Published in final edited form as:

J Abnorm Psychol. 2009 August ; 118(3): 554–563. doi:10.1037/a0016480.

Attention Moderates the Processing of Inhibitory Information in Primary Psychopathy

Joshua D. Zeier, Jeffrey S. Maxwell, and Joseph P. Newman

University of Wisconsin-Madison

Abstract

Primary psychopathic individuals are less apt to re-evaluate or change their behavior in response to stimuli outside of their current focus of attention. According to the response modulation hypothesis, this tendency reflects a lack of responsivity to important peripheral information and undermines adaptive self-regulation. To evaluate this hypothesis, we administered a response competition (flanker-type) task and manipulated focus of visual attention. We predicted that psychopathic individuals would display significantly less interference to response incongruent information than non-psychopathic participants when attention was cued to the target location but display normal interference when there was no pre-potent focus of attention. The results confirmed this hypothesis and are consistent with the contention that attention moderates psychopathic individuals' responsivity to inhibitory cues. Finally, we discuss the implications of this attentional anomaly for psychopathic traits and behavior.

Keywords

Psychopathy; Attention; Response Modulation; Anxiety

Psychopathic offenders comprise a distinct subgroup of antisocial individuals distinguished by a particularly problematic pattern of interpersonal, affective, lifestyle, and antisocial traits and behaviors (Hare, 1991, 2003). The cold, callous, manipulative, and impulsive features of psychopathic individuals, combined with their propensity to commit criminal acts, have led researchers to theorize that psychopathic individuals tend to behave in ways that are motivated exclusively by personal goals, irrespective of the feelings and rights of others or future negative consequences. Prominent clinical descriptions of psychopathy also describe psychopathic individuals as having low levels of neurotic anxiety (Cleckley, 1976; Karpman, 1946). Thus, psychopathic individuals with relatively low levels of anxiety are often labeled "primary psychopaths," whereas those with relatively high levels of anxiety are described as "secondary" or "neurotic psychopaths." Moreover, these groups appear to be etiologically distinct (Brinkley, Newman, Lynam, & Widiger, 2004; Lykken, 1995). Given the clinical and theoretical importance of this distinction, and especially the apparent differences in underlying etiology, this study focused specifically on primary psychopathy.¹

A critical question in psychopathy research concerns the reasons why psychopathic individuals focus on personal goals and ignore considerations that might otherwise inhibit their

---

Correspondence concerning this article should be addressed to Joshua D. Zeier, Department of Psychology, University of Wisconsin-Madison, 1202 West Johnson Street, Madison, WI 53706. E-mail: jdzeier@wisc.edu.

¹The predictions and discussion of the results in this paper are specific to primary psychopathic offenders; that is, those with low levels of anxiety (cf. Newman & Brinkley, 1997). Throughout the paper, "primary psychopathy" will be used to discuss prior research and current predictions and results that are specific to low-anxious psychopathic individuals. For studies in which anxiety was not assessed or was not related to the results, "psychopathy" will be used.

inappropriate behavior. Broadly speaking, there appear to be two different categories of explanations for this phenomenon. Psychopathic individuals may a) be less motivated to respond to inhibitory cues or b) have an attentionally mediated deficit that reduces processing of inhibitory cues that are peripheral to their primary focus of attention. Theories of psychopathy positing an emotion deficit such as low fear (Lykken, 1957, 1995) or empathy (Blair et al., 2002; Blair, 2004) as the fundamental psychopathic deficit are consistent with a motivational deficit; that is, emotional information related to behavioral inhibition is understood to be less meaningful for psychopathic individuals.

Newman and colleagues, on the other hand, have theorized that psychopathic individuals' insensitivity to inhibitory cues, including emotional information, is attentionally mediated (e.g., Newman & Lorenz, 2003). They describe the specific attentional problem of psychopathic individuals as a response modulation deficit. Response modulation is defined as a relatively brief and automatic interruption of goal-directed behavior that occurs in response to salient stimuli or feedback that are outside the current focus of attention. Thus, the proposed response modulation deficit holds that psychopathic participants are less likely to be affected by or use secondary, contextual information when it is extraneous to their dominant response set (Patterson & Newman, 1993; Newman & Wallace, 1993). Consequently, insensitivity to inhibitory or emotional cues may not reflect the fact that they are fundamentally less meaningful to psychopathic individuals; rather, psychopathic individuals' sensitivity to such cues may be insufficient when their attention is directed elsewhere (e.g., engaged in goal-direct behavior).

A number of empirical results provide support for the response modulation hypothesis. For example, Newman and Kosson (1986) administered a go/no-go discrimination learning task in which participants were required to press a button when particular stimuli were presented on a computer monitor to earn money and to inhibit pressing when other stimuli were presented to avoid losing money. As predicted, psychopathic participants more frequently failed to inhibit punished responses than non-psychopathic controls. To examine whether this deficiency was due to a deficit in response modulation or a generally impoverished response to punishment (i.e., a motivational or emotional deficit), Newman and Kosson (1986) administered a slightly modified version of the task that omitted the reward contingency. Instead, participants began with a cash stake and lost money each time that they responded to "no-go" stimuli or failed to respond to "go" stimuli. Under these circumstances, psychopathic and non-psychopathic participants displayed comparable passive avoidance.

Sensitivity to threat cues is often assessed using psychophysiological measures like skin conductance (SC) because behavioral measures such as passive avoidance may reflect deliberate inhibition rather than emotion-mediated learning. Thus, Arnett, Smith, and Newman (1997) examined SC responses under the same conditions employed by Newman and Kosson (1986). Paralleling results from the Newman and Kosson study, psychopathic individuals displayed significantly weaker SC responses to threat cues than controls while responding for rewards, but showed comparable SC responses to the same stimuli in a punishment-only condition. Thus, psychopathic individuals' physiological sensitivity as well as their behavioral sensitivity to inhibitory information appears to be a function of their attentional set. That is, when threat cues are part of the dominant response set (primary focus of attention), psychopathic individuals show no difference in their behavioral or psychophysiological response to them.²

The above results are externally valid and consistent with predictions generated by the response modulation hypothesis, but do not represent direct tests of the response modulation hypothesis. Because the passive avoidance deficits demonstrated by psychopathic offenders occur in conditions involving an approach-avoidance conflict, it is unclear whether the poor performance of psychopathic individuals in these tasks is truly attentionally mediated, or

reflects fundamental motivational or emotional processes that bias the perceived relevance of approach and avoidance contingencies. More powerful evidence for the role of attention in mediating sensitivity to inhibitory cues comes from Hiatt, Schmitt, and Newman (2004), who employed variations of the standard Stroop task to investigate the role of attentional focus without this motivational component. Paralleling results from the passive avoidance studies, psychopathic individuals displayed less interference from incongruent stimuli than controls when the incongruent cues were peripheral to their primary focus of attention, but showed comparable interference when they were not. More specifically, the groups did not differ on the standard Stroop task in which the color and word cues are presented in the same location, whereas psychopathic participants displayed less interference than controls when the color and word were spatially separated (see also Newman, Schmitt, & Voss, 1997; Smith, Arnett, & Newman, 1992; cf. Mitchell, Richell, Leonard, & Blair, 2006). Similar results have also been found using female psychopathic and non-psychopathic offenders (Vitale, Brinkley, Hiatt, & Newman, 2007).

These response conflict tasks support the response modulation hypothesis, but may not preclude a motivational explanation. Psychopathic individuals may approach these tasks differently than non-psychopathic individuals, giving less weight to potential errors generated by the incongruent information, which may account for the observed differences in performance. In other words, the emotional or motivational weight of the distractors, and the influence that this has on the performance of non-psychopathic individuals, may reflect a fundamental responsivity to information that calls for pausing or re-evaluating behavior that psychopathic individuals lack. Moreover, the relative “lack of concern” for inhibitory information displayed by psychopathic individuals on such measures may be functionally similar to the lack of concern for the rights and feelings of others or the fearlessness described in other theories of the psychopathic deficit.

In the context of a response conflict task, a more elegant and compelling test of response modulation would manipulate the focus of attention, while keeping all other variables constant. This approach allows for a direct test of the role of attention in the moderation of response to inhibitory information, while holding the emotional and motivational aspects of the task relatively constant. The experiment presented here provides such a test, using a modified version of the classic flanker task (Eriksen & Eriksen, 1974). In this version of the task, some trials include pre-target attentional cues that indicate where the target stimulus will appear, while other trials draw attention to both target and distractor locations. When afforded a pre-potent attentional focus that creates a dominant response set for critical information, the response modulation hypothesis predicts that psychopathic individuals will be relatively unaffected by information in an unattended location. Conversely, when attention is cued to both the target and distractor location, there is no primary focus of attention; thus, psychopathic and nonpsychopathic participants should not differ. This is consistent with the results for basic Stroop tasks, where psychopathic individuals do not differ, as the spatially integrated presentation of primary and secondary information precludes a pre-target focus of attention on relevant information (see Hiatt et al., 2004).

---

²It should be noted that these findings, like those of Newman & Kosson (1986), pertain to a group difference in psychopathy rather than to primary psychopathy. Although the passive avoidance deficit is particularly pronounced in primary psychopathic groups, group differences in electrodermal activity have been more pronounced in comparisons involving the high anxious groups. As noted by Newman, et al. (1997), the more likely reason for this difference is that the penalties associated with passive avoidance errors cause low-anxious non-psychopathic individuals to inhibit punished responses regardless of their sensitivity to punishment cues but, like low-anxious psychopathic individuals, they do not react to non-contingent threat cues with significant electrodermal activation. In other words, it appears that both low-anxious psychopathic and control groups are relatively insensitive to threat, but the psychopathic group also fails to extract the relevant information needed for adaptive avoidance learning.

In this study, we employ two different cuing manipulations, exogenous and endogenous cues, to evaluate the generality of the predicted effect. Exogenous cues draw attention to a location automatically. For example, flashing a box somewhere on a computer screen automatically draws a participant's attention to that location. Endogenous cues, on the other hand, direct individuals to shift their attentional focus (McCormick, 1997; Theeuwes, 1991, 1994; Yantis, 1993). For example, an arrow that appears at fixation and indicates where a target will appear will not automatically draw attention to the proper location, but will direct the participant to shift attention effortfully to that location. The differential effects of these cue types will be investigated, although the response modulation hypothesis does not predict differential effects for these cue types. For response modulation, the critical dimension is engagement of attention rather than the means by which attention is engaged.

The response modulation hypothesis predicts that psychopathic participants will show at least as much interference as non-psychopathic participants in trials where no pre-target focus of attention exists. When cued to the target location, however, it predicts that psychopathic participants will show less interference from distracting information than non-psychopathic individuals. It is important to note that cuing is expected to reduce interference in all participants; the response modulation hypothesis predicts that the effect of cuing on selective attention will be significantly stronger in psychopathic participants. Such results would provide further support for the response modulation hypothesis and, critically, would confirm that this is causally related to attentional focus. Moreover, by including conditions that differ only in attentional focus, tonic differences in motivation or processing of emotional information would appear insufficient to explain why primary psychopathic individuals exhibit this difference.

Method

Participants

Participants were 110 incarcerated Caucasian males in a medium security correctional institution in Wisconsin who met our basic inclusion criteria. This required that all participants were 45 years old or younger, free of any history of psychosis or bipolar disorder, and not currently taking psychotropic medication. Also, only participants scoring 70 or higher on a brief intelligence questionnaire, the Shipley Institute of Living Scale (Zachary, 1986) were included in our analyses. For this experiment, participants' ages ranged from 19 to 44, with a mean of 32.29 ($SD=7.38$). Estimated IQ scores ranged from 71.00 to 123.09, with a mean of 101.63 ($SD=10.57$).³

Psychopathy Checklist-Revised—Psychopathy was assessed using the Psychopathy Checklist-Revised (PCL-R; Hare, 1991; 2003). Information gleaned from a 60–90 minute interview with the inmate and a review of his institutional file was used to score the participant on the presence of 20 different items; each item is scored 0, 1, or 2, depending on the degree to which an individual manifests a specific trait or pattern of behavior related to psychopathy. Scores on this measure ranged from 2.1 to 38.0, with a mean of 22.03 ($SD=9.34$). In this sample, Cronbach's alpha for the PCL-R was .88. Ten participants were assessed independently by two raters; interrater reliability (i.e., the intra-class correlation) for this subset of scores was .99. Offenders were paid \$8 for their participation in the interview.

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 and secondary psychopathy in offender samples (Brinkley et al.,

³Participants were also administered a measure of handedness (Chapman & Chapman, 1987). As there were no group differences on this measure, and including this as a covariate did not change any subsequent analyses, participants were not excluded from the study if they were left-handed.

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 WAS ranged from 0 to 34, with a mean of 12.62 ($SD=8.56$). Offenders were paid \$7 for completing a packet of questionnaires that included the WAS.

Diagnostic classification—As in previous research, participants scoring 20 or lower on the PCL-R were considered non-psychopathic ($n=55$), and participants scoring 30 or higher were considered to be psychopathic ($n=36$). Participants scoring between 20 and 30 ($n=19$) were not included in psychopathy-related analyses. Participants were also divided into low-anxious and high-anxious groups using a median split (12) on the WAS. This procedure for identifying low-anxious participants is in keeping with previous investigations (Glass & Newman, 2006; Newman, et al., 2005; Hiatt et al., 2004). This procedure resulted in the classification of 53 participants as “low-anxious” and 57 participants as “high-anxious.” Ultimately, then, the sample can be considered as being divided into four groups: low-anxious (i.e., primary) psychopathic ($n=14$), low-anxious non-psychopathic ($n=30$), high-anxious psychopathic ($n=22$), and high-anxious non-psychopathic ($n=25$) participants.

Analyses of participant characteristics—Due to the potential relevance of intelligence for performance on cognitive tasks, we examined the extent to which estimated IQ was differentially associated with the four groups formed by crossing psychopathy with anxiety. A 2×2 Analysis of Variance revealed that psychopathic participants ($M=97.90$, $SD=11.72$) earned significantly lower IQ scores than non-psychopathic participants ($M=103.80$, $SD=10.17$), $F(1, 87)=5.45$, $p=.02$.

Owing to the potential importance of anxiety for influencing sensitivity to peripheral inhibitory cues, we also performed an analysis to determine whether there were any significant group differences in anxiety as measured by the WAS scores. Psychopathic participants had significantly higher anxiety scores ($M=14.31$, $SD=8.39$) than non-psychopathic participants ($M=10.84$, $SD=8.00$) in this sample, $F(1, 89)=3.93$, $p=.05$.⁴ Please see Table 1 for additional information concerning demographic and other individual difference variables for each of our participant groups.

Apparatus

This task was presented on a PC with a 16 inch monitor, and was programmed in E-Prime. Participants’ eyes were roughly 30 centimeters from screen. Responses were entered on the number pad on a keyboard. Participants were instructed to hold down the “middle” key (the ‘5’ key) when not responding, and to press the “up” key (the ‘8’ key) to indicate that the target was a number, and the “down” key (the ‘2’ key) when the target was a letter. No feedback was given in this task by the computer or by the experimenter.

Procedure

Each participant completed one testing session of 384 test trials. Individuals completed this task as part of a testing session which included three other tasks. They were paid \$4 for completing this particular task. For this task, trials were blocked by cue type; there were four blocks (2 for each cue type) of 96 trials each, and cue type alternated by block. Two different orders (exogenous-first or endogenous-first) were counterbalanced; order was not related to interference on this task, nor did it interact with psychopathy or anxiety. For each trial, a fixation

⁴The positive relationship of psychopathy and anxiety in this sample may seem unusual, but we do not believe that it is problematic. Although PCL-R scores are generally unrelated to anxiety, it is not unusual to find small but significant relationships between psychopathy and anxiety in specific subsamples. These effects are generally modest, as they were in this sample, as reflected by the fact that this effect was not significant when the analysis was performed separately for low- and high-anxious groups. Thus, we do not believe that this modest (albeit significant) effect has important implications for the results and interpretations reported in this manuscript.

point (+) appeared for a random amount of time between 800–1200 milliseconds. This was followed by a cue; for exogenous trials, the cue appeared for 100 milliseconds, while for endogenous trials the cue appeared for 300 milliseconds. The different timing parameters are necessary because it takes more time to respond to an endogenous cue (which requires an effortful shift of attention) than it does to respond to/make use of an exogenous cue (which draws attention automatically); prior research using these cue types has found these specific parameters appropriate (Goldsmith & Yeari, 2003).

Following the appearance of the cue, the target appeared for 30 milliseconds. The target display consisted of two stimuli, one appearing in the left visual field and one appearing in the right visual field (both equidistant from fixation), along with a central arrow denoting which stimulus is the target. Visual angle from the center of the fixation point to the edge of either primary stimulus was 1.91 degrees (if visual angle is calculated from the edge of the arrow cue to the edge of the stimulus, it was 0.94 degrees).

The target stimulus in this task was always a 5, 8, G, or M; the distractor was always one of these stimuli or an asterisk. Participants entered a response indicating whether the target was a letter or a number, and were presented with congruent (two letters or two numbers), incongruent (one letter and one number), and control (one letter or number in the target location and an asterisk in the distractor location) trials. Participants entered a response indicating whether the target was a letter or a number.

This is followed by an inter-trial interval of 1500 milliseconds before the next target appears. Before the participants began the first block of a cue type, they completed a short set of practice trials (12 trials for each of the two practice sets), which also had longer cue and target durations (all cues appeared for 600 milliseconds, and all targets appeared for 100 milliseconds). Trials in which participants took less than 100 milliseconds or more than 1500 milliseconds to respond were not included in the analyses.

For each trial, participants were shown either a directional or a neutral cue. For the endogenous cue condition, the directional cue was an arrow that appeared at fixation, indicating where the target would appear. The neutral cue was an equals sign that appeared at fixation. This indicated that the target was about to appear, but gave no information as to where (the target was equally likely to appear in either visual field after this cue). For the exogenous cue condition, the directional cue was a box that appeared in the location where the target would appear. For neutral cue trials, two boxes appeared, one in each possible target location; again, this indicated that the target was about to appear, but provided no information about the target location; thus, the participant had to rely on the arrow that appears at fixation, at the same time as the target, to determine which stimulus was the target. Neutral cues and directional cues appeared equally and pseudo-randomly in the experiment; directional cues were always valid. For simplicity, trials with neutral cues will be described as “uncued,” and trials with directional cues will be described as “cued.” See Figure 1 for a graphical depiction of the different trial types.

The primary dependent measure for this task was interference, calculated as the difference in mean reaction time between correct incongruent trials and correct control trials. This measure assessed the degree of conflict or interference created by response-incongruent distractors (relative to a baseline, in which the distractor is unrelated to any response).⁵ As reported by Botvinick, Nystrom, Fissell, Carter, and Cohen (1999), for incongruent trials “the combined influence of the target and flankers leads to conflict in the form of competition between correct

⁵Although some studies calculate interference as the difference in reaction time between incongruent and congruent trials, we feel that a comparison of incongruent and control trials is more appropriate. Interference scores calculated using incongruent and congruent trials may be confounded by including the effects of both facilitatory and inhibitory processes. Calculating interference as the difference between incongruent and control trials allows for a purer assessment of the effects of inhibitory information (Roberts & Hall, 2008).

and incorrect responses, an effect that is reflected in prolonged reaction times” (p. 179). Thus, comparing the response time for these trials to a neutral baseline should provide a clear metric for assessing the influence of incongruent information. Response time differences on flanker (and flanker-type) tasks have been related to neural correlates, such as anterior cingulate cortex activation (Botvinick et al., 1999) which, in turn, has been shown to be quantitatively related to the degree of conflict (Takezawa & Miyatani, 2005).

Results

Preliminary Analyses

To investigate the overall effects of cue presence and cue type, we conducted a 2 (cued or uncued) $\times$ 2 (endogenous or exogenous) univariate ANOVA, with interference as the dependent measure. Overall, there was a strong main effect of cuing on interference, such that the presence of a cue reduced the amount of interference from an incongruent distractor by an average of 32 milliseconds, $F(1, 109)=75.24$, $p<.01$. Demonstrating the generality of the attentional focus manipulation, cue type (exogenous or endogenous) did not have a significant main effect on interference, nor did it significantly moderate the cuing effect.

In light of the significant group differences in intelligence reported in the Methods section, we also examined the effects of intelligence on performance. First, we examined the bivariate correlation between intelligence and interference for both cued and uncued trials. The correlation between intelligence and interference was small and non-significant in the entire sample as well as in the low-anxious and high-anxious subsamples. In addition, we examined the effects of including IQ as a covariate in the primary analysis reported below. Consistent with the non-significant correlations, inclusion of this covariate had virtually no effect on the overall analysis. Thus, including IQ as a covariate in our primary analyses was contraindicated.

We also conducted analyses to investigate the presence of general performance differences on this task related to psychopathy or anxiety. We performed a 2 (psychopathic or non-psychopathic) $\times$ 2 (low-anxious or high-anxious) univariate ANOVA, with overall accuracy as the dependent measure; no significant relationships were present⁶ (mean accuracy for the entire sample was 94%, $SD=5\%$). We also performed the same analysis using reaction time for uncued control trials (i.e. the baseline condition) as the dependent measure, to investigate the presence of general group differences in response speed. Again, there were no significant differences.⁷ There was also no difference related to psychopathy or anxiety when examining facilitation (i.e. the difference between mean reaction time for congruent and control trials) using the same comparison, consistent with results from prior research (Hiatt et al., 2004). The mean reaction times for each trial type (congruent, incongruent, and control) and cue (cued or uncued) are presented in Table 2.

⁶Although there were no differences psychopathy or anxiety related differences on overall accuracy for this task, the mean accuracy for each of our four participant groups are presented here for the reader's information: low-anxious psychopathic participants ($M=93\%$, $SD=6\%$), low-anxious non-psychopathic participants ($M=95\%$, $SD=4\%$), high-anxious psychopathic participants ($M=95\%$, $SD=4\%$), and high-anxious non-psychopathic participants ($M=93\%$, $SD=6\%$).

⁷Data for uncued control trials were selected as the baseline condition (to investigate overall reaction time effects) because there are theoretical reasons to predict differences in the other conditions, due to the presence of attentional cues and inhibitory information. However, given that psychopathic participants appeared to respond more quickly in this task (see Table 2), we conducted a 2 (psychopathic or non-psychopathic) $\times$ 2 (low-anxious or high-anxious) univariate ANOVA, with overall mean reaction time as the dependent measure. There was a trend-level main effect for psychopathy, $F(1,87)=2.95$, $p=.09$, with psychopathic participants responding an average of 36 milliseconds faster than non-psychopathic participants. There was no significant main effect of psychopathy when data was analyzed separately for low- and high-anxious participants.

Hypothesis Testing

To examine our hypotheses, we conducted a 2 (psychopathic or non-psychopathic individual) $\times$ 2 (low-anxious or high-anxious) $\times$ 2 (cued or uncued) $\times$ 2 (exogenous or endogenous block) ANOVA with interference scores (i.e., the difference in mean reaction time between control and incongruent trials, excluding error trials) as the dependent measure. This analysis revealed a significant 3-way interaction of psychopathy, anxiety, and cue presence, $F(1, 87)=9.73, p<.01$. To investigate our a priori hypothesis, we examined the data separately for low anxious participants (data for high-anxious participants are reported below). Consistent with our hypothesis, analysis of the data for the low-anxious groups revealed a significant psychopathy by cue presence interaction, $F(1, 42)=5.36, p=.03$, with low-anxious psychopathic participants showing a significantly greater effect of cuing on the processing of distracting information. This analysis is presented graphically in Figure 2. This effect was not moderated by cue type (exogenous or endogenous), suggesting that the focus of attention (i.e., the presence of a directional attentional cue), rather than the method by which attention is elicited, appears to be the critical variable differentiating the psychopathic and nonpsychopathic groups in this study.

To examine whether the greater cuing effect found for low-anxious psychopathic participants related specifically to reduced interference in the cued condition, we analyzed the data separately for cued and uncued trials. As predicted, low-anxious psychopathic participants ($M=14, SD=19$) showed significantly less interference than low-anxious non-psychopathic participants ($M=27, SD=19$) on cued trials, $F(1, 42)=4.36, p=.04$. A comparable analysis for the uncued trials indicated that the interference scores of psychopathic individuals ($M=65, SD=29$) and non-psychopathic individuals ($M=52, SD=31$) did not differ, $F(1, 42)=1.87, p=.18$.

Results for High-Anxious Groups

Although a priori hypotheses were restricted to comparisons between low-anxious groups, we repeated these analyses for the high-anxious groups for the sake of completeness. A psychopathy $\times$ cue presence analysis revealed a significantly smaller effect of cuing on interference for high-anxious psychopathic participants than for high-anxious non-psychopathic participants, $F(1, 45)=4.31, p=.04$. When the data were analyzed separately for cued and uncued trials, interference scores for high-anxious psychopathic participants did not differ significantly from high-anxious non-psychopathic participants on cued ($M=26, SD=23$ for psychopathic individuals, $M=16, SD=21$ for non-psychopathic individuals, $F(1, 45)=2.46, p=.12$) or uncued trials ($M=49, SD=28$ for psychopathic individuals, $M=59, SD=35$ for psychopathic individuals, $F(1, 45)=1.20, p=.28$).

Supplementary Analyses

While we believe that our primary analyses are the most appropriate way to examine these data, alternative analyses are possible and these alternatives could yield different results. To address concerns about the use of difference scores to index interference, supplementary analyses were performed using overall reaction time scores and including trial type (incongruent or control) as a condition. First, the data was analyzed in a 2 (low-anxious or high anxious) $\times$ 2 (psychopathic or non-psychopathic) $\times$ 2 (cued or uncued) $\times$ 2 (endogenous or exogenous) $\times$ 2 (incongruent or control) repeated measures ANOVA. This analysis yielded a significant four-way interaction of trial type (incongruent or control) $\times$ cue presence (cued or uncued) $\times$ anxiety (low-anxious or high-anxious) $\times$ psychopathy (psychopathic or non-psychopathic), $F(1,87)=10.06, p<.01$, analogous to the results of the interference analysis presented above..

As with the primary analyses, we then analyzed performance separately for low and high anxious groups, to test hypotheses about primary (i.e. low-anxious) participants. The analysis for low-anxious participants yielded a significant three-way interaction, $F(1,42)=5.97, p=.02$, that replicates results reported for the interference measure. That is, cuing had a significantly greater effect on interference (the difference in reaction time between incongruent and control trials) for psychopathic participants. This interaction was also significant in the analysis of high-anxious participants, $F(1,45)=3.94, p=.05$. In comparison to high-anxious controls, the high-anxious psychopathic group showed more interference in cued conditions and slightly less interference in uncued conditions.

Another potential concern about the interference analyses relates to our use of control trials rather than congruent trials as a baseline for computing interference. Though we believe that control trials provide a superior neutral baseline, we re-examined our hypotheses using this alternative baseline to address concerns and provide additional information on the predicted effects. Testing for a cue presence $\times$ psychopathy group interaction (separately for low and high-anxious participants) revealed a significant effect in the low-anxious participants, $F(1, 42)=8.64, p<.01$. Replicating results found for the incongruent-control interference measure, low-anxious psychopathic participants showed a significantly stronger effect of cuing than low-anxious non-psychopathic participants. This effect was not significant in the high-anxious participants.

Discussion

As predicted by the response modulation hypothesis, individuals with primary psychopathy were significantly less affected by response incongruent information than controls when this information was peripheral to a pre-potent focus of attention (i.e., to a cued target location). However, the groups displayed comparable interference under well-matched control conditions that directed attention to both target and distractor locations, substantiating the importance of attentional factors in moderating a person's reactions to response conflict. Thus, the current findings document the importance of attention in moderating sensitivity to motivationally significant information in primary psychopathy and provide further support for the response modulation hypothesis.

According to the response modulation hypothesis, (a) individuals with primary psychopathy are relatively insensitive to contextual information, (b) this neglect of contextual information undermines their responsivity to a variety of environmental stimuli that normally facilitate self-regulation, and (c) their diminished response to contextual information (i.e. information that is peripheral to a pre-potent focus of attention) is moderated by attentional factors. In light of existing support for the first two propositions (Hiatt et al., 2004; Newman et al., 1997; Newman & Kosson, 1986), the current study was designed to evaluate the role of attention in moderating the insensitivity to contextual information that characterizes primary psychopathy.

Toward this end, we manipulated participants' pre-potent focus of attention while examining the effects of peripheral, response-incongruent information on behavior. Based on previous research (Hiatt et al., 2004; Smith et al., 1992; Munro, Dywan, Harris, McKee, Unsal, & Segalowitz, 2007), we assumed that there would be no group differences in interference unless the incongruent information was peripheral to a pre-potent focus of attention. That is, we predicted that individuals with primary psychopathy would display reduced interference to incongruent information once their attention was directed to a target location. As noted above, the results provided strong and specific support for this hypothesis and, thus, demonstrate that attention plays a pivotal role in moderating sensitivity to contextual information in primary psychopathy.

The present results also clarify the implications of the response modulation hypothesis for primary psychopathic individuals' performance on Stroop-like tasks. Previous research with modified Stroop tasks demonstrates that they display reduced interference when the to-be-attended and to-be-ignored aspects of the stimuli are spatially distinct, though they show normal interference when the information is spatially integrated, as it is in the standard Stroop task (Hiatt et al., 2004). Based on these findings, Hiatt and colleagues proposed that psychopathic individuals display superior selective attention under conditions that allow them to focus on one aspect of a visual display. However, this interpretation was speculative because attention was not manipulated in their experimental tasks. The present findings do not negate the possibility that spatial separation is important for observing a lack of responsivity to inhibitory stimuli, but they do suggest that it is not sufficient. The incongruent stimuli in the present study were spatially separated in both the "cued" and "uncued" trials, yet primary psychopathic participants differed only in the "cued" condition.

Further clarification is provided by the Mitchell et al. (2006) study that examined the effects of presenting emotional distractors before and after a neutral target stimulus in a perceptual discrimination task. As expected, psychopathic individuals were less distracted by these temporally distinct emotional distractors. According to the authors, the results could be interpreted as "in line with the response set modulation account by suggesting that individuals with psychopathy present with reduced processing of the information peripheral to the dominant response set if it is spatially and temporally peripheral to the information necessary for the dominant response set" (p. 564). We agree that these results are in line with the response modulation hypothesis and, moreover, agree that temporal as well as spatial separation will often be sufficient to reveal group differences in response modulation. However, we believe that this characterization of the response modulation deficit is incomplete. The critical dimension relates to whether or not a pre-potent focus of attention exists (regardless of whether there is spatial or temporal separation). When a pre-potent focus of attention exists, it biases attention towards specific stimuli or dimensions and causes other information to be outside of that focus, so that response modulation is needed to process the secondary information. In past research, this focus has been established by a response bias, as in the passive avoidance task employed by Newman and Kosson (1986), spatial separation, as in the modified Stroop tasks used by Hiatt et al. (2004), and temporal separation, as in the task presented by Mitchell and colleagues (2006).

Prior to investigations of response conflict tasks (e.g. modified Stroop tasks), much of the research on response modulation deficits in psychopathy used monetary rewards and punishments. The use of these incentives was important to ensure adequate motivation for task performance and to demonstrate the importance of response modulation deficits for maladaptive behavior (i.e., failure to inhibit responses that result in loss of money). In addition, it was initially proposed that establishing a dominant response set for reward was crucial for observing psychopathy-related deficits in response modulation (Gorenstein & Newman, 1980). However, following a series of experiments in which primary psychopathic participants displayed passive avoidance deficits only when afforded a prepotent focus of attention, Newman, Patterson, Howland, and Nichols (1990) proposed that the presence of a dominant response set, rather than hypersensitivity to reward or behavioral activation, was responsible for their response modulation deficits. The current results bolster this interpretation of the primary psychopathic deficit in response modulation as a situation specific "inattention" to information that is not part of a pre-potent focus of attention or dominant response set.

On the surface, the association between past research on passive avoidance learning and research involving response competition tasks may appear to be remote because of the extent to which the experimental manipulations and dependent measures differ. Indeed, individuals with primary psychopathy typically display a performance deficit on passive avoidance tasks,

whereas they display less interference (i.e., better performance) when presented with response incongruent distractors. Nevertheless, performance on both paradigms is a function of participants' sensitivity to contextual information and affected by response modulation (albeit in opposite directions). While the differences between the paradigms can be distracting, philosophy of science underscores the importance of conducting such conceptual replications as a means of evaluating the generality of a theoretical model and ruling out experiment-specific factors as alternative explanations for one's findings. From this perspective, a greater difference between experimental contexts results in a more powerful conceptual replication.

Of course, when evaluating theoretical predictions in disparate experimental contexts, there is no guarantee that the same processes are responsible for the ostensibly related behaviors. Indeed, it is likely that different psychological processes and neural mechanisms are at play in a passive avoidance task as opposed to a Stroop or flanker task. Nevertheless, the utility of a theoretical model relates to its ability to generate valid predictions across a range of circumstances. To the extent that predictions are consistently supported in different experimental contexts, such results imply that the theoretical principles as opposed to task-specific factors are responsible for the observed results. In our view, the situation-specific insensitivity to peripheral information in the present study reflects the same response modulation deficit that underlies observed passive avoidance deficits in psychopathic offenders. While, in this case, the response modulation deficit led to superior performance under specific conditions, we propose that the observed group difference actually reflects a response modulation deficit that hampers self-regulation in situations that require individuals to alter or suspend goal-directed behavior in order to accommodate relevant peripheral information.

With regard to the clinical significance of the current findings for psychopathic behavior, MacCoon, Wallace and Newman (2004) have elaborated a model that clarifies the implications of response modulation deficits for the disinhibited behavior of psychopathic individuals. According to these authors, self-regulation depends upon a person's ability to maintain a context appropriate balance of attention to primary (i.e., top-down) and peripheral (i.e., bottom-up) cues. The "context-appropriate" aspect of this proposal highlights the fact that the value of maintaining or shifting the focus of attention will vary according to the demands of a situation. Although successful goal-directed behavior depends upon a person's ability to maintain a top-down focus on the goal in spite of myriad distractors, it is also dependent upon one's ability to revise a strategy in response to bottom-up cues indicating that this strategy is no longer appropriate. Newman and colleagues have proposed that a deficit in response modulation, as manifested in primary psychopathy, will attenuate a person's sensitivity to interpersonal cues that conflict with their immediate goals, render them oblivious to affective information unless it is an integral aspect of their goal-directed behavior, and undermine their consideration of information that might otherwise serve to inhibit inappropriate impulsive and antisocial behavior (Newman & Lorenz, 2003; Patterson & Newman, 1993; see also Hare, 1998).

This theoretical model of psychopathy also provides insight into the real-world behavior of psychopathic individuals. For example, in *Psychopathy: Theory and Research*, Hare (1970) describes a man who escaped from a prison hospital and returned to his lifestyle of making money through fraud and other illegal activities. He presented himself as the head of a philanthropic organization and enlisted the help of religious groups to help him raise funds. To expedite his fundraising, he made an impressive appearance on a local television station. His plea proved highly effective in meeting his immediate goal, as he successfully solicited significant donations. Outside of the scope of his goal, however, there were obvious negative consequences to appearing on television as a fugitive; indeed, the event led to his re-arrest. For a less psychopathic individual, the consequences of television exposure would almost certainly

have engendered response conflict and led to a different decision. While this example may seem distinct from the methodology and findings of the laboratory task presented here, the same principle is at work. That is, this individual failed to make use of salient, inhibitory information that was outside of his prepotent focus of attention. We propose that such deficits are a function of attentional focus, and have relevance in situations ranging from simple cognitive tasks to real-world antisocial behavior.

Regarding potential limitations of this study, it is worth noting that the predictions and results are specific to a comparison of low-anxious psychopathic and non-psychopathic individuals. The importance of distinguishing between primary (i.e., low-anxious) and secondary (i.e., high-anxious) psychopathic subtypes has been emphasized for decades (Cleckley, 1976; Hare, 1970; Karpman, 1946), because high levels of neurotic anxiety can give rise to antisocial syndromes that mimic primary psychopathy but are etiologically distinct. Moreover, such proposals are supported by a wealth of laboratory evidence (see Brinkley et al., 2004; Newman et al., 2005). While this strategy limits the generalizability of our findings to a subset of psychopathic individuals, it is our contention that the “classic” (i.e., Cleckley, 1976) description of psychopathy defines a relatively homogeneous group in terms of the manifestation of psychopathic traits, behaviors, and underlying etiological processes (Brinkley et al., 2004).⁸

Finally, although motivational and emotional factors were well matched across the cuing conditions, these variables were not experimentally manipulated. Thus, the results of this specific study cannot be presented as underlying or explaining the obvious emotional impairments associated with psychopathy. Nevertheless, we believe that the response modulation hypothesis posits a mechanism within which performance differences on both cognitive and affective deficits can be understood (see Newman & Lorenz, 2003). Conversely, theories that posit emotion deficits as the proximal mechanism for psychopathy appear unable to explain the results presented here. We acknowledge the possibility that psychopathy may reflect multiple independent deficiencies (e.g., Patrick, Hicks, Nichol, & Krueger, 2007; Fowles & Dindo, 2006) rather than a single information processing deficit (Brinkley et al., 2004). However, given the viability of the unitary model, we propose that studies of emotion processing and other putative deficits should manipulate attention to evaluate the importance of response modulation for any observed deficits. If, as we have proposed, this attentional deficit is a core aspect of primary psychopathy, then attention may also moderate the expression of these deficits. Although there is already some evidence to support this speculation, (e.g., Arnett et al., 1997; Dvorak-Bertsch, Curtin, Rubinstein, & Newman, in press; Newman & Kosson, 1986), additional studies are needed.

This study examined the conditions under which primary psychopathic individuals fail to process highly salient inhibitory information. Using a task with highly salient distractors, we have created a rigorous test of the mechanism theorized to underlie primary psychopathy. The results confirm the critical role of attentional engagement and the direction of attention towards relevant information for moderating performance differences associated with primary psychopathy. By demonstrating the direct relationship of attentional focus and insensitivity to highly salient, response-incongruent information, these results provide the most powerful

---

⁸Some researchers associate primary and secondary psychopathy with the interpersonal and affective (Factor 1) and lifestyle and antisocial (Factor 2) traits of the disorder, respectively. Here, we use the terms “primary” and “secondary” with reference to the etiology, not symptomatology, of the disorder. Primary psychopathy refers to an intrinsic, fundamental deficit that undermines sensitivity to important interpersonal, affective, and inhibitory cues that normally modulate goal-directed behavior while secondary psychopathy refers to other causal factors or deficits (e.g. chaotic developmental history, emotional hyperreactivity) that give rise to a phenotypically similar syndrome (see Lykken, 1995 for review). Although the causes of their psychopathic behavior are presumed to differ, both syndromes are associated with high levels of the interpersonal, affective, lifestyle, and antisocial traits associated with psychopathy and cannot, therefore, be equated with Factor 1 or 2 of the PCL-R.

evidence to date that primary psychopathic individuals manifest an attentionally-moderated deficit that undermines their processing of inhibitory information. While adaptive within the parameters of the present study, we propose that this insensitivity to important contextual information may also underlie failures to inhibit behavior in the face of dire personal and societal consequences. Thus, uncovering the nature of the response modulation deficit, and further clarifying its specific association with primary psychopathic individuals' interpersonal, affective, and behavioral problems, represents a crucial next step toward understanding and treating psychopathy.

Acknowledgments

This research was supported by National Institute of Mental Health Grant MH53041. We acknowledge the assistance and support of the staff at the Oshkosh Correctional Institution, as well as the cooperation of the Wisconsin Department of Corrections. We especially thank Warden Judy Smith, Dr. Alexander Stolarski, Sandy Henrickson, and Jennifer Sykora of the Oshkosh Correctional Institution for their assistance. We thank Samantha Glass, Melanie Malterer, and Jeremy Bertsch for their feedback on this manuscript, and we thank Naomi Sadeh and Matt Shane for interviewing and diagnosing participants.

References

- Arnett PA, Smith SS, Newman JP. Approach and avoidance motivation in psychopathic criminal offenders during passive avoidance. *Journal of Personality and Social Psychology* 1997;72:1413–1428. [PubMed: 9177023]
- Blair RJR. The roles of orbital frontal cortex in the modulation of antisocial behavior. *Brain and Cognition* 2004;55:198–208. [PubMed: 15134853]
- Blair RJR, Mitchell DGV, Richell RA, Kelly S, Leonard A, Newman C, Scott SK. Turning a deaf ear to fear: Impaired recognition of vocal affect in psychopathic individuals. *Journal of Abnormal Psychology* 2002;111:682–686. [PubMed: 12428783]
- Botvinick M, Nystrom LE, Fissell K, Carter CS, Cohen JD. Conflict monitoring versus selection-for-action in anterior cingulate cortex. *Nature* 1999;402:179–181. [PubMed: 10647008]
- 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.
- Chapman LJ, Chapman JP. The measurement of handedness. *Brain and Cognition* 1987;6:175–183. [PubMed: 3593557]
- Cleckley, H. *The mask of sanity*. Vol. 5. St. Louis, MO: Mosby; 1976.
- Dvorak-Bertsch JD, Curtin JJ, Rubinstein TJ, Newman JP. Psychopathic traits and affective processing under attentional load. *Psychophysiology*. in press
- Eriksen BA, Eriksen CW. Effects of noise letters upon the identification of a target letter in a nonsearch task. *Perception & Psychophysics* 1974;16:143–149.
- Fowles, DC.; Dindo, L. A dual-deficit model of psychopathy. In: Patrick, CJ., editor. *Handbook of psychopathy*. New York: Guilford Press; 2006.
- Glass SJ, Newman JP. Recognition of facial affect in psychopathic offenders. *Journal of Abnormal Psychology* 2006;115:815–820. [PubMed: 17100539]
- Goldsmith M, Yeari M. Modulation of object-based attention by spatial focus under endogenous and exogenous orienting. *Journal of Experimental Psychology: Human Perception and Performance* 2003;29:897–918. [PubMed: 14585013]
- Gorenstein EE, Newman JP. Disinhibitory psychopathology: A new perspective and a model for research. *Psychological Review* 1980;87:301–315. [PubMed: 7384345]
- Hare, RD. *Psychopathy: Theory and research*. New York: John Wiley & Sons, Inc; 1970.
- Hare, RD. *The Hare Psychopathy Checklist Revised*. Toronto, Ontario, Canada: Multi-Health Systems; 1991.
- Hare, RD. Psychopathy, affect, and behavior. In: Cooke, DJ.; Forth, AE.; Hare, RD., editors. *Psychopathy: Theory, research, and implications for society*. Dordrecht, The Netherlands: Kluwer; 1998. p. 105-137.

- Hare, RD. Manual for the Hare Psychopathy Checklist-Revised. Vol. 2. Toronto, Ontario, Canada: Multi-Health Systems; 2003.
- Hiatt KD, Schmitt WA, Newman JP. Stroop tasks reveal abnormal selective attention among psychopathic offenders. *Neuropsychology* 2004;18:50–59. [PubMed: 14744187]
- Karpman B. Psychopathy in the scheme of human typology. *Journal of Nervous and Mental Disease* 1946;103:276–288.
- Lykken DT. A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology* 1957;55:6–10.
- Lykken, DT. The antisocial personalities. Mahwah, NJ: Erlbaum; 1995.
- 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*. New York: Guilford; 2004. p. 422–446.
- McCormick PA. Orienting attention without awareness. *Journal of Experimental Psychology: Human Perception and Performance* 1997;23:168–180. [PubMed: 9157183]
- Mitchell DGV, Richell RA, Leonard A, Blair RJR. Emotion at the expense of cognition: Psychopathic individuals outperform controls on an operant response task. *Journal of Abnormal Psychology* 2006;115:559–566. [PubMed: 16866596]
- Munro GES, Dywan J, Harris GT, McKee S, Unsal A, Segalowitz SJ. ERN varies with degree of psychopathy in an emotion discrimination task. *Biological Psychology* 2007a;76:31–42. [PubMed: 17604898]
- Newman JP, Brinkley CA. Reconsidering the low-fear explanation for primary psychopathy. *Psychological Inquiry* 1997;8:236–244.
- Newman JP, Kosson DS. Passive avoidance learning in psychopathic and nonpsychopathic offenders. *Journal of Abnormal Psychology* 1986;95:252–256. [PubMed: 3745647]
- Newman, JP.; Lorenz, AR. Response modulation and emotion processing: Implications for psychopathy and other dysregulatory psychopathology. In: Davidson, RJ.; Scherer, K.; Goldsmith, HH., editors. *Handbook of affective sciences*. Oxford University Press; 2003. p. 904–929.
- 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, Patterson CM, Howland EW, Nichols SL. Passive avoidance in psychopaths: The effects of reward. *Personality and Individual Differences* 1990;11:1101–1114.
- Newman JP, Patterson CM, Kosson DS. Response perseveration in psychopaths. *Journal of Abnormal Psychology* 1987;96:145–148. [PubMed: 3584663]
- 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]
- Newman, JP.; Wallace, JF. Psychopathy and cognition. In: Kendall, P.; Dobson, K., editors. *Psychopathology and cognition*. New York: Academic Press; 1993. p. 293–349.
- 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]
- Roberts KL, Hall DA. Examining a supramodal network for conflict processing: A systematic review and novel functional magnetic resonance imaging data for related visual and auditory Stroop tasks. *Journal of cognitive neuroscience* 2008;20:1063–1078. [PubMed: 18211237]
- Smith SS, Arnett PA, Newman JP. Neuropsychological differentiation of psychopathic and nonpsychopathic criminal offenders. *Personality and Individual Differences* 1992;13:1233–1245.
- Takezawa T, Miyatani M. Quantitative relation between conflict and response inhibition in the flanker task. *Psychological Reports* 2005;97:515–526. [PubMed: 16342579]

- Theeuwes J. Exogenous and endogenous control of attention: The effect of visual onsets and offsets. *Perception & Psychophysics* 1991;49:83–90. [PubMed: 2011456]
- Theeuwes J. Endogenous and exogenous control of visual selection. *Perception* 1994;23:429–440. [PubMed: 7991343]
- Vitale JE, Brinkley CA, Hiatt KD, Newman JP. Abnormal selective attention in psychopathic female offenders. *Neuropsychology* 2007;21:301–312. [PubMed: 17484593]
- Welsh, G. Factor dimensions A and R. In: Welsh, GS.; Dahlstrom, WG., editors. *Basic readings on the MMPI in psychology and medicine*. Minneapolis: University of Minnesota Press; 1956. p. 264-281.
- Yantis S. Stimulus-driven attentional capture. *Current Directions in Psychological Science* 1993;2:156–161.
- Zachary, RA. *Shipley Institute of Living Scale: Revised manual*. Los Angeles: Western Psychological Services; 1986.

Figure 1.

Examples of the different types of trials. Cue type (endogenous or exogenous) and cue presence (uncued or cued) is indicated in the figure. The trial types are control, congruent, incongruent, and control, respectively. The target stimulus (i.e. the stimulus that the participant is to respond to) is the letter “G” for all of the examples presented here. The timing for each component of the trial (in milliseconds) is listed in the center of the figure. Note that the fixation point appears for a random interval period, between 800–1200 ms. Endogenous cues are presented for 300 ms, while exogenous cues appear for 100 ms.

Low Anxious Participants

Figure 2.

Graph of mean interference scores for low-anxious non-psychopathic and psychopathic participants (with standard error bars).

Table 1
Mean Values and Standard Deviations for Demographic and Personality Variables.

Measure	Low Anxious			High-Anxious		
	Non-Psychopathic n=30			Non-Psychopathic n=25		
	Mean	SD	Mean	SD	Mean	SD
Age	33.47	6.96	31.79	9.18	33.12	7.59
Estimated IQ	103.84	10.90	99.84	13.78	103.75	9.43
Welsh Anxiety Score	4.47	3.27	5.93	3.99	18.48	4.44
Violent Crimes	2.17	1.62	4.07	3.05	2.68	2.27
Non-Violent Crimes	7.2	6.76	12	7.85	6.72	7.24
Total Crimes	9.37	7.36	16.07	9.28	9.4	7.17
PCL-R Factor 1 score	5.07	3.20	12.68	1.44	5.52	2.52
PCL-R Factor 2 score	6.38	3.64	14.79	1.79	6.96	3.04
PCL-R Total Score	13.42	4.93	32.4	2.39	14.67	4.61
					31.64	6.77
					96.66	10.34
					19.64	5.57
					3.95	2.65
					21.48	16.27
					25.43	15.93
					13	1.77
					15.35	1.59
					33.17	2.33

Table 2
Mean Reaction Times (in Milliseconds) and Standard Deviations for the Different Trial Types and Cuing Conditions.

Cue	Trial Type	Low Anxious			High-Anxious		
		Non-Psychopathic n=30		Psychopathic n=14	Non-Psychopathic n=25		Psychopathic n=22
		Mean	SD	Mean	Mean	SD	Mean
Cued	Congruent	728	103	672	731	91	711
	Control	718	103	662	725	85	694
	Incongruent	744	104	675	740	86	720
Uncued	Congruent	800	108	739	800	90	781
	Control	775	100	721	774	83	754
	Incongruent	826	104	787	834	81	803