

Emotion Processing in the Criminal Psychopath: The Role of Attention in Emotion-Facilitated Memory

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The response modulation hypothesis specifies that low-anxious psychopathic individuals have difficulty processing information outside their primary attentional focus. To evaluate the applicability of this model to affective processing, the authors had 239 offenders, classified with the Psychopathy Checklist—Revised (R. D. Hare, 2003) and the Welsh Anxiety Scale (G. Welsh, 1956), perform 1 of 3 emotion memory tasks that examined the effects of emotion on memory for primary and contextual information. Regardless of anxiety level, psychopathic and control offenders demonstrated a significant and comparable memory bias for emotional over neutral words in the primary conditions. However, psychopathic individuals showed significantly less memory bias than did controls in the contextual conditions. Results indicate that the impact of emotion on memory is moderated by attentional factors.

Keywords: psychopathy, emotion, memory

Psychopathy is a highly unique and intriguing form of psychopathology because psychopathic individuals appear to lack the guiding force of emotion (Blair, 2005). Theoretical conceptualizations of psychopathy have focused on this affective poverty, emphasizing the psychopathic individual's inability to learn from punishment and insensitivity to the rights and feelings of others. A particularly common view is that psychopathic individuals have a diminished capacity for emotional responding that, in turn, undermines both their ability to learn from punishment and their motivation to conform behavior to the expectations of others (Blair, 2005; Lykken, 1995).

The response modulation hypothesis (RMH), by contrast, holds that psychopathic individuals are capable of normal emotional responses but have difficulty processing affective information when it is peripheral to their primary attentional focus (Newman & Lorenz, 2003). Psychopathic and nonpsychopathic offenders display, consistent with this model, comparable behavioral and psychophysiological responses to threat cues when they are the focus of attention, but psychopathic individuals display significantly weaker responses when they are focused on earning rewards (Arnett, Smith & Newman, 1997; Newman & Kosson, 1986).

Whereas emotion-based models predict weaker responses to affective cues regardless of attentional focus, the RMH holds that attentional factors determine the quality of emotion processing (Newman & Lorenz, 2003).

A related model of psychopathy involves Gray's (1982) theory of behavioral inhibition system (BIS) functioning (Fowles, 1980), which, like the RMH, is based on the septo-hippocampal-orbitofrontal system (Gorenstein & Newman, 1980). According to Gray, the BIS is sensitive to punishment stimuli, cues that predict omission of expected rewards and novelty. In response to such cues, the BIS functions to increase nonspecific arousal, "inhibit all ongoing behaviour, whether instrumental or classically conditioned or innate," and "perform the maximum possible analysis of current environmental stimuli, especially novel ones" (Gray, 1982, p. 13). When operating effectively, the BIS enables a person to use environmental cues to anticipate future significant negative events and inhibit behavior accordingly. In contrast, a hyporeactive BIS, with a higher threshold for punishment reactivity, would interfere with the formation of such associations and passive avoidance learning.

Although similar to Gray's (1982) model, the RMH (Newman, 1997, 1998) holds that psychopathic individuals are deficient specifically in the interrupt and attention components of BIS functioning. In contrast to a weak BIS model, the RMH predicts that psychopathic individuals will be normally responsive (i.e., experience the same increase in arousal) to threat and other emotion-related information within their attentional focus (Newman, 1998). However, both models predict that psychopathic individuals will be less likely to suspend goal-directed behavior and increase attention to contextual cues in response to such emotion elicitors.

Owing to the overlap between the weak BIS and poor response modulation models, studies generated by the RMH have typically controlled for general sensitivity to punishment cues. Specifically, reactions to punishment stimuli have been measured both when they were a part of participants' primary attentional focus and when they were peripheral to participants' primary goal-directed

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focus (e.g., earning rewards). As predicted by the RMH, such studies showed that psychopathic and nonpsychopathic individuals displayed equivalent emotion responses and learning when threat cues were primary; however, weaker emotion processing and learning when attending to threat cues required participants to alter a dominant response set for reward (e.g., Arnett et al., 1997; Newman & Kosson, 1986). Moreover, relative to controls, psychopathic individuals were less likely to pause following punishment feedback, and this reduced reflectivity predicted poorer passive avoidance learning (Newman, Patterson, Howland, & Nichols, 1990).

Patterson and Newman (1993) asserted that these and other findings indicate that psychopathic individuals are normally responsive to punishment and other emotionally significant events but that their poor response modulation undermines their ability to link such events with environmental cues and thus learn from experience. In the passive avoidance task described above, both psychopathic and nonpsychopathic participants clearly examined the experimental stimuli before responding. However, when a response resulted in punishment, this affectively significant event interrupted goal-directed behavior, initiated reflection (i.e., redirected attention), and facilitated the formation of associations between the emotional event and stimulus context to a greater extent in nonpsychopathic than in psychopathic individuals. This supposition is consistent with findings by Flor, Birbaumer, Hermann, Ziegler, and Patrick (2002), who demonstrated that psychopathic and nonpsychopathic individuals do not differ in response to unconditioned punishment stimuli, though psychopathic individuals have difficulty learning to associate such stimuli with environment events (i.e., conditioned stimuli).

This description of the psychopathic deficit highlights the potential importance of emotion-facilitated memory for this so-called deficit in learning from experience. Nonpsychopathic individuals remember emotional information (words, images) more readily than neutral information, and further, emotion enhances source memory (i.e., memory for information associated with an eliciting stimulus; D'Argembeau & Van der Linden, 2004; Doerksen & Shimamura, 2001; Dolan, 2002; Kensinger & Corkin, 2003). When emotion cues are primary, the RMH predicts that psychopathic and nonpsychopathic individuals will display comparable responses to an eliciting stimulus and, thus, enhanced memory for emotional versus neutral cues. Moreover, it follows from the RMH that, in nonpsychopathic but not psychopathic individuals, emotion cues would also enhance source memory. As described above, the RMH predicts intact processing of and response to emotional information, but the response modulation deficit associated with psychopathic individuals is expected to undermine processing of contextual information and, in particular, the linking of contextual cues with emotional events. Thus, psychopathic individuals would not be expected to show emotion-facilitated source memory (i.e., memory for context). Of particular relevance for the inhibitory deficits associated with psychopathy, this type of memory is critical for linking significant events with environmental cues, learning from experience, and self-regulation.

Historically, there has been little research examining emotion memory in psychopathy. One study finds behavioral evidence for normal emotion-facilitated memory in psychopathic individuals (Kiehl et al., 2001), and one does not (Christianson et al., 1996). Of relevance to the current study, psychopathic participants in the

latter study recalled as many or more elements from an emotional slide as did nonpsychopathic participants. The observed group difference in memory was that psychopathic participants failed to show the emotion-related bias that resulted in nonpsychopathic controls' selectively recalling more emotion-related elements in the center of the display. It is unclear, then, whether this finding indicates a psychopathy-related deficit in emotion-facilitated memory or in emotion-facilitated redirection of attention.

To date, then, results for the effects of emotion on memory processes in psychopathy are inconclusive. Moreover, no study has been designed to address the specific predictions of the RMH. To the extent that psychopathic individuals are normally responsive to emotion cues, it should be possible to demonstrate that emotion exerts a similar influence on the primary performance of psychopathic and nonpsychopathic individuals but that its effect on context processing—particularly the linking of contextual cues with emotion-eliciting events—is significantly weaker in psychopathic participants. Toward this end, we employed three versions of an emotion memory task where we could examine memory for emotional versus neutral words (primary task), while simultaneously measuring participants' ability to link the words to contextual cues associated with the words.

In the first task, the impact of emotion on memory for words and their locations was examined. The second task also examined emotion-facilitated memory but with a different contextual variable (colored box around the word). Further, as the interpretation of similar group performance on the recall task of Experiment 1 could have been complicated by the possibility that the psychopathic individuals might compensate for less efficient emotion processing by applying greater effortful top-down processing, Experiment 2 attempted to reduce the opportunity for compensatory processing by shortening presentation times to minimize direct exposure to the stimuli. Finally, Experiment 3 examined whether physical separation was necessary for exposing the information-processing deficits of psychopathic individuals or if they would also display a deficit when contextual cues were spatially integrated with the primary experimental stimuli.

We expected that, on the basis of the RMH, the emotional aspect of a word would bias the processing of primary information in psychopathic individuals and controls alike because an attentional shift was not required. But, we expected emotion to increase context processing significantly less in psychopathic individuals relative to nonpsychopathic controls because the psychopathic group would be less likely to elaborate upon the initial emotional response. More specifically, we predicted that (a) both groups would recall significantly more emotion than neutral words on the primary focus word memory task and (b) this emotion memory bias would persist for contextual information associated with emotion words in the control group but not in the psychopathic group. Consistent with previous work in our lab (see Brinkley, Newman, Widiger, & Lynam, 2004), hypotheses were evaluated in low-anxious participants.

Method

Participants

Participants were 239 Caucasian male inmates recruited from two medium-security prisons in Wisconsin. Potential participants

were prescreened to exclude those over 45 years old, with a history of psychosis or bipolar disorder or taking psychotropic medications, or with an IQ less than 70 as estimated by the Shipley Institute of Living Scale (SILS; Zachary, 1986). Informed consent was covered both orally and in written format.

Psychopathy Assessment

The Psychopathy Checklist—Revised (PCL–R; Hare, 2003) was used to assess psychopathy, as it has good reliability and validity in Caucasian samples. The PCL–R assessment involves a 60–90 min interview and file review to obtain information used to rate 20 psychopathy-related items as 0, 1, or 2, reflecting the degree to which each trait characterizes the individual. Participants were assigned to high and low psychopathy groups based on the standard cutoff scores of 30 and above and 20 and below. To evaluate interrater reliability, a second rater who was present during interviews provided independent PCL–R ratings for 20 inmates. The intraclass correlation coefficient was .98. In addition, a median split on the Welsh Anxiety Scale (Welsh, 1956) was used to divide participants into high and low anxious groups. See Table 1 for participant characteristics.

Stimuli

Stimuli consisted of 24 neutral, 12 positive, and 12 negative words. Words were matched on frequency, pronounceability, length, number of syllables, concreteness, and imagery (see Lorenz & Newman, 2002, for details about the development of this word set).

Procedure

Participants completed one of three versions of an emotion memory task and were individually tested by male experimenters blind to group membership. Participants were paid \$3 for completing this task.

Experiment 1 was an adaptation of a task used by D'Argembeau and Van der Linden (2004) that involved presenting a series of words one at a time and then testing recall and word location with a computerized assessment. Participants were instructed to read and remember each word as it appeared, as they would later be tested for their memory of the words. A 2×2 grid of white boxes against a black background was presented on the screen. Each trial began with a 2-s fixation point indicating the location of the upcoming word. Following a 500-ms interstimulus interval, a word was presented in white font for 2 s followed by a 500-ms intertrial interval. Four additional neutral words were added to control for primacy and recency effects but were excluded from data analysis. The task consisted of 52 trials with positive, negative, and neutral words presented in equal numbers in each of the four quadrants. After a 5-min filler task, participants were given paper and asked to recall as many words as possible and then were given a computerized test of word location.¹

Experiment 2 was identical to Experiment 1 except that the words were presented centrally and for only 200 ms. The intertrial interval was adjusted such that total presentation times were the same as those in Experiment 1. Words were presented in white font with either a yellow or blue rectangular frame centered around the

word. This colored box represented the contextual information in this task. For the recall task, participants were asked to write down as many words as they could remember, as well as to indicate with a Y or a B the color of the box that had surrounded each word.

Experiment 3 was identical to Experiment 2 except that the words themselves were presented in either yellow or blue font to provide an assessment of spatially integrated contextual information processing. For the recall task, participants were asked to write down as many words as they could remember as well as to indicate with a Y or a B the color in which each word had been presented.

Results

The analyses for this short report make use of data from three experiments with similar designs to examine group differences in primary and contextual emotion processing in one well-powered study.²

Preliminary Analyses

Group differences in SILS-estimated intelligence and age were examined with a 2 (group: psychopathic, nonpsychopathic) \times 2 (anxiety: high or low) analysis of variance (ANOVA). No main effects or interactions were significant. An analysis examining potential valence effects indicated that negative words facilitated memory more than did positive words in both the recall, $F(1, 235) = 117.670, p < .001$, and context, $F(1, 235) = 5.225, p < .05$, conditions. As this effect did not vary by group, remaining analyses are collapsed across valence.

Overall Analyses

Group differences in raw scores for total recall were not evident in either the recall, $F(1, 235) = 1.710, p = .19$, or context, $F(1, 235) < 1.0$, condition. Thus, two difference scores were calculated to assess the effects of emotion on memory for words (primary focus) and their associated contextual features (location, box color, and word color). The recall difference score was calculated by subtracting the neutral word hit rate from the emotion word hit rate. Word hit rate was calculated by dividing the number of words recalled by the total possible (i.e., 24). Context difference scores were similarly calculated by dividing the number of correctly designated contextual features for recalled words by the total possible contextual features (i.e., the number of emotional or neutral words recalled). In both cases, scores could range from -1 to 1 , where positive values indicated a bias toward increased memory for emotional information. Recall and context scores represented emotion bias in the primary and contextual focus conditions, respectively. One low-anxious control and one low-anxious psychopath were excluded because their recall difference score exceeded 2.5 standard deviations above the mean.

¹ Location accuracy was obtained from the computerized assessment for the words correctly recalled. The context variable was then calculated in the same way as for Experiments 2 and 3.

² Effects did not vary across experiments, nor were there any significant Experiment \times Group interactions. Individual analyses and participant information for the three experiments are available on request.

Table 1
Mean (SD) Participant Characteristics

Demographics and measure	Control			Psychopathic		
	Low anxious	High anxious	Total	Low anxious	High anxious	Total
<i>n</i>	75	75	150	45	44	89
Age in years	32.49 (7.58)	31.85 (7.39)	32.17 (7.47)	31.29 (8.39)	29.68 (6.29)	30.49 (7.42)
SILS	100.87 (11.27)	100.86 (10.92)	100.86 (11.06)	99.31 (12.12)	102.86 (9.64)	101.08 (11.04)
WAS	3.91 (2.87)	17.01 (5.65)	10.46 (7.95)	6.02 (3.97)	20.86 (5.70)	13.36 (8.91)
PCL-R	14.02 (4.46)	14.55 (3.90)	14.29 (4.19)	32.01 (1.97)	31.76 (2.01)	31.89 (1.98)

Note. SILS = Shipley Institute of Living Scale; WAS = Welsh Anxiety Scale; PCL-R = Psychopathy Checklist—Revised.

Group differences in performance were examined with a 2 (group: psychopathic, nonpsychopathic) \times 2 (anxiety: low, high) \times 2 (condition: recall, context) mixed-model ANOVA with the emotion bias difference scores as the dependent variable. This analysis yielded a significant main effect for group, $F(1, 235) = 10.742, p = .001$, that was qualified by a significant Condition \times Group interaction, $F(1, 237) = 9.752, p < .01$. The interaction revealed that the groups did not differ significantly in the recall condition, $F(1, 237) < 1.0$, but did differ in the context condition, $F(1, 237) = 10.682, p = .001$. The control ($M = .12, SD = .09$) and psychopathic ($M = .11, SD = .08$) groups showed a similar emotion bias in the primary focus (recall) condition, with both the control, $F(1, 149) = 291.505, p < .001$, and psychopathic, $F(1, 88) = 182.399, p < .001$, group means differing significantly from zero. In the context condition, the control group ($M = .23, SD = .45$) showed a significantly greater emotion bias than did the psychopathic group ($M = .03, SD = .46$).

Hypothesis Testing

Planned comparisons were used to examine the prediction that low-anxious psychopathic individuals would perform as well as controls in the primary focus recall condition but worse than controls in the context condition. As predicted, both groups performed similarly in the recall condition, $F(1, 118) < 1.0$, with both the control, $F(1, 74) = 131.854, p < .001$, and psychopathic, $F(1, 44) = 128.174, p < .001$, group means significantly greater than zero. In the context condition, the low-anxious control group exhibited a significantly greater emotion memory bias than did the low-anxious psychopathy group, $t(118) = 2.075, p = .02$ (one-tailed; see Figure 1), with the control, $F(1, 74) = 16.969, p < .001$ but not the psychopathic, $F(1, 44) < 1.0$, group mean differing significantly from zero.

Discussion

The current research examined the differential effects of emotion on memory for primary versus contextual information in individuals with and without psychopathy. According to the RMH model of psychopathy, the deficit in emotion processing is not absolute. Rather, it reflects limitations in the allocation of attention; the capacity to process emotion stimuli is intact, but the subsequent elaboration of and attentional response to emotional information is impaired. In response to an emotional cue, nonpsychopathic individuals interrupt their primary focus and devote increased attention to the environment, facilitating the formation of

associations between the eliciting stimulus and its context. Although psychopathic individuals are also affected by emotional cues, they are less likely to reallocate attention. While this response leads to increased processing of focal stimuli, it is less well elaborated and less well associated with peripheral information.

On the basis of this model, we predicted that emotion would enhance processing for information within the attentional focus of low-anxious psychopathic individuals without enhancing their processing of contextual information. Consistent with these predictions and previous work (e.g., Kiehl et al., 2001), low-anxious psychopathic individuals recalled more emotion words than neutral words, and this bias was comparable to that seen in the control group. This effect did not hold for the processing of contextual information. Whereas the emotion response to the word stimuli facilitated the processing of contextual information for the control group, this facilitation was largely absent in psychopathic individuals.

Although data were collapsed across three different studies, it is important to note that the data were consistent across the studies, spanning spatially separated and integrated contextual information. This suggests that simply integrating a contextual cue into the visual focus is not sufficient to overcome the deficit in emotion-biased context processing. The RMH suggests a more subtle deficit; psychopathic individuals fail to process information outside their attentional set rather than their visual focus of attention (see Newman & Kosson, 1986).

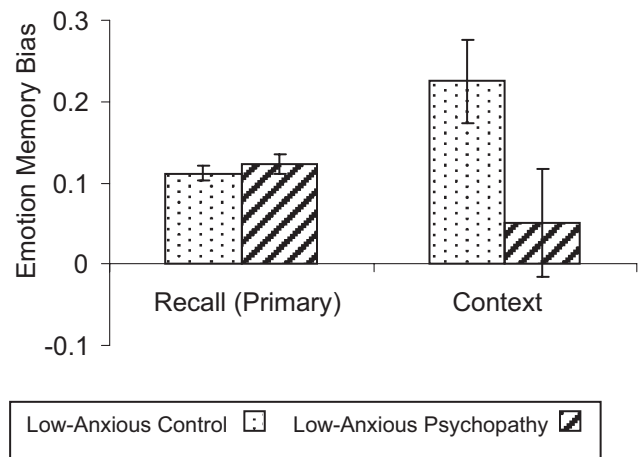


Figure 1. Group performance in the recall and context conditions.

While the absence of a contextual emotion bias in psychopathy is an interesting finding, it is the presence of a differential deficit that is most potentially significant. Specifically, the psychopathy group exhibited a strong (i.e., significantly greater than zero) emotion memory effect in the primary condition. Moreover, this effect was apparent even when the stimuli were presented for a limited amount of time, reducing the likelihood of more effortful processing. The current results are not easily accounted for by theories that postulate a fundamental emotion deficit, as these models highlight deficits that should be evident regardless of attentional focus. Although such findings do not necessarily establish the existence of normal emotion processing in psychopathic individuals, they highlight the potential importance of future research to specify the circumstances under which emotion processing functions in psychopathy.

Given the field's focus on deficits in emotion processing, much of the speculation regarding neurological regions underlying this deficit has naturally focused on the amygdala (Blair, 2005). Interestingly, if the focus were redirected toward exploring the role of emotion-based elaboration of context processing in psychopathy, other regions of interest might emerge. Specifically, the hippocampus has been implicated in various types of context processing such as source memory, spatial processing, and contextual fear conditioning (Alvarez, Biggs, Chen, Pine, & Grillon, 2008; Davachi, Mitchell, & Wagner, 2003; Ross & Slotnick, 2008). Thus the hippocampus can be said to play a large role in terms of associating features of the environment (both neutral and emotional) with motivationally significant events related to goal-directed behavior, including the avoidance of negative experiences. In fact, Gray's (1982) model of BIS functioning, like the RMH, is based on the septo-hippocampal-orbitofrontal system, positing a prominent role for the hippocampus in detecting novel or unexpected stimuli, interrupting ongoing behavior, redirecting attention, and integrating contextual cues to facilitate adaptive future responding. Considering the role of the hippocampus and its interaction with other regions, such as the amygdala, may provide valuable clues regarding the interaction between affective and contextual processing in psychopathic individuals.

Regarding potential limitations of the current study, at least two issues merit consideration. As the data were collapsed across three studies, details and analyses specific to each study could not be presented in full. However, the overall findings regarding the differential effects of emotion on primary versus contextual processing were remarkably consistent (see footnote 2). Second, while we attempted to reduce the likelihood of effortful processing of emotional information by psychopathic offenders, it is not possible to rule it out entirely. Future work would benefit from the use of an approach that encompasses both biological and behavioral measures that are well suited to examining the relative contribution of effortful processes (e.g., event-related potentials) and group differences in bottom-up responses (e.g., skin conductance) to emotional stimuli. Such a multifaceted approach could offer a further clarification of the nature of emotion and context processing in psychopathy.

Despite these limitations, the results suggest two tentative conclusions: First, psychopathic individuals appear to process and be influenced by emotional information, even when there is no explicit requirement to process the emotional aspect of the task and the stimuli are presented for a limited amount of time. Second,

psychopathic individuals appear to be deficient in their ability to connect emotion experiences to contextual cues. This could prove to be a crucial variable for understanding their failure to anticipate, and thus be guided by, emotional events. The most profound impact that this context-processing deficit has on psychopathic individuals may be to limit their ability to benefit from one of the most potent and important roles of emotion, redirecting attention. Emotion serves to highlight things that are outside our focus because they are frequently important for survival and should be attended to. If emotion fails to redirect the focus of psychopathic individuals in the same way as it does in control samples, then they will be less likely to learn the contextual variables that predict motivationally significant events. They will be less capable of appreciating the impact of their own actions on others or even on themselves. In this way, psychopathic individuals may fail to acquire the same breadth of emotional experience as do nonpsychopathic individuals, not because they are incapable of processing emotion but because they have difficulty appreciating its broader context.

Overall, it appears that emotion does not bias contextual processing in psychopathic individuals in the same way that it does in nonpsychopathic individuals, but there is growing evidence that emotion does influence processing when it is part of their primary focus. The current research takes the important step of demonstrating that psychopathic individuals are not oblivious to emotion and that it does actually influence their behavior. Although emotion processing is frequently impaired in people with psychopathy, we propose that such deficits reflect their anomalous processing of contextual information. Further clarification of their emotion-processing deficits may derive from research that characterizes the attentional factors that constrain emotion processing in psychopathic individuals. Future work should be directed toward understanding when and how normal emotion processing occurs in psychopathic individuals and what variables influence such processing. By providing insight into the boundary conditions of their emotion-processing deficits, such research could go a long way toward generating new ideas that could contribute to a better understanding of psychopathy and emotion processing in general.

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