Published in final edited form as:

Assessment. 2013 October ; 20(5): 610–619. doi:10.1177/1073191111415364.

Both self-report and interview-based measures of psychopathy predict attention abnormalities in criminal offenders

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Abstract

Historically, psychopathy has been viewed as a clinical syndrome with a unitary etiology, assessed via clinical interview. However factor analytic studies suggest that psychopathy may also be understood as a combination of two subfactors consisting of (a) interpersonal-affective and (b) lifestyle-antisocial traits. Further, evidence supports the use of self-report measures to assess psychopathy and these sub-factors. This investigation employed a Stroop-like task to determine the relationship of the two psychopathy factors, as assessed by both interview-based and self-report measures, to attention-related abnormalities in psychopathy. For both instruments, the factors interacted to predict performance (i.e., interference), though the unique main effects were non-significant. The results suggest that the anomalous selective attention of psychopathic offenders is specific to individuals with high scores on both factors. Moreover, these results have important implications for the two-factor model of psychopathy, and provide preliminary support for the functional similarity of self-report and interview-based measures of psychopathy.

Keywords

Psychopathy; Attention; Two-Factor Model; Response Modulation; Psychopathic Personality Inventory

Psychopathic individuals present with a high degree of antisocial behavior, are unemotional and manipulative, and are relatively unresponsive to psychotherapeutic treatment (Harris & Rice, 2006). Whereas some researchers conceptualize psychopathy as a categorical form of psychopathology (Harris, Rice, & Quinsey, 1994), others understand it as a dimensional construct with a continuous distribution of psychopathic traits (Walters, Duncan, & Mitchell-Perez, 2007; Guay, Ruscio, Knight, & Hare, 2007; Edens, Marcus, Lilienfeld, & Poythress, 2006). These different conceptualizations have important implications for the design and analysis of research on psychopathy. If psychopathy represents one or more continuous traits, these traits can be assessed and studied in community or undergraduate samples, and need not rely on offender samples and participants with substantially elevated levels of antisociality or psychopathy. In contrast, if psychopathy is a categorical syndrome, then a sizable sample of participants that meet the clinical criteria for psychopathy is necessary to do meaningful research on the construct, and clinically validated assessments should be used.

Hare's (2003) Psychopathy Checklist-Revised (PCL-R) has played an important role in shaping modern conceptualizations of psychopathy. A PCL-R score of 30 (out of a possible 40) is the recommended cutoff for a categorical diagnosis of psychopathy in North America

(Hare, 2003), but there is good evidence that the PCL-R may also be used as a continuous measure of psychopathy (Guay et al., 2007; Edens et al., 2006). Furthermore, there is evidence that PCL-R psychopathy may be conceptualized as a unitary “super-ordinate” construct, made up of two major sub-factors that may be further subdivided into four facets (see Neumann, Hare, & Newman, 2007). The first major factor appears to capture the interpersonal (facet 1) and affective (facet 2) symptoms of psychopathy, whereas the second major factor appears to capture the impulsive (facet 3) and antisocial (facet 4) aspects of psychopathy.

The identification of the two major psychopathy factors caused some investigators to rethink the psychopathy construct (e.g., Lilienfeld, 1994, 1998; Patrick, Hicks, Nichol, & Krueger, 2007). Rather than conceptualizing psychopathy as the result of a single underlying predisposition, these investigators proposed that psychopathy could be more accurately understood as a combination of two distinct psychopathological processes. Most commonly, unique associations of the psychopathy factors with other variables are identified using a multiple regression analysis that allows investigators to measure the strength of the association of one factor while controlling for the effects of the other factor (cf. Lynam, Hoyle, & Newman, 2006). Summarizing such research, Patrick and colleagues (2007) recently characterized PCL-R Factor 1 and 2 as reflecting a core defect in defensive responding and a cognitive deficit, respectively.

This multi-dimensional approach to psychopathy has increased interest in the assessment of psychopathic traits and their correlates within “normal” (i.e. non-criminal) populations. This interest, in turn, has bolstered interest in self-report measures. Such measures are relatively inexpensive to administer, may be used when interviews are not practical, and are valid even when collateral information (e.g. prison files) is unavailable. As a result, self-report measures are well-suited for assessing psychopathy in larger samples and diverse populations. Critically, self-report measures appear to have similar relationships with experimental and clinical outcomes as the PCL measures in some cases (e.g. Edens, Poythress, & Watkins, 2001; Gordon, Baird, & End, 2004).

Most commonly, interview-based measures have been used with incarcerated individuals to evaluate the association of psychopathy with relevant external and experimental variables, whereas self-report measures have been used primarily in research on non-incarcerated samples, such as college students. However, to evaluate the functional similarity of self-report and interview-based assessments of psychopathy, it is desirable to examine their relation to theoretically relevant measures within the same sample. Toward this end, we investigated the functional similarity of the Psychopathy Checklist: Screening Version (Hart, Cox, & Hare, 1995) and the Psychopathic Personality Inventory (Lilienfeld, 1990; Lilienfeld & Andrews, 1996), using an incarcerated sample of male offenders and a theoretically relevant measure of conflict processing.

Specifically, we examined the unique and interactive effects of the two main psychopathy factors using a Picture-Word Stroop task that has revealed performance abnormalities in categorically-defined psychopathic individuals (e.g., Hiatt, Schmitt, & Newman, 2004; Newman, Schmitt, & Voss, 1997) identified with the PCL-R. In this task, participants are presented with a display that contains both to-be-attended and to-be-ignored dimensions. Generally, when the to-be-ignored element of the display conflicts with the correct response, interference results. However, psychopathic individuals are relatively immune to the interference generated by incongruent information under these conditions (Newman et al., 1997; Hiatt et al., 2004; Zeier, Maxwell, & Newman, 2009). Further, such deficits are often specific to primary psychopathy which, in keeping with the initial clinical conceptualization of the disorder, describes individuals with low levels of anxiety as well as high psychopathy

scores (Cleckley, 1976). Although individuals with primary psychopathy are better able to ignore the incompatible distracters in this task, their tendency to maintain a rigid goal-directed focus of attention also has a maladaptive side. When engaged in inappropriate or even criminal behavior, their insensitivity to inhibitory information greatly impedes the possibility for effective self-regulation (MacCoon, Wallace, & Newman, 2004).

Based on these and related results, Newman and colleagues have proposed that psychopathic individuals display a response modulation deficit, making them less responsive to secondary cues that lead non-psychopathic individuals to re-evaluate their behavior (Patterson & Newman, 1993). This deficit is theorized to relate to the broad concept of psychopathy, and thus may be found only in individuals with high scores on both psychopathy factors. If this theory is correct, then it would not be useful to study the relation of this deficit to the unique variance of either factor. On the other hand, a significant interaction of the psychopathy factors may be observed if participants with high scores on both factors manifest a distinctly different performance profile than participants with high scores on either factor alone. Previous research has shown this type of psychopathy factor interaction related to both violent behavior (Walsh & Kosson, 2008) and an emotion-processing deficit (Vanman, Mejia, Dawson, Schell, & Raine, 2003), suggesting that these deficits are most pronounced in individuals with elevated scores on both factors, like those who would be identified as having the syndrome of psychopathy (Hare & Neumann, 2009).

Based on the response modulation model, we predicted that primary psychopathy would be associated with reduced interference in the Picture-Word Stroop task. Further, within the context of the two-factor model, we predicted that interference would relate primarily to the interaction of the psychopathy factors, with individuals scoring high on both factors showing a significantly weaker response to unattended, incongruent information.¹ Our *a priori* predictions could be most confidently made for the PCL:SV, as prior research with this task used an interview-based assessment. However, to the extent that the latent factor constructs assessed by the PPI are equivalent, we predicted that the same relationship would exist for both interview and self-report measures.

Methods

Participants

Participants consisted of 161 incarcerated Caucasian males from a maximum security prison in Wisconsin who were between the ages of 18 and 45 and scored at least 70 on a questionnaire designed to approximate intelligence (Zachary, 1986)². Also, only individuals who were not taking psychotropic medications and who had no diagnosis of bipolar disorder or psychosis were included. Finally, participants whose total accuracy was below 75% or who were more than 2.5 standard deviations from the mean on the primary dependent measure (i.e., interference) were not included in analyses; this resulted in the exclusion of 34 participants and a final pool of 127 participants. Each participant was assessed for psychopathy using the PCL:SV (Hart et al., 1995) and the PPI (Lilienfeld, 1990; Lilienfeld

¹The Factor 2 symptoms of psychopathy appear to be negatively associated with executive functioning and intelligence (Morgan & Lilienfeld, 2000; Ross, Benning, & Adams, 2007) deficits that would generally be expected to undermine the cognitive control processes that enable people to resist interference on Stroop tasks (e.g. Long & Prat, 2002; Kiefer, Ahlegian, & Spitzer, 2005). Thus, it may be expected that Factor 2 would relate to increased interference from incongruent information on the current task. However, interference on this version of the Picture-Word task does not appear to primarily reflect deficits in cognitive control. Rather, performance depends on the ability to focus attention on the critical element of the display and filter out distracters at an earlier stage of processing.

²Because prior research with the Picture-Word task found that significant psychopathy-related effects were specific to Caucasian versus African American offenders (e.g. Lorenz & Newman, 2002; Newman et al., 1997), the current analyses focus on Caucasian offenders exclusively. Further research is needed to explore the reasons for and limits of such race-related discrepancies.

& Andrews, 1996). Participants were paid \$15 for completing the PCL:SV interview and a battery of questionnaires, including the PPI.

PCL:SV—For the PCL:SV, a semi-structured interview was conducted with each offender, and information from this interview and a review of the inmate's institutional file was used to assess participants. The PCL:SV has been shown to serve as an adequate short form of the PCL-R (Cooke, Michie, Hart, & Hare, 1999), the most commonly used and well-validated measure for the clinical assessment of psychopathy. The two-factor model of psychopathy was originally formed using the initial Psychopathy Checklist (Harpur, Hakstian, & Hare, 1988) and appears to apply to the PCL:SV as well (Guy & Douglas, 2006; Hill, Neumann, & Rogers, 2004; Rogers, Salekin, Hill, Sewell, Murdock, & Neumann, 2000).

The PCL:SV is scored by giving a rating of 0, 1, or 2 on 12 items to indicate the presence of traits and behaviors associated with psychopathy with six items each comprising the two psychopathy factors. Participants scoring 12 or below on the PCL:SV are considered non-psychopathic, and participants scoring 18 or above are considered psychopathic. Full scale scores on the PCL:SV ranged from 4 to 23 ($M=13.96$, $SD=4.49$), while scores for Factor 1 ranged from 2 to 12 ($M=6.51$, $SD=2.53$) and scores for Factor 2 ranged from 1 to 12 ($M=7.37$, $SD=2.76$). The correlation between the two factors in this sample was .47, $p<.001$. Cronbach's alpha for the full-scale score was .78 ($n=116$), .67 ($n=125$) for Factor 1, and .72 ($n=118$) for Factor 2.³ In this study, the interrater reliability (i.e. intraclass correlation), calculated for a subset of 17 participants, was .95. Fifty-four participants scored in the "low" or non-psychopathic range, 32 participants scored in the "high" or psychopathic range, and 41 participants scored in the "intermediate" range.

PPI—The Psychopathic Personality Inventory (PPI; Lilienfeld, 1990; Lilienfeld & Andrews, 1996), a self-report measure of psychopathic traits, was completed by 121 of the 127 eligible participants. This instrument has been found to have a similar two-factor structure as the PCL-R and PCL:SV (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003, but see Neumann, Malterer, & Newman, 2008). This scale consists of 187 items. Items are responded to on a 1-4 scale, corresponding to false, mostly false, mostly true, and true. The scale consists of 8 subscales that are added together to create an overall psychopathy rating. The Factor 1 scale consists of the items from three of these subscales: Stress Immunity, Social Potency, and Fearlessness. The Factor 2 scale is made up of the Impulsive Nonconformity, Blame Externalization, Machiavellian Egocentricity, and Carefree Nonplanfulness. The eighth subscale, Coldheartedness, did not clearly map on to either of these factors in prior analyses of the instrument. For the current sample, Cronbach's alpha for the Factor 1 scale was .88 ($n=112$), and for the Factor 2 scale was .93 ($n=107$). Total scores on the PPI scale ranged from 264 to 495, with a mean of 389.69 ($SD=44.52$); Cronbach's alpha for items comprising the total score was .95. The correlation of the PCL:SV scores and the PPI scores are reported in Table 1.

Welsh Anxiety Scale—Participants completed the Welsh Anxiety Scale (WAS; Welsh, 1956), a 39-item questionnaire that assesses neurotic anxiety and has proven useful for distinguishing primary (low-anxious) and secondary (high-anxious) psychopathy in offender samples (Brinkley, Newman, Widiger, & Lynam, 2004; Newman, MacCoon, Vaughn, & Sadeh, 2005). This measure requires participants to respond "true" or "false" to anxiety-related statements; higher scores on this measure indicate higher anxiety. Scores on the

³The reliability of the factors and total psychopathy scores are only calculated for participants with ratings on all of the items for the relevant scale. Participants for which particular items were omitted are excluded from reliability analyses. However, the PCL scales contain an algorithm by which prorated scores can be applied to individuals for whom not all items can be rated. Thus, all participants included in the primary analyses have full scale and factor scores.

WAS ranged from 0 to 35, with a mean of 14.72 ($SD=9.10$). A median split on this measure was used to create low ($n=59$) and high ($n=68$) anxious subgroups, in keeping with previous investigations (Glass & Newman, 2006; Newman, et al., 2005; Hiatt et al., 2004).

Diagnostic classification—For group analyses, participants were assigned to one of four categories based on their levels of psychopathy and anxiety. These groups consisted of low-anxious (i.e., primary) psychopathic ($n=12$), low-anxious non-psychopathic ($n=31$), high-anxious psychopathic ($n=20$), and high-anxious non-psychopathic ($n=23$) participants. Participants with intermediate psychopathy scores ($n=41$) were excluded from group analyses.⁴

Task and Procedure

The Picture-Word task used here is a modified version of the task developed by Gernsbacher and Faust (1991) and used in prior research on response modulation (Newman et al., 1997; Hiatt et al., 2004; MacCoon et al., 2004). The present version of the task was programmed using the E-Prime development software. The task consisted of 15 practice trials (that were not included in any of the analyses) and 80 test trials. Half of the test trials involved indicating whether or not two words were conceptually related, and half involved indicating if two pictures were related. Each trial began with a screen that appeared for 1000 milliseconds (ms) and alerted the participant to what kind of trial they would complete; that is, a ‘P’ for picture trials or a ‘W’ for word trials. Following this, there was a 1000-ms interstimulus interval (ISI), a 700-ms context display, and a 50-ms SOA. Finally, the test display appeared, and it remained on the screen for 2000-ms or until the participant responded.

The context display consisted of a picture with a word superimposed on it. The alerting stimulus (i.e. the ‘P’ or ‘W’) informed the participant which aspect of the context display to attend to. The test display consisted of a picture or word, depending on the alerting stimulus (i.e., P or W). Participants were to enter a response indicating whether or not the attended aspect of the context display was conceptually related to the test display stimulus. For example, a participant might first have seen the letter ‘P’ on the screen, followed by a word superimposed on a picture (the context display), such as the word “RAIN” printed over a picture of a baseball player. Finally, the participant was shown the test display; in this example, the test display would be a picture. If the picture was of an umbrella, the participant should respond that this was a mismatch. However, the word was conceptually related to the picture (i.e., “RAIN” is related to umbrella) and this creates interference. There are 20 trials of this type in the task (“experimental” trials), as well as 20 trials in which all three items are conceptually unrelated (“comparison” trials). Subtracting a participant’s mean reaction time for comparison trials from his mean reaction time for experimental trials was the primary measure of the amount of distraction caused by the relationship of the unattended element of the context display and the test display (“interference”). There were also 40 trials in which the attended part of the context display matched the test display (“filler” trials). These trials were included so that there were an equal number of “match” and “mismatch” trials, although they were not included in any analyses.

All displays were presented within a 9×9 centimeter square, that was bordered by a blue line and presented in the center of the screen at all times; the remainder of the screen was

⁴As mentioned, accuracy and interference cutoffs resulted in 34 of the 161 participants being excluded from subsequent analyses. In terms of the diagnostic groups this resulted in the removal of 2 low-anxious non-psychopathic, 10 low-anxious participants with intermediate psychopathy scores, 4 low-anxious psychopathic, 7 high-anxious non-psychopathic, 9 high-anxious participants with intermediate psychopathy scores, and 1 high-anxious psychopathic participant.

black. Participants received feedback after every trial. If a participant responded incorrectly, the word “Wrong” appeared on the screen. If a participant responded correctly, the word “Correct” appeared, and he was told how much money he earned for that trial. For each trial, the participant could earn 1-5 cents, based on how quickly he entered the correct response.

Results

Replication of Primary Psychopathy Effects

We performed a one-way ANOVA to replicate results from previous studies on the Picture-Word task that examined psychopathy categorically. This analysis used PCL:SV assessed psychopathy (psychopathic versus non-psychopathic) as the grouping variable and interference as the dependent variable. The 2 (non-psychopathic or psychopathic) X 2 (low-anxious or high-anxious) ANOVA was performed yielded a significant effect of psychopathy, $F(1, 82)=5.88, p=.02, \eta^2=.067$. Neither the main effect of anxiety ($F(1, 82)=0.96, p=.33, \eta^2=.012$) nor the Psychopathy x Anxiety interaction ($F(1, 82)=0.40, p=.53, \eta^2=.005$) approached statistical significance.⁵ Reaction time data for each of the participant groups, broken down by trial type, are presented in Table 2.

As our a priori hypothesis related specifically to low-anxious participants, a one-way ANOVA was performed comparing low-anxious psychopathic and non-psychopathic participants. Replicating previous research, the low-anxious psychopathic group ($M=-6, SD=56$) displayed significantly less interference than low-anxious controls ($M=36, SD=60$), $F(1,41)=4.52, p=.04, \eta^2=.099$. The comparison of the high-anxious psychopathic group ($M=-11, SD=70$) to the high-anxious non-psychopathic group ($M=14, SD=57$) yielded no significant differences, $F(1,41)=1.69, p=.20, \eta^2=.040$.

Primary Analyses

To examine the unique and interactive effects of the two main psychopathy factors on Picture-Word task performance, we conducted a hierarchical regression analysis that included all participants (i.e., including mid-range PCL:SV scorers, $n=127$). The factor scores were z-scored (standardized and centered at zero) for this analysis, and the interaction term represented the product of these standardized scores. The first step of the analysis, including the two psychopathy factors, did not approach statistical significance, $F(2,124)=1.66, p=.20, \eta^2=.026$. Neither the unique effects of Factor 1 ($\beta=-.06, t(124)=-0.56, p=.58$) nor Factor 2 ($\beta=-.13, t(124)=-1.26, p=.21$) were significant. However, the second step, which included the interaction of the two psychopathy factors, accounted for a significant increase in variance, $F \text{ Change} = 4.68, p=.03$; the interaction term uniquely accounted for 3.6% of the variance in interference, $\beta=-.19, t(123)=-2.16, p=.03$. A graph of the regression lines from this analysis (Figure 1) elucidates the interpretation of this interaction. Specifically, participants who showed markedly reduced interference on this task were those with high scores on both psychopathy factors.

A second regression analysis was performed using the PPI factors ($n=121$). The first step of the analysis, including the two psychopathy factors, did not approach statistical significance, $F(2,118)=1.67, p=.19, \eta^2=.027$. Neither the unique effect of Factor 1 ($\beta=-.11, t(118)=-1.20, p=.23$) nor Factor 2 ($\beta=-.11, t(118)=-1.15, p=.25$) approached significance. However, the second step, which included the interaction of the two psychopathy factors, accounted for a significant increase in variance, $F \text{ Change} = 4.62, p=.03$; the interaction term uniquely

⁵Similar analyses were also performed with IQ and accuracy as dependent measures, to evaluate their potential importance as confounding variables. Neither psychopathy, anxiety, nor their interaction was significantly associated with intelligence or accuracy on the current task.

accounted for 3.7% of the variance in interference, $\beta = -.19$, $t(117) = -2.15$, $p = .03$. A graph of the regression lines from this analysis (Figure 2) elucidates the interpretation of this interaction. Specifically, participants who showed markedly reduced interference on this task were those with high scores on both psychopathy factors.⁶

Supplementary Analyses

Evaluating the statistical independence of the interview and self-report effects

—In the primary analyses, the psychopathy factors interacted to predict task performance regardless of whether they were assessed using interview-based or self-report measures. Inspection of these effects indicates that individuals with elevated scores on both factors of psychopathy show reduced interference on this task. What remains to be clarified is whether these relationships are statistically independent. To investigate this, a linear regression was conducted with interference as the dependent measure, and the PCL:SV and PPI factor variables and their respective interaction terms entered simultaneously as the predictors (for this analysis, $n = 121$). The interaction of the PCL:SV factors still approached significance, $\beta = -.17$, $t(114) = -1.83$, $p = .07$, and the interaction of the PPI factors remained significant, $\beta = -.18$, $t(114) = -1.95$, $p = .05$. Thus, it appears that the significant interaction effects that were observed in separate analyses of the PCL:SV and the PPI factors either remain significant or close to significant even after partialling effects associated with the other measure.

Continuous analyses involving psychopathy total scores—Finally, we performed analyses to investigate the shape of the association between psychopathy and interference. As we postulate that the interaction reflects something unique about the overall psychopathy construct, we also examined the direct relationship between interference and total psychopathy scores. Overall, there was a trend-level relationship of PCL:SV psychopathy score and interference, $r(126) = -.15$, $p = .08$. When investigating the PPI total score, there was a significant association between PPI score and interference, $r(120) = -.18$, $p = .05$. A full report of zero-order correlations of the PCL:SV and PPI factor and total scores with interference are presented in Table 1.

Inspection of the scatter plot portraying the relationship between PCL:SV scores and interference suggested that the data may be more precisely explained by a quadratic (versus linear) model. In the overall sample ($n = 127$), the quadratic effect was significant, $F(2, 124) = 6.18$, $p < .01$ and accounted for 9.1% of the variance in interference. A scatter plot of these data, with lines representing the linear and quadratic effects, is presented in Figure 3. With the PPI measures ($n = 121$), the quadratic effect was nearly significant, $F(2, 118) = 2.82$, $p = .06$, $\eta^2 = .046$.

Discussion

The results of this study confirmed our hypotheses that selective attention abnormalities associated with psychopathy relate specifically to individuals with elevated levels of both psychopathy factors (i.e., those that would be identified as diagnostically psychopathic by standard criteria). Here, a significant interaction of the two factors reflected that reduced interference was unrelated to the unique variance of either psychopathy factor, but reflected something unique to individuals expressing elevated levels of both the interpersonal/affective and lifestyle/antisocial symptoms of psychopathy. Interestingly, this pattern of

⁶Due to competing models of psychopathy, hierarchical regression analyses were performed to investigate all main effects and interactions for the 3 and 4 facet models of psychopathy. There were no significant main effects or interactions of the facets with interference observed in these analyses.

results held for both an interview-based psychopathy measure (the PCL:SV) and a self-report psychopathy measure (the PPI).

In the current experiment, when analyses focused only on the unique contributions of the two factors, we found no significant effects regardless of whether the factors were assessed using self-report or interview-based measures. Thus, the selective attention abnormalities demonstrated by psychopathic individuals in this and previous research (e.g., Hiatt et al., 2004; Newman et al., 1997; Zeier et al., 2009) appear to be unrelated to the unique variance associated with psychopathy Factor 1 or 2. In addition to clarifying the association between these selective attention abnormalities and the psychopathy factors, this study also corroborated the relationship of these abnormalities and primary psychopathy using an alternative measure of psychopathy (i.e., the PCL:SV rather than the PCL-R). These findings have three major implications for psychopathy.

First, our results provide additional support for the attentional abnormalities postulated by the response modulation theory of psychopathy. According to this theory, psychopathic individuals are not affected by peripheral information that is incongruent with their primary focus of attention. Consequently, they appear oblivious to internal and external stimuli that cause non-psychopathic individuals to stop and evaluate their behavior. Insensitivity to the incongruent contextual information in the Picture-Word task provides a quantitative assessment of this deficit. In our view, impaired response modulation results in better task performance for psychopathic individuals when ignoring salient distracters, but creates problems when such information is necessary for effective self-regulation (MacCoon et al., 2004; Zeier et al., 2009). The reduced interference displayed by psychopathic participants in this study corroborates previous findings (Newman et al., 1997; Hiatt et al., 2004) and attests to the reliability and utility of this paradigm for exploring psychopathy-related abnormalities in selective attention. These previous findings were generally specific to low-anxious participants; likewise, the results of this study, while significant in the entire sample, were more robust for low-anxious participants. Further, the current findings suggest that the Picture-Word task provides a relatively reliable measure of the postulated deficit. Such results are especially noteworthy in light of the fact that the current task, like our previous studies and the original research by Gernsbacher and Faust (1991), involved only 20 incongruent trials. Although the task appears to be reliable as is, it is possible that increasing the number of trials would provide an even more reliable assessment of the postulated attentional abnormality.

Second, the present study demonstrates that some psychopathy-related deficits may not be adequately explained by the unique variance of one or both of the psychopathy factors, and may instead reflect the interaction of these factors. During the past 15 years, investigators have increasingly focused on the unique correlates of the psychopathy facets and seemingly rejected the idea of psychopathy as a unitary disorder (e.g. Guay et al., 2007; Miller, Lynam, Widiger, & Leukefeld, 2001), reflecting a concern that analyses of psychopathy total scores alone may overlook important associations related to specific components of psychopathy. The present study highlights a related concern: if the interaction of the psychopathy factors explains a significant amount of the variance in empirical results, then there is clearly an important predictive element that is missed when only the unique effects are analyzed or discussed (see also Lilienfeld, 1994). Moreover, analysis of the factor interactions may be crucial for clarifying how psychopathy differs from other syndromes of disinhibition, such as Antisocial Personality Disorder, Substance Use Disorders, and Borderline Personality Disorder, that relate to the unique variance associated with Factor 2 of the PCL-R (e.g., Patrick, Hicks, Krueger, & Lang, 2005; Smith & Newman, 1990; Herpertz et al., 2001). In conjunction with earlier findings, the present result indicate that such interactions are relevant for understanding emotion processing deficits (Vanman et al., 2003), clinically

significant (violent) behavior (Walsh & Kosson, 2008; Harpur & Hare, 1991, as cited in Hare & Neumann, 2009), and attentional anomalies, three critical components of psychopathy.

While there are clear benefits of investigating factor interactions in psychopathy, there are also important limitations to moderated multiple regression. The low power of tests for interactions in multiple regression has led to the characterization of such effects as “elusive” (Aguinis & Stone-Romero, 1997). Moreover, the moderate correlation of the two factors is somewhat problematic because it is more difficult to detect interaction effects when predictors are correlated. In addition, crossover interactions are more likely to be detected statistically than interactions that are not of this form (McClelland & Judd, 1993). This is likely to be important for psychopathy because both factors will often relate to outcome variables in a similar fashion. For example, both factors typically have a positive relationship with crime, although this association is generally stronger for Factor 2 (see Douglas, Vincent, & Edens, 2006). In comparison to crossover interactions, such fan-shaped interactions limit the possible magnitude of for the interaction term (McClelland & Judd, 1993), making the threshold for detecting this kind of effect very high.

A third and relatively novel contribution of this experiment concerns our finding that self-report and interview-based psychopathy scales have a functionally similar factor structure and may account for complementary variance in explaining psychopathy-related effects. For both assessment measures, an interaction related to elevated scores on the two psychopathy factors (i.e. interpersonal-emotional and lifestyle-antisocial traits) predicted insensitivity to salient distractors. To our knowledge, this is the first demonstration that a self-report measure of psychopathy relates to the selective attention anomaly identified with interview-based measures of psychopathy in adult male offenders (e.g., Hiatt et al., 2004). Moreover, the relationship between Picture-Word task interference and the psychopathy factors was virtually identical across the two different assessment measures. In other words, if this study was performed solely with one or the other assessment measure, the results and conclusions would remain essentially the same. Such findings complement prior reports addressing the concurrent validity of the PPI using the PCL-R (Poythress, Edens, & Lilienfeld, 1998; cf. Malterer, Lilienfeld, Neumann, & Newman, 2010), and the potential association between the PPI and PCL factors (Benning, Patrick, Blonigen, Hicks, & Iacono, 2005).

This description of the functional equivalence of the PPI and PCL:SV factors may lead one to believe that these effects are statistically equivalent. Superficially, this appears to be the case; the variance accounted for and the shape of the interactions for these two analyses are quite similar. However, the actual correlations between the PPI and PCL scores are in the low to moderate range, and the correlation between PPI-1 and PCL:SV Factor 1 was not significant in this sample (see also Malterer et al., 2010). Further, when the PPI and PCL:SV variables are entered into a simultaneous regression, the PPI interaction remains significant, and the PCL:SV effect still approaches significance ($p=.07$). This suggests that these effects, although similar, are essentially statistically independent. While it is important to be cautious about the meaning of a supplementary analysis from a single study, it seems that one of two things must be true if this is a reliable effect. One possibility is that the self-report and interview-based measures both get at the same underlying construct, but tap independent variance as a result of differences in specific content and/or method variance. If this is the case, further investigation would be required to understand why two measures that ostensibly measure the same construct would have a relatively weak relationship with each other yet equally strong and functionally similar relationships with external variables. The most obvious reason for this is method variance (self-report vs. interview-based measures) but other factors could play a role. Alternatively, the two measures may assess two distinct constructs that happen to have a similar relationship with task performance in this study.

Also of note, supplementary analyses of the total scores for both the PPI and PCL:SV uncovered a significant quadratic relationship of these measures and interference. This effect was particularly pronounced for the PCL:SV and indicates that the negative linear relationship of psychopathy and interference provides an inexact description of the data. A more accurate description of this relationship is that, at low levels of psychopathy, increasing levels of psychopathic traits are related to greater interference. However, beyond a certain point (i.e., approximately PCL:SV score of 12; see Figure 3), the association between psychopathy and interference changes, such that increasing levels of psychopathic traits predicts less interference. This quadratic association appears consistent with the significant factor interactions found in this study; that is, high scores on both factors (which would generally describe participants with high total scores) are associated with lower interference scores. A potential limitation of these findings relates to the presence of a handful of individuals with very low PCL:SV total scores who also displayed low levels of interference. Further research is needed to evaluate the reliability of this effect and its potential relevance and meaning. A final implication of this quadratic relationship pertains to the likelihood of replicating the psychopathy-related attentional abnormalities in non-clinical samples. To the extent that such abnormalities are specific to very high levels of psychopathy (or high scores on both factors), the negative association between psychopathy and interference may be difficult to detect in undergraduate and other samples where low psychopathy scores predominate.

In summary, this investigation corroborates previous evidence demonstrating reduced processing of peripheral incongruent information in psychopathic offenders (see also Zeier et al., 2009). Moreover, our results for the psychopathy factors demonstrate parallels between interview-based and self-report measures of these constructs. The significant factor interactions observed for both psychopathy measures provide evidence that some deficits associated with psychopathy relate to the joint presence of both Factor 1 and Factor 2 traits and may indicate that a core psychopathic deficit underlies the selective attention deficits in psychopathy.

Acknowledgments

This research was supported by National Institute of Mental Health Grant MH53041. We acknowledge the assistance and support of the staff of the Dodge Correctional Institution, especially Dr. Robert DeYoung, Warden Cathy Jess, and Deputy Warden Mark Heise. We thank Samantha Glass and Melanie Malterer for their feedback on this manuscript, and we thank Kristi Hiatt, Naomi Sadeh, and Matt Shane for interviewing and diagnosing participants.

References

- Aguinis H, Stone-Romero EF. Methodological artifacts in moderated multiple regression and their effects on statistical power. *Journal of Applied Psychology*. 1997; 82:192–206.
- Benning SD, Patrick CJ, Blonigen DM, Hicks BM, Iacono WG. Estimating facets of psychopathy from normal personality traits: A step toward community epidemiological investigations. *Assessment*. 2005; 12:3–18. [PubMed: 15695739]
- Benning SD, Patrick CJ, Hicks BM, Blonigen DM, Krueger RF. Factor structure of the Psychopathic Personality Inventory: Validity and implications for clinical assessment. *Psychological Assessment*. 2003; 15:340–350. [PubMed: 14593834]
- Brinkley CA, Newman JP, Widiger T, Lynam D. Two approaches to parsing the heterogeneity of psychopathy. *Clinical Psychology: Science and Practice*. 2004; 11:69–94.
- Cooke DJ, Michie C, Hart SD, Hare RD. Evaluating the screening version of the Hare Psychopathy Checklist–Revised (PCL:SV): An item response theory analysis. *Psychological Assessment*. 1999; 11:3–13.
- Cleckley, H. *The mask of sanity*. 5th ed.. Mosby; St. Louis, MO: 1976.

- Douglas, KS.; Vincent, GM.; Edens, JF. Risk for criminal recidivism: The role of psychopathy. In: Patrick, CJ., editor. *Handbook of Psychopathy*. Guilford Press; New York: 2006.
- Edens JF, Marcus DK, Lilienfeld SO, Poythress NG. Psychopathic, not psychopath: Taxometric evidence for the dimensional structure of psychopathy. *Journal of Abnormal Psychology*. 2006; 115:131–144. [PubMed: 16492104]
- Edens JF, Poythress NG, Watkins MM. Further validation of the Psychopathic Personality Inventory among offenders: Personality and behavioral correlates. *Journal of Personality Disorders*. 2001; 15:403–415. [PubMed: 11723875]
- Gernsbacher MA, Faust ME. The mechanism of suppression: A component of general comprehension skill. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. 1991; 17:245–262.
- Glass SJ, Newman JP. Recognition of facial affect in psychopathic offenders. *Journal of Abnormal Psychology*. 2006; 115:815–820. [PubMed: 17100539]
- Gordon HL, Baird AA, End A. Functional differences among those high and low on a trait measure of psychopathy. *Biological Psychiatry*. 2004; 56:516–521. [PubMed: 15450788]
- Guay JP, Ruscio J, Knight RA, Hare RD. A taxometric analysis of the latent structure of psychopathy: Evidence for dimensionality. *Journal of Abnormal Psychology*. 2007; 116:701–716. [PubMed: 18020717]
- Guy LS, Douglas KS. Examining the utility of the PCL:SV as a screening measure using competing factor models of psychopathy. *Psychological Assessment*. 2006; 18:225–230. [PubMed: 16768600]
- Hare, RD. *Manual for the Hare Psychopathy Checklist-Revised*. 2nd ed.. Multi-Health Systems; Toronto, Ontario, Canada: 2003.
- Hare RD, Neumann CS. Psychopathy: Assessment and forensic implications. *The Canadian Psychiatric Association Journal / La Revue de l'Association des psychiatres du Canada*. 2009; 54:791–802.
- Harpur TJ, Hakstian R, Hare RD. Factor structure of the Psychopathy Checklist. *Journal of Consulting and Clinical Psychology*. 1988; 56:741–747. [PubMed: 3192791]
- Harris, GT.; Rice, ME. Treatment of psychopathy: A review of empirical findings. In: Patrick, CJ., editor. *Handbook of psychopathy*. Guilford Press; New York: 2006. p. 555-572.
- Harris GT, Rice ME, Quinsey VL. Psychopathy as a taxon: Evidence that psychopaths are a discrete class. *Journal of Consulting and Clinical Psychology*. 1994; 62:387–397. [PubMed: 8201078]
- Hart, SD.; Cox, DN.; Hare, RD. *Manual for the Psychopathy Checklist: Screening Version (PCL:SV)*. Multi-Health Systems; Toronto: 1995.
- Herpertz SC, Werth U, Lukas G, Qunaibi M, Schuerkens A, Kunert H, Sass H. Emotion in criminal offenders with psychopathy and borderline personality disorder. *Archives of General Psychiatry*. 2001; 58:737–745. [PubMed: 11483139]
- Hiatt KD, Schmitt WA, Newman JP. Stroop tasks reveal abnormal selective attention among psychopathic offenders. *Neuropsychology*. 2004; 18:50–59. [PubMed: 14744187]
- Hill CD, Neumann CS, Rogers R. Confirmatory factor analysis of the Psychopathy Checklist: Screening Version in offenders with Axis I disorders. *Psychological Assessment*. 2004; 16:90–95. [PubMed: 15023097]
- Kiefer M, Ahlegian M, Spitzer M. Working memory capacity, indirect semantic priming, and Stroop interference: Pattern of interindividual prefrontal performance differences in healthy volunteers. *Neuropsychology*. 2005; 19:332–344. [PubMed: 15910119]
- Lilienfeld, SO. Unpublished doctoral dissertation. University of Minnesota; Twin Cities Campus: 1990. Development and preliminary validation of a self-report of psychopathic personality.
- Lilienfeld SO. Conceptual problems in the assessment of psychopathy. *Clinical Psychology Review*. 1994; 14:17–38.
- Lilienfeld SO. Methodological advances and developments in the assessment of psychopathy. *Behaviour Research and Therapy*. 1998; 36:99–125. [PubMed: 9613020]
- Lilienfeld SO, Andrews BP. Development and preliminary validation of a self-report measure of psychopathic personality traits in noncriminal populations. *Journal of Personality Assessment*. 1996; 66:488–524. [PubMed: 8667144]

- Long DL, Prat CS. Working memory and Stroop interference: An individual differences investigation. *Memory & Cognition*. 2002; 30:294–301. [PubMed: 12035891]
- Lorenz AR, Newman JP. Do emotion and information processing deficiencies found in Caucasian psychopaths generalize to African-American psychopaths? *Personality and Individual Differences*. 2002; 32:1077–1086.
- Lynam DR, Hoyle RH, Newman JP. The perils of partialling: Cautionary tales from aggression and psychopathy. *Assessment*. 2006; 13:328–341. [PubMed: 16880283]
- MacCoon, DG.; Wallace, JF.; Newman, JP. Self-regulation: The context-appropriate allocation of attentional capacity to dominant and non-dominant cues. In: Baumeister, RF.; Vohs, KD., editors. *Handbook of Self-Regulation: Research, Theory, and Applications*. Guilford; New York: 2004. p. 422-446.
- McClelland GH, Judd CM. Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin*. 1993; 114:376–390. [PubMed: 8416037]
- Malterer MB, Lilienfeld SO, Neumann CS, Newman JP. Concurrent validity of the Psychopathic Personality Inventory with offender and community samples. *Assessment*. 2010; 17:3–15. [PubMed: 19955107]
- Miller JD, Lynam DR, Widiger TA, Leukefeld C. Personality disorders as extreme variants of common personality dimensions: Can the Five Factor Model adequately represent psychopathy? *Journal of Personality*. 2001; 69:253–276. [PubMed: 11339798]
- Morgan AB, Lilienfeld SO. A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical Psychology Review*. 2000; 20:113–136. [PubMed: 10660831]
- Neumann CS, Hare RD, Newman JP. The super-ordinate nature of the Psychopathy Checklist-Revised. *Journal of Personality Disorders*. 2007; 21:102–117. [PubMed: 17492916]
- Neumann CJ, Malterer MB, Newman JP. Factor structure of the Psychopathic Personality Inventory (PPI): Findings from a large incarcerated sample. *Psychological Assessment*. 2008; 20:169–174. [PubMed: 18557694]
- Newman JP, MacCoon DG, Vaughn LJ, Sadeh N. Validating a distinction between primary and secondary psychopathy with measures of Gray's BIS and BAS constructs. *Journal of Abnormal Psychology*. 2005; 114:319–323. [PubMed: 15869363]
- Newman JP, Schmitt W, Voss W. The impact of motivationally neutral cues on psychopathic individuals: Assessing the generality of the response modulation hypothesis. *Journal of Abnormal Psychology*. 1997; 106:563–575. [PubMed: 9358687]
- Patrick CJ, Hicks BM, Krueger RF, Lang AR. Relations between psychopathy facets and externalizing in a criminal offender sample. *Journal of Personality Disorders*. 2005; 19:339–356. [PubMed: 16178678]
- Patrick CJ, Hicks BM, Nichol PE, Krueger RF. A bifactor approach to modeling the structure of the Psychopathy Checklist-Revised. *Journal of Personality Disorders*. 2007; 21:118–141. [PubMed: 17492917]
- Patterson CM, Newman JP. Reflectivity and learning from aversive events: Toward a psychological mechanism for the syndromes of disinhibition. *Psychological Review*. 1993; 100:716–736. [PubMed: 8255955]
- Poythress NG, Edens JF, Lilienfeld SO. Criterion-related validity of the Psychopathic Personality Inventory in a prison sample. *Psychological Assessment*. 1998; 10:426–430.
- Rogers R, Salekin RT, Hill C, Sewell KW, Murdock ME, Neumann CS. The Psychopathy Checklist-Screening Version: An examination of criteria and subcriteria in three forensic samples. *Assessment*. 2000; 7:1–15. [PubMed: 10668002]
- Ross SR, Benning SD, Adams Z. Symptoms of executive dysfunction are endemic to secondary psychopathy: An examination in criminal offenders and noninstitutionalized young adults. *Journal of Personality Disorders*. 2007; 21:384–399. [PubMed: 17685835]
- Smith SS, Newman JP. Alcohol and drug abuse-dependence in psychopathic and nonpsychopathic criminal offenders. *Journal of Abnormal Psychology*. 1990; 99:430–439. [PubMed: 2266219]

- Vanman EJ, Mejia VY, Dawson ME, Schell AM, Raine A. Modification of the startle reflex in a community sample: Do one or two dimensions of psychopathy underlie emotional processing? *Personality and Individual Differences*. 2003; 35:2007–2021.
- Walsh Z, Kosson DS. Psychopathy and violence: The importance of factor level interactions. *Psychological Assessment*. 2008; 20:114–120. [PubMed: 18557688]
- Walters GD, Duncan SA, Mitchell-Perez K. The latent structure of psychopathy: A taxometric investigation of the Psychopathy Checklist-Revised in a heterogeneous sample of male prison inmates. *Assessment*. 2007; 14:270–278. [PubMed: 17690383]
- Welsh, G. Factor dimensions A and R. In: Welsh, GS.; Dahlstrom, WG., editors. *Basic readings on the MMPI in psychology and medicine*. University of Minnesota Press; Minneapolis: 1956. p. 264-281.
- Zachary, RA. *Shipley Institute of Living Scale: Revised manual*. Western Psychological Services; Los Angeles: 1986.
- Zeier JD, Maxwell JS, Newman JP. Attention moderates the processing of inhibitory information in primary psychopathy. *Journal of Abnormal Psychology*. 2009; 118:554–563. [PubMed: 19685952]

Figure 1.

A graph of the predicted mean interference scores on the Picture-Word task as a function of PCL:SV factor scores. For both factors, “low” represents 1 standard deviation below the mean score, and “high” represents 1 standard deviation above the mean.

Figure 2.

A graph of the predicted mean interference scores on the Picture-Word task as a function of PPI factor scores. For both factors, “low” represents 1 standard deviation below the mean score, and “high” represents 1 standard deviation above the mean.

Figure 3. A scatter plot of the relationship of the PCL:SV scores and interference (in milliseconds), with linear ($p=.08$) and quadratic ($p<.01$) fit lines included.

Table 1

Zero-Order Correlations of PCL:SV and PPI Scores and Picture-Word Task Interference. Note that n=121 for all correlations involving the PPI; for all others n=127.

Scale	1	2	3	4	5	6	7
1. PCL:SV Factor 1		.465**	.838**	.13	.225*	.266**	-.177
2. PCL:SV Factor 2			.867**	.197*	.433**	.452**	-.153
3. PCL:SV Total				.185*	.392**	.420**	-.154
4. PPI-1					0.169	.597**	-.128
5. PPI-2						.866**	-.125
6. PPI Total							-.182*
7. Interference							

Table 2

Mean Reaction Time (in Milliseconds) and Standard Deviation by Trial Type and Participant Group

Trial Type	Low Anxious		High Anxious	
	Non-Psychopathic n=31	Psychopathic n=12	Non-Psychopathic n=23	Psychopathic n=20
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Comparison	794 (191)	810 (167)	756 (183)	721 (181)
Experimental	830 (181)	804 (183)	769 (209)	710 (177)
Filler	744 (155)	731 (148)	682 (159)	637 (163)