behavioral regulation strategies, psychopathic women may be less susceptible to disinhibited responding on laboratory tasks, such as the card-playing task and passive avoidance (PA) paradigms, which are designed to elicit impulsivity.

At present, there are too few laboratory studies with psychopathic women to draw firm conclusions regarding these discrepant findings. However, it is useful to consider the nature of the experimental paradigms involved. The PA, card-playing, and lexical-decision tasks involve modulation of motor responses by affective and inhibitory cues, whereas the startle-probe paradigm involves a physiological and relatively automatic index of affect processing. Thus, these paradigms differ importantly in regard to opportunities for response regulation, with the former tasks being more subject to effortful behavioral regulation than the startle paradigm.

Each of these possibilities has important implications, not just for the conceptualization of psychopathy in women but for the RMH specifically. At a minimum, they suggest either that the RMH is applicable only to particular psychopathic populations or that the RMH needs to be refined to predict more specifically which associated behavioral abnormalities will be expressed in various psychopathic groups and in what contexts. In the absence of studies that test these possibilities, the RMH is weakened as a proposed etiological mechanism of psychopathy.

The current studies attempt to clarify the nature of psychopathy in female offenders by testing the hypothesis that, despite their normal performance on tasks assessing behavioral disinhibition and emotion facilitation, psychopathic women do exhibit other etiological relevant abnormalities associated with the syndrome in males. In the first study, we used the computerized PW task from the Newman et al. (1997) study to test for abnormal selective attention among women with relatively high scores on the PCL-R. In the second study, we used the PW Stroop task from the Hiatt et al. (2004) study to test the prediction that, similar to low-anxious, psychopathic men, low-anxious, psychopathic women will show less interference than do controls in response to incongruent secondary stimuli. In both cases, the primary objective is to replicate findings from psychopathic males, thereby providing support for the cross-gender generalizability of the RMH for psychopathy and for the associated abnormalities in selective attention.

General Method

Participants

Participants were Caucasian females incarcerated at the Taycheedah Correctional Institution, a multi-security-level prison in central Wisconsin. A file prescreen was conducted to exclude

individuals who were 40 or more years old, who had performed below the 4th grade level on the prison's standardized measures of reading and math achievement, or who had diagnoses of bipolar disorder or psychosis.

Individuals meeting the inclusion criteria were invited to participate in an ongoing study being conducted at the prison. All participants were presented with the elements of informed consent both orally and in writing.

Psychopathy Assessment

Psychopathy was assessed using the PCL-R (Hare, 1991). Considered the "state of the art" measure of the psychopathy syndrome (Fulero, 1995), the PCL-R is composed of 20 items that tap the personality and behavioral characteristics of psychopathy (e.g., grandiose sense of self worth, juvenile delinquency). Each item is rated as 0 (*not present*), 1 (*may be present*), or 2 (*definitely present*). Recent analyses suggest that four facets comprise the PCL-R (Hare, 2003). These facets tap each of the components of the psychopathy construct. Facet 1 includes items tapping the interpersonal characteristics of psychopathy, Facet 2 includes items tapping the affective characteristics of psychopathy, Facet 3 includes items tapping the impulsive lifestyle associated with psychopathy, and Facet 4 includes items tapping the antisocial behaviors of psychopathic individuals.

PCL-R scores were based on information gathered during 1-hr semistructured interviews and reviews of the inmates' prison files (including presentence investigations and conduct reports) that were conducted by trained graduate students.

Historically, scores of 30 and above have been recommended for classifying participants as psychopathic (Hare, 1991). Although this score has served as the hallmark in much experimental research, there are data suggesting that this cut score may not apply to all populations (e.g., Cooke, 1996; Cooke & Michie, 1997).

There is some evidence that this may be the case for female populations. First, the base rates for psychopathy in women using the traditional cut score are lower than the rates in men. For example, in a sample of female methadone patients, Rutherford et al. (1996) did not find any women scoring above 30 on the PCL-R. This was not the case among male methadone patients (Alterman, Cacciola, & Rutherford, 1993). Similarly, although the base rate for psychopathy in male prison populations typically ranges from 15% to 30% (Salekin, Rogers, Ustad, & Sewell, 1998) among incarcerated women, the base rates have been as low as 11% (Loucks, 1995; Neary, 1990) and 9% (Vitale et al., 2002).

Second, Bolt et al. (2004) used mean and covariance structure analysis to examine the invariance of the PCL-R across gender and found that although the factors structure of the PCL-R replicated across gender, the mean structure did not. This indicates that many PCL-R characteristics become manifest at different levels of psychopathy across gender.

Finally, although the PCL-R assesses much more than antisocial behavior, antisocial behavior is an important component of the instrument. For example, high scores on items such as juvenile delinquency, criminal versatility, and revocation of conditional release all depend on extensive histories of criminal behavior. Although there are clearly women with such histories, rates of

violent and criminal behavior are typically higher for males than females (Goldstein et al., 1996; Zoccolillo, 1993).

Taken together, these findings suggest that a cut score based on findings in male samples may not be applicable to a female population. As a result, we used an alternative cut score of 24 in the current study. This score creates percentages of psychopathic women similar to those found in male samples. Further, this cut score results in sample sizes large enough to yield reliable estimates of performance. The higher cut score results in too few psychopathic participants, making it more likely that results could be biased by a few extreme individuals. However, because the use of this lower cut score is unorthodox, the means for psychopathic and nonpsychopathic participants based on the traditional cut score of 30 have been included in a footnote for each experiment.

The prototypical psychopathic individual (see Cleckley, 1976) is characterized by good intelligence and an absence of thought disorder and neurosis. However, the PCL-R is independent of measures of these constructs (Hare, 1991; Schmitt & Newman, 1999). As a result, some researchers have argued (Brinkley et al., 2003; Newman & Brinkley, 1997) that to study the prototypical psychopathic individual and to create homogenous groups for analysis, the PCL-R should be supplemented with measures of intelligence, psychosis, and trait anxiety. In their study, Hiatt et al. (2004) excluded participants with subnormal intelligence as assessed by the Shipley Institutes of Living Scale (SILS; Shipley, 1982) and participants with diagnoses or evidence of psychosis or bipolar disorder. Although participants with high levels of trait anxiety were included in their study, Hiatt et al. (2004) formulated hypotheses specifically for prototypical psychopathic individuals (i.e., those low in trait anxiety) and used planned comparisons in addition to overall analyses of variance (ANOVAs) to test their predictions. This has been the approach used for most recent tests of the RMH (e.g., Lorenz & Newman, 2002a; Newman et al., 1997; Vitale et al., 2005). Consistent with this approach, we also supplemented the PCL-R with measures of intelligence, psychosis, and trait anxiety and tested the RMH within the low-anxious groups.

Additional Materials

In addition to the structured interview used to rate psychopathy, we administered a series of self-report measures to assess the intelligence, psychopathology, and trait anxiety of participants.

The SILS (Shipley, 1982). The SILS is a measure of intellectual functioning. It consists of a 40-item vocabulary test and a 20-item abstraction test. The measure can be used to obtain reliable estimates of Wechsler Adult Intelligence Scales—Revised scores (Shipley, 1982). The SILS has demonstrated good psychometric properties including split-half reliabilities ranging from .84 to .92 (Shipley, 1982). Participants with borderline or lower intelligence (i.e., <70) were excluded from the analyses.

The Welsh Anxiety Scale (WAS; Welsh, 1956). The WAS is a 39-item true-false questionnaire that was derived from the Minnesota Multiphasic Personality Inventory to measure anxiety and negative affect. Consistent with Gray's (1991) anxiety construct, the WAS correlates approximately .66 with neuroticism and .33 with introversion. In this sample, the internal consistency of the WAS was $\alpha = .92$. Median splits on the WAS were used to divide participants into high- and low-anxious groups.

The Symptom Checklist-90-Revised (SCL-90; Derogatis, 1992). The SCL-90 is a 90-item questionnaire that assesses the degree to which a participant is experiencing current major psychiatric symptoms. The measure consists of nine primary symptom scales (e.g., depression, schizophrenia) and three global indices. The global symptom index is one of the three indices and provides an estimate of individuals' overall self-reported pathology. The SCL-90 demonstrates test-retest reliability coefficients ranging from .80 to .90 (Derogatis, 1992) and correlates with other measures of psychopathology (e.g., Minnesota Multiphasic Personality Inventory, Social Adjustment Scale, and General Health Questionnaire; Derogatis, 1992). In this sample, internal reliability for the various subscales ranged from $\alpha = .73$ to $\alpha = .97$.¹

Procedure

On the 1st day of the study, a semistructured interview was conducted to aid in psychopathy assessments. Following the interview, participants were asked to complete the SILS, WAS, and SCL-90. Participants returned for two to four subsequent experimental sessions. These sessions typically occurred 1–2 weeks apart. Each of the experimental tasks presented here were included with two or three other tasks in 1-hr testing sessions. Participants were tested individually by a female experimenter who was blind to group membership.

Statistical Analyses

To test the primary hypotheses in both studies, we used one-tailed *t* tests to conduct planned comparisons between low-anxious, psychopathic individuals and controls. One-tailed tests were used because each study was testing for reduced Stroop interference among psychopathic individuals in comparison with controls. In no case was it predicted that low-anxious, psychopathic individuals would show increased interference in comparison with that seen in low-anxious controls. In addition, for completeness, omnibus ANOVAs are included in both studies, in addition to as supplemental analyses examining the associations between interference on each task and total PCL-R scores used dimensionally, as well as each of the four PCL-R facets.²

Study 1

In Study 1, we used the computerized PW task (Newman et al., 1997) to test the generalizability of abnormalities in selective attention predicted by the RMH to psychopathic females. If psychopathic females are characterized by relative insensitivity to

¹ Global symptom index scores were compared across groups to test for group differences in psychopathology. There were no significant main effects or interactions involving group, indicating that levels of psychopathology were similar for psychopathic individuals and controls.

² Supplemental analyses are included examining the associations between the PCL-R facets and interference scores for each task. It is important to note, however, that tests of the RMH have been confined to groups of low-anxious, psychopathic males and that the association between psychopathy and interference scores does not appear to be continuous (e.g., Brinkley et al., 2004; Newman et al., 1997).

motivationally neutral, secondary stimuli, they should show significantly less interference than would the controls on the PW task.

Method

Participants. Data were collected for 285 Caucasian female offenders. The mean PCL-R total score was 18.85 ($SD = 7.08$). Means and standard deviations for the facets were 3.08 and 1.94, 4.22 and 2.01, 5.40 and 2.49, and 4.29 and 2.51 for Facets 1, 2, 3, and 4, respectively.

Task and procedures. The PW task used in this study is the same as that used by Newman et al. (1997) and is based on a task developed by Gernsbacher and Faust (1991, Experiment 3).

The task consists of 160 trials. Half of the trials involve comparing two words to determine if they are related, and the rest of the trials involve comparing two pictures to determine if they are related. Trials are initiated by a *P* on picture trials and a *W* on word trials. This 1,000-ms warning stimulus alerts participants to focus on the picture or word component of the following display and thus establishes a dominant response set. Following the warning stimulus and a 1,000-ms interstimulus interval (ISI), a context display is presented for 700 ms, followed by a variable interval (50 ms or 1,000 ms), which is followed by the test display. The test display remains on the screen until either the participant responds or until 2,000 ms elapse.

Each context display contains a line drawing and a superimposed word presented simultaneously (see online materials). The drawing and word are always unrelated. The test display is simply another picture (without a superimposed word) on picture trials or another word (without a picture) on word trials. According to the type of trial, participants must decide whether the word or the picture shown in the test display is related to the word or picture that was presented in the context display. On picture trials, therefore, participants must focus on the picture in the context display and ignore the word and vice versa for word trials. Following Gernsbacher and Faust (1991), we instructed participants to press one button with their left index finger if the stimuli were related and to press a second button with their right index finger if they were not related.

The 160 trials are divided into three types: experimental, comparison, and filler trials. In the 40 experimental trials, the to-be-ignored component of the context display is conceptually related to the test display, whereas the to-be-attended-to component is unrelated to the test display. Thus, the correct answer is "unrelated," but participants may have difficulty rejecting the potential relationship because the to-be-ignored contextual cues prime related associations. Each set of experimental trials is matched by a set of comparison trials. The only difference between experimental and comparison trials is that the to-be-ignored component of the context display in all 40 comparison trials is also unrelated to the test display (see online materials). The comparison trials provide a means of assessing whether the meaning of the contextual cues is interfering with decision times on the experimental trials. For example, an experimental trial may involve a picture of a baseball player with the word *rain* superimposed as the context display and a picture of an umbrella as the test display. The corresponding comparison trial might involve the same picture with the word

soup superimposed as the context display. In both cases, the correct answer is "unrelated," but associations elicited by the word *rain* have been shown to slow reaction times under these circumstances (Gernsbacher & Faust, 1991). In the 80 filler trials, the to-be-attended-to component of the context display is conceptually related to the test display, and the to-be-ignored component is unrelated. These displays, which merit the "related" response, are included so that the base rate for "related" and "unrelated" responses is equated.

In addition to varying the relation between the context and test displays, another crucial variable concerns the time between the offset of the context display and the onset of the test display (i.e., ISI). A fixed but quasi-randomized schedule of trials ensures that the ISI is 50 ms for one half of the trials and is 1,000 ms for the other half. The measure of primary interest is the interference score, which is computed by subtracting participants' average response latency on comparison trials from their average response latency on experimental trials. At the 50-ms ISI, the interference score affords an index of the extent to which relatively automatic associations elicited by the to-be-ignored stimuli interfere with rejecting the test display. Gernsbacher and Faust (1991) reported significant interference at the 50-ms ISI across groups despite providing participants with explicit instructions to ignore these stimuli. At the 1,000-ms ISI, their control participants displayed minimal interference. Thus, hypothesis testing in this study focused on interference at the 50-ms ISI (see also Newman et al., 1997).

Throughout this experiment, a filled white (9 cm × 9 cm) square bordered by a 2-mm blue line occupied the center of the otherwise black computer screen. All displays were presented inside the blue border of the white square. After each trial, participants received feedback: For correct responses, they received the message "Correct" with a value \$0.01 to \$0.05 (centered below) indicating the amount they had earned. For incorrect responses, they received the message "Wrong." Participants completed 23 practice trials (not analyzed) before performing the actual experiment. Consistent with Gernsbacher and Faust (1991) and Newman et al. (1997), we included only those participants performing the task with 75% accuracy or better in this report. In addition, response times falling more than 2.5 standard deviations from the mean were designated as outliers and were excluded from the analyses.

Results and Discussion

There were 123 Caucasian female offenders with PCL-R scores of 24 or greater (i.e., psychopathic; $n = 53$) or scores of 14 and below (i.e., nonpsychopathic; $n = 70$). Low-anxious groups were formed using a median split on the WAS, resulting in 20 low-anxious, psychopathic individuals and 41 low-anxious controls.

Preliminary analyses. Correlations between measures are presented in Table 1. A 2 (psychopathy group) × 2 (high anxious vs. low anxious) ANOVA with SILS-estimated IQ as the dependent variable was conducted to test for group differences in intelligence. There was a significant main effect for anxiety, $F(1, 119) = 4.59$, $p < .05$, with high-anxious participants showing significantly lower intelligence than low-anxious participants. There were no other significant main effects or interactions. Mean intelligence scores for all participants are presented in Table 2.

Table 1
Correlations Between PW Performance, PCL-R, SCL-90, IQ, Anxiety, and PCL-R Facets for Study 1

| Measure | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|----------------------------|--------|--------|--------|---------|--------|--------|--------|--------|-------|-------|------|
| 1. PCL-R | 1.00 | — | | | | | | | | | |
| 2. GSI | 0.09 | 1.00 | | | | | | | | | |
| 3. PSD | 0.10 | 0.64** | 1.00 | | | | | | | | |
| 4. IQ | -0.17 | -0.13 | 0.03 | 1.00 | | | | | | | |
| 5. WAS | 0.22* | 0.62** | 0.46** | -0.26** | 1.00 | | | | | | |
| 6. Facet 1 (interpersonal) | 0.83** | -0.04 | -0.01 | -0.04 | 0.04 | 1.00 | | | | | |
| 7. Facet 2 (affective) | 0.74** | 0.09 | 0.11 | -0.05 | 0.17 | 0.61** | 1.00 | | | | |
| 8. Facet 3 (lifestyle) | 0.90** | 0.14 | 0.08 | -0.23** | 0.25** | 0.66** | 0.53** | 1.0 | | | |
| 9. Facet 4 (antisocial) | 0.85** | 0.10 | 0.09 | -0.22* | 0.21* | 0.57** | 0.47** | 0.75** | 1.00 | | |
| 10. InterferenceP | -0.03 | 0.03 | -0.08 | 0.07 | 0.05 | -0.01 | -0.07 | 0.04 | -0.06 | 1.00 | |
| 11. InterferenceW | -0.06 | -0.01 | -0.06 | -0.02 | -0.13* | 0.01 | 0.09 | -0.08 | -0.12 | -0.01 | 1.00 |

Note. PW = picture-word; PCL-R = Psychopathy Checklist-Revised total score; SCL-90 = Symptom Checklist-90-Revised; IQ = Shipley Institutes of Living Scale estimated Wechsler Adult Intelligence Scale—Revised intelligence score; GSI = Global Symptom Index of the SCL-90; PSD = Positive Symptom Distress Index of the SCL-90; WAS = Welsh Anxiety Scale total score; InterferenceP = interference on picture trials; InterferenceW = interference on word trials.

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

Group differences in accuracy were assessed using a 2 (psychopathy group) \times 2 (high anxious vs. low anxious) ANOVA with accuracy as the dependent variable. There were no significant main effects or interactions. Accuracy data for all groups are presented in Table 2

Primary analyses. A repeated measures ANOVA with trial type (picture or word) as the within-subjects factor and psychopathy (psychopath or nonpsychopath) and anxiety (high- or low-anxious participants) as between-subjects factors was used to analyze interference. There was no main effect for either psychopathy, $F(1, 119) = 2.12, p = .15$, or anxiety, $F(1, 119) = .57, p = .45$. There was a trend for the interaction between psychopathy and anxiety, $F(1, 119) = 2.92, p = .09$. Group means are presented in Table 2.

A planned comparison (t test) was used to test our hypothesis that low-anxious psychopaths would display less interference than low-anxious controls. The results showed that, across trial type, low-anxious, psychopathic participants showed significantly less interference ($M = 2.78$ ms, $SD = 58.52$) than did low-anxious, nonpsychopathic participants ($M = 46.77$ ms, $SD = 73.91$), $t(119) = 2.16, p < .05$ (one-tailed),³ Cohen's $d = .59$. A scatterplot of the data for low-anxious participants is presented as Figure 1.

Supplemental analyses. To examine the associations between the four facets of the PCL-R and interference scores on the PW task, we entered the four facets simultaneously into two separate regressions: one with interference on picture trials as the dependent variable and the second with interference on word trials as the dependent variable. For the regression examining interference on picture trials, none of the four facets accounted for a significant proportion of the variance in picture-trial interference (Facet 1, $\beta = -.01$; Facet 2, $\beta = -.08$; Facet 3, $\beta = .13$; and Facet 4, $\beta = -.12$). For the regression examining interference on word trials, only Facet 2 was a significant, though weak, predictor of picture-trial interference, ($\beta = .14, p < .05$; Facet 1, $\beta = .03$; Facet 3, $\beta = -.06$; Facet 4, $\beta = -.14$).

Overall, the results of Study 1 demonstrate that the relative insensitivity to interference from contextual cues on the PW task exhibited by low-anxious, psychopathic males in Newman et al.

(1997) generalizes to psychopathic female offenders. Indeed, in their study, Newman et al. (1997) reported mean interference scores of -18.0 ms ($SD = 22.0$) for the low-anxious, psychopathic males and 58.0 ms ($SD = 82.0$) for the low-anxious, nonpsychopathic males. Thus, the current finding is consistent with the performance of psychopathic males and suggests that deficits in selective attention may be associated with the syndrome in both genders.

Study 2

The results of Study 1 provide initial support for the presence of abnormalities in selective attention among psychopathic females. Specifically, like psychopathic men, the psychopathic women in Study 1 were characterized by abnormal attention exhibited as decreased interference from inconsistent, secondary information on a Stroop-like task.

To test the reliability of this finding among psychopathic women, we used the PW Stroop task. This task is conceptually similar but methodologically dissimilar to the PW Task. Both tasks assess the relative interference of unrelated stimuli on task performance. However, whereas the PW Task instructs participants to determine if two consecutively presented stimuli are conceptually related or not, the PW Stroop requires only that participants name a series of line drawings. Further, the PW Task is a computerized task presented in a trial-by-trial format. In contrast, the PW Stroop consists of a series of cards on which stimuli are presented simultaneously.

Consistent with the performance of low-anxious, psychopathic males, it was predicted that low-anxious, psychopathic women would show significantly less interference than would controls

³ The mean interference scores for low-anxious, psychopathic participants and low-anxious, nonpsychopathic participants on the PW task using the PCL-R cut scores of 30 and 20 were 11.18 ($SE = 23.90$) and 39.84 ($SE = 9.47$), respectively.

Table 2
Mean IQ and PW Task Performance for High- and Low-Anxious Psychopathic and Nonpsychopathic Participants

| Variable | Low-anxious subjects | | | | High-anxious subjects | | | |
|---------------------------------|-------------------------------------|-----------|----------------------------------|-----------|-------------------------------------|-----------|----------------------------------|-----------|
| | Nonpsychopathic (<i>n</i> = 41) | | Psychopathic (<i>n</i> = 20) | | Nonpsychopathic (<i>n</i> = 29) | | Psychopathic (<i>n</i> = 33) | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| IQ | 102.05 | 10.20 | 97.92 | 5.61 | 96.86 | 8.34 | 95.77 | 10.10 |
| Errors | 146.26 | 6.71 | 143.55 | 6.44 | 138.93 | 9.49 | 141.39 | 8.61 |
| Average interference | 46.77 | 73.92 | 2.78 | 58.52 | 33.52 | 94.51 | 37.01 | 63.04 |
| Interference for picture trials | 67.00 | 104.50 | -14.75 | 75.28 | 65.22 | 154.08 | 82.47 | 96.45 |
| Interference for word trials | 26.54 | 97.22 | 20.32 | 73.46 | 1.82 | 117.74 | -8.45 | 109.24 |

Note. IQ = Shipley Institutes of Living Scale estimated Wechsler Adult Intelligence Scale—Revised intelligence score; PW = picture-word.

when naming the drawings of objects on the card with superimposed, incongruent words.

Method

Participants. Data were collected for 251 Caucasian female offenders. The mean PCL-R total score was 18.13 (*SD* = 6.97). Means for the facets were 2.82 (*SD* = 1.84), 4.03 (*SD* = 2.02), 5.20 (*SD* = 2.47), and 4.34 (*SD* = 2.50), for Facets 1, 2, 3, and 4, respectively.

Task and procedures. The PW Stroop task, a modified version of a task used by Rosinski, Golinkoff, and Kukish (1975) and Golinkoff and Rosinski (1976), consists of four 8.5 in. × 11.0 in. (21.59 cm × 27.94 cm) cards, each with a superimposed 4 × 5 grid outlining 20 squares measuring 2.0 in. × 2.0 in. (5.08 cm × 5.08 cm).

For all cards, stimuli are presented centrally within the 20 squares. Card 1 contains words only, Card 2 contains picture outlines only, Card 3 contains picture outlines with superimposed, incongruent words, and Card 4 contains picture outlines with superimposed, three-letter trigrams (nonwords). Each card contains the same set of stimuli in different orders. Cards 1 and 2 are presented first and second, respectively, and Cards 3 and 4 are presented next, in counterbalanced order. Participants are instructed to read the words on Card 1 and name the pictures on Cards 2–4. Participants are instructed to ignore the words or letters on Cards 3 and 4, respectively. We asked 1 of 2 female experimenters, blind to participants' group membership, to sit next to the participants to record reaction times and accuracy for all cards.

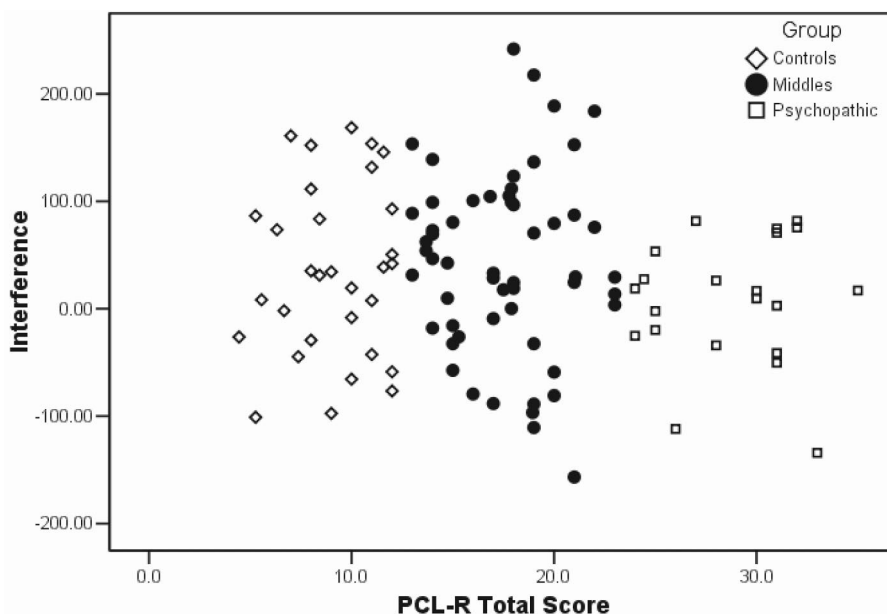


Figure 1. Scatterplot of picture-word task interference scores, averaged across picture and word trials, for low-anxious participants. PCL-R = Psychopathy Checklist—Revised.

Table 3
Correlations Between PW Stroop Performance, PCL-R, SCL-90, IQ, Anxiety, and PCL-R Facets for Study 2

| Measure | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----------------------------|--------|--------|--------|---------|--------|--------|--------|--------|-------|------|
| 1. PCL-R | 1.00 | — | | | | | | | | |
| 2. GSI | 0.16 | 1.00 | | | | | | | | |
| 3. PSD | 0.15 | 0.65** | 1.00 | | | | | | | |
| 4. IQ | -0.11 | -0.22* | -0.12 | 1.00 | | | | | | |
| 5. WAS | 0.25** | 0.66** | 0.52** | -0.28** | 1.00 | | | | | |
| 6. Facet 1 (interpersonal) | 0.79** | 0.02 | 0.05 | -0.03 | 0.09 | 1.00 | | | | |
| 7. Facet 2 (affective) | 0.75** | 0.16 | 0.15 | 0.01 | 0.20* | 0.62** | 1.00 | | | |
| 8. Facet 3 (lifestyle) | 0.88** | 0.15 | 0.10 | -0.17 | 0.27** | 0.59** | 0.49** | 1.0 | | |
| 9. Facet 4 (antisocial) | 0.84** | 0.20* | 0.14 | -0.20* | 0.18* | 0.51** | 0.45** | 0.74** | 1.00 | |
| 10. Interference | 0.03 | 0.07 | 0.09 | -0.06 | 0.04 | -0.02 | 0.10 | -0.01 | -0.06 | 1.00 |

Note. PW = picture-word; PCL-R = Psychopathy Checklist-Revised total score; SCL-90 = Symptom Checklist-90-Revised; IQ = Shipley Institutes of Living Scale estimated Wechsler Adult Intelligence Scale—Revised intelligence score; GSI = Global Symptom Index of the SCL-90; PSD = Positive Symptom Distress Index of the SCL-90; WAS = Welsh Anxiety Scale total score.

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

Mistakes made on Card 2 (naming pictures) were corrected on the card's completion to increase the likelihood that participants would use the proper names on the remaining two cards. No other feedback was given to the participants throughout the task. Participants earned \$3.00 for completing this task.

The primary dependent measure was the degree to which superimposed, incongruent words interfered with picture naming. Interference was calculated by subtracting participants' response times to Card 4 (pictures with superimposed trigrams) from their response times to Card 3. Interference scores that fell more than 2.5 standard deviations from the mean were designated as outliers and excluded from the analyses.

Results and Discussion

There were 118 Caucasian female offenders with PCL-R scores of 24 and above ($n = 48$) or 14 and below ($n = 70$). Low-anxious groups were formed using a median split on the WAS, resulting in 19 low-anxious, psychopathic individuals and 42 low-anxious controls.

Preliminary analyses. Correlations between descriptive measures are presented in Table 3.

A 2 (psychopathy group) \times 2 (high anxious vs. low anxious) ANOVA with SILS-estimated IQ as the dependent variable was conducted to test for group differences in intelligence. There was a significant main effect for anxiety, $F(1, 115) = 7.08, p < .05$, with high-anxious participants showing significantly lower intelligence than low-anxious participants. There were no other significant main effects or interactions. Mean intelligence scores for all participants are presented in Table 4.

Group differences in accuracy were assessed using a 2 (psychopathy group) \times 2 (high anxious vs. low anxious) ANOVA with interference on Card 3 (i.e., the interference card) accuracy as the dependent variable. There were no significant main effects or interactions. Accuracy data for all groups are presented in Table 4.

Primary analyses. Group differences in interference were assessed using a 2 \times 2 \times 2 ANOVA with psychopathy group (psychopathic or control), anxiety group (high anxious vs. low anxious), and card order (Card 3 before Card 4 or Card 4 before Card 3) as factors. The overall interference effect was significant,

$F(1, 110) = 31.06, p < .001$. There was a significant main effect of order, $F(1, 110) = 17.01, p < .01$, with participants showing greater interference when Card 3 preceded Card 4.

There was no main effect for either psychopathy, $F(1, 110) = .15, p = .70$, or anxiety, $F(1, 110) = 1.45, p = .23$, although the overall ANOVA also revealed a significant Psychopathy \times Anxiety interaction, $F(1, 110) = 3.99, p < .05$. Inspection of the means (see Table 4) indicated that, among low-anxious participants, psychopathic individuals demonstrated less interference than did controls, whereas among high-anxious participants, controls showed less interference than did psychopathic individuals.

Consistent with our prediction, the planned comparison involving the low-anxious, psychopathic and the low-anxious, nonpsychopathic participants showed significantly reduced interference among low-anxious, psychopathic individuals ($M = .56, SD = .67$) relative to low-anxious controls ($M = 1.89, SD = .45$), $t(110) = 1.68, p < .05$ (one-tailed), Cohen's $d = .40$.⁴ A scatterplot of the data for low-anxious participants is presented in Figure 2.

Supplemental analysis. To examine the associations between the four facets of the PCL-R and the interference scores on the PW Stroop task, we simultaneously entered the four facets into a regression, with interference as the dependent variable. None of the four facets accounted for a significant proportion of the variance in PW Stroop interference (Facet 1, $\beta = -.05$; Facet 2, $\beta = .13$; Facet 3, $\beta = .02$; and Facet 4, $\beta = -.08$).

The results of Study 2 demonstrate that low-anxious, psychopathic females show less interference than do low-anxious, nonpsychopathic females on a PW Stroop task. In their study of male offenders, Hiatt et al. (2004) reported mean interference scores of 0.99 ($SD = 2.45$) for the low-anxious, psychopathic males and 2.97 ($SD = 3.77$) for the low-anxious, nonpsychopathic males. The similar data for females reported here offer further support for the generalizability of specific attention deficits from psychopathic male to psychopathic female offenders.

⁴ The mean interference scores for low-anxious, psychopathic participants and low-anxious, nonpsychopathic participants on the PW Stroop using the PCL-R cut scores of 30 and 20 were .63 ($SE = .99$) and 1.91 ($SE = .32$), respectively.

Table 4
Mean IQ and PW Stroop Task Performance for High- and Low-Anxious Psychopathic and Nonpsychopathic Participants

| Variable | Low-anxious subjects | | | | High-anxious subjects | | | |
|--------------|-------------------------------------|-----------|----------------------------------|-----------|-------------------------------------|-----------|----------------------------------|-----------|
| | Nonpsychopathic (<i>n</i> = 42) | | Psychopathic (<i>n</i> = 19) | | Nonpsychopathic (<i>n</i> = 28) | | Psychopathic (<i>n</i> = 29) | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| IQ | 102.43 | 10.14 | 97.67 | 5.75 | 96.34 | 8.84 | 93.90 | 11.68 |
| Errors | 1.02 | 1.49 | 0.84 | 0.83 | 0.63 | 0.93 | 1.17 | 1.18 |
| Interference | 1.89 | 3.07 | 0.56 | 2.18 | 1.45 | 2.80 | 2.36 | 4.42 |

Note. IQ = Shipley Institutes of Living Scale estimated Wechsler Adult Intelligence Scale—Revised intelligence score; PW = picture-word.

General Discussion

In these studies, we tested the hypothesis that specific abnormalities in selective attention predicted by the RMH and characteristic of low-anxious, psychopathic males would be manifested among low-anxious, psychopathic females. Prior research examining the laboratory correlates of psychopathy in samples of women has been equivocal. Although psychopathic women exhibit interpersonal characteristics similar to psychopathic men (Forth, Brown, Hart, & Hare, 1996; Rutherford, Alterman, & Cacciola, 1995; Vitale et al., 2002) and demonstrate similar abnormalities on psychophysiological measures of emotion processing (Sutton, Arnett, & Newman 2003; Sutton et al., 2002), their performance on behavioral regulation tasks (e.g., Vitale & Newman, 2001; Vitale et al., 2005) has not differed from the performance of nonpsychopathic women.

This study provides support for the RMH proposal (Hiatt et al., 2004; MacCoon et al., 2003; Newman et al., in press) that psychopathic individuals' response modulation deficit is manifested in response to both emotionally neutral and emotionally valenced stimuli. Moreover, the results are consistent with recent characterizations of the RMH that associated the information-processing deficits of psychopathic individuals with difficulty integrating bottom-up information into a top-down mediated focus of selective attention.

These data also suggest that the deficit in response modulation exhibited by psychopathic individuals is somewhat different from behavioral impulsivity. Although early investigations relied on paradigms designed to elicit impulsive responding (e.g., passive avoidance tasks, the card perseveration task) to test the RMH, recent examinations such as the current study show that this deficit

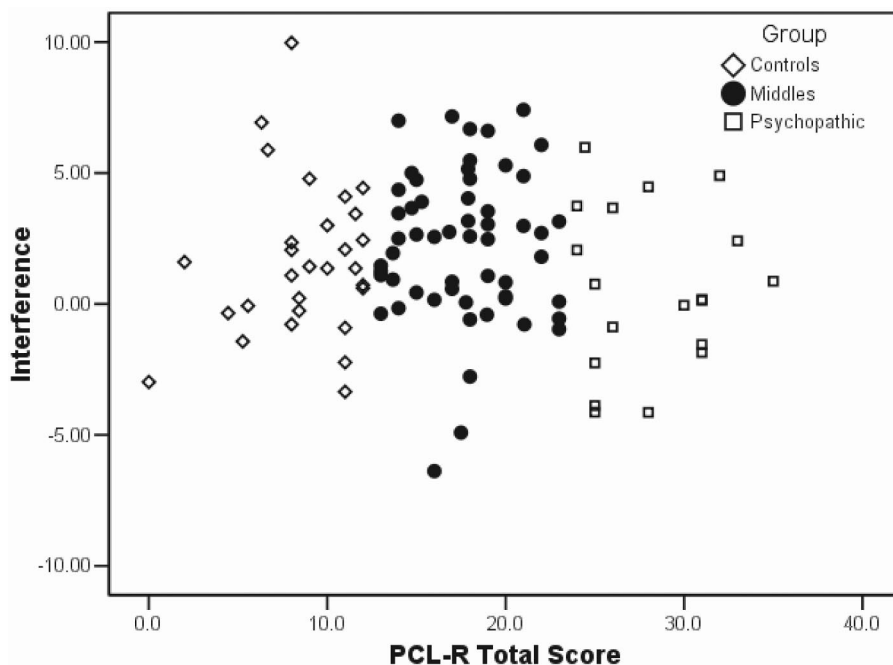


Figure 2. Scatterplot of picture-word Stroop interference scores for low-anxious participants. PCL-R = Psychopathy Checklist—Revised.

can be detected in paradigms that do not evoke such responses. Further, these tasks help to clarify the role of motivation in psychopathic performance. Specifically, the deficit observed on tasks such as the PW and PW Stroop actually results in better performance (i.e., responses with less interference) by psychopathic participants than by nonpsychopathic participants.

Although the specifications tested here increase the predictive specificity of the RMH for psychopathy, further refinement is needed. Whereas psychopathic individuals appear less able to accommodate information that is peripheral to their dominant response set (i.e., top-down focus of selective attention), the exact content of any individual's dominant response set can be difficult to specify. In the absence of such specifications, the content of these sets can be determined only post hoc, on the basis of what information did not appear to be used or processed on a particular task. However, this problem is not unique to the RMH for psychopathy. Gray and McNaughton (2000) noted a similar problem in their discussion of passive avoidance learning in animals. Specifically, they noted that an organism's goals are "defined by the subject and not always recognizable by the experimenter" (Gray & McNaughton, 2000, p. 268). The exact content of an individual's dominant response set may be determined by a number of biological, experiential, and situational factors. Thus, the top-down focus of selective attention may not be "absolutely predictable" (Gray & McNaughton, 2000, p. 268). However, recent formulations of the RMH represent progress towards clarifying when and how the content of the individual's dominant response set—regardless of the specific content—will be modulated by bottom-up influences.

One important limitation of the current findings pertains to the use of alternative cut scores (PCL-R scores lower than 14 and higher than 24) to classify psychopathic and nonpsychopathic participants. The decision to use these cut scores was pragmatic. Our goal was to select a cut score that would create psychopathy groups comparable in size with those in male offender samples, which would therefore create sample sizes large enough to generate reliable performance estimates. Because of the lower base rate of psychopathy in this sample relative to male samples, the traditional PCL-R cut score (PCL-R scores of 30 or higher), did not meet these criteria.

In light of this, caution is required when interpreting these results, particularly as they apply to psychopathic individuals. If we conceptualize psychopathic individuals specifically as individuals scoring above 30 on the PCL-R, then this set of studies provides only limited evidence for response modulation deficits in this group.

It is important to note, however, that the predictions tested in this sample were generated from studies of men classified using the traditional psychopathy cut scores. Thus, the finding that these predictions were supported in women using the alternative cut scores to designate psychopathic and nonpsychopathic groups suggests that these classifications were meaningful as well as pragmatic. Moreover, the additional finding that the performance of participants scoring over 30 on the PCL-R was consistent with that of participants scoring over 24 on the PCL-R provides additional support for this classification strategy. However, additional studies using both the current cut scores and the traditional PCL-R cut

scores (i.e., ≥ 30) are necessary to bolster the utility and validity of this alternative strategy. Further, although such exploratory analyses may be useful as we continue to refine our understanding of the psychobiological processes underlying psychopathy, this does not suggest that we should discard the cut score of 30 for other research and clinical purposes (e.g., risk assessment).

The analytic strategy used in the present study also highlights the possibility that, just as the symptoms associated with psychopathy may be less pronounced among females, so too might the behavioral expressions of underlying etiological processes. This would be consistent with the difficulty researchers have had replicating passive avoidance deficits among psychopathic women and would also be somewhat consistent with the current data. Specifically, although the psychopathic women in this study demonstrated selective attention deficits similar to those demonstrated by psychopathic males, comparison of the effect sizes across studies suggests that these deficits may be less pronounced among women. For example, Newman et al. (1997) reported an effect size of .91 for their analysis of interference in Caucasian males using the PW task and an effect size of .61 can be calculated from the data reported by Hiatt et al. (2004) in their analysis of PW Stroop interference among Caucasian males. Both are larger than the effect sizes of .59 and .40 reported here.

The present results support the proposal that psychopathy in women is associated with specific deficits in selective attention associated with the syndrome in males. By demonstrating comparable abnormalities in attention processing among psychopathic male and female offenders, this study contributes to an expanding literature supporting the generalizability of psychopathy to females.

As this literature has continued to grow, researchers have attempted to provide meaningful explanations for differences that have emerged (e.g., Cale & Lilienfeld, 2002; Hamburger, Lilienfeld, & Hogben, 1996; Lilienfeld & Hess, 2001). As already noted, in contrast to psychopathic males, psychopathic female offenders do not differ from nonpsychopathic females on particular laboratory tasks that require response regulation. One possibility is that the behavioral expression of the underlying deficits associated with psychopathy in women differs from the expression of these deficits in psychopathic men as a result of motivational, environmental, or socialization differences across gender that influence behavioral regulation (e.g., Sutton et al., 2003; Vitale & Newman, 2001). For example, societal strictures on female aggression and impulsivity may have contributed to the formation of more effective behavior regulation strategies among psychopathic females relative to psychopathic males.

In light of this possibility, paradigms such as the computerized PW and PW Stroop tasks emerge as particularly powerful tools, as they are relatively motivationally neutral and may be relatively immune to compensatory self-regulation strategies. Thus, these tasks, and others like them, will become of central importance in studying diverse samples of psychopathic individuals (e.g., females, "white-collar" psychopathic individuals) who may differ from incarcerated psychopathic males in their motivation to regulate their behaviors and in the efficacy of the strategies that they select to do so.

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