

Differentiating the Cognition-Emotion Interactions that Characterize Psychopathy versus Externalizing

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Disinhibitory psychopathology encompasses a broad range of traits and behaviors that are epitomized by psychopathy and externalizing (Gorenstein & Newman, 1980; Krueger, Markon, Patrick & Iacono, 2005, Patrick, Zempolich & Levenston, 1997; Patrick & Zempolich, 1998; Poythress, & Hall, 2011, Zuckerman, 1978). Psychopathic individuals are characterized by difficulty establishing genuine relationships, minimal and superficial affective experience, an impulsive behavioral style, and a chronic antisocial lifestyle that entails great costs to society as well as for the affected individual (e.g., incarceration). Alternatively, externalizing individuals often display excessive reward seeking, intense hostility and reactive aggression, and poor impulse control (Buckholtz et al., 2010; Gorenstein & Newman, 1980; Krueger, Markon, Patrick & Iacono, 2005; Pridmore, Chambers & McArthur, 2005; Newman & Lorenz, 2003). Although both psychopathy and externalizing are characterized by antisociality, impulsivity, irresponsibility, and aggression, these syndromes are commonly measured and expressed in distinct manners.

Psychopathy is a common and severe psychopathological disorder affecting approximately 1% of the general population and 25% of incarcerated male offenders (Hare, 2006; Neumann & Hare, 2008). The gold-standard measure of psychopathy, particularly with incarcerated samples, is Hare's Psychopathy Checklist-Revised (2003; PCL-R). The PCL-R, an interview-based measure, identifies individuals displaying a combination of disinhibited traits

(i.e., impulsivity, irresponsibility), a chronic antisocial lifestyle, and a variety of interpersonal and affective symptoms (i.e., callousness, glibness, superficial charm, shallow emotions). Because the impulsivity and antisocial lifestyle symptoms apply to most disinhibitory psychopathology, it is the callous-unemotional traits that distinguish psychopathy from externalizing disorders (i.e., antisocial personality disorder, substance abuse/dependence) and externalizing personality traits (e.g., low constraint).

In contrast to psychopathy, the externalizing spectrum encompasses a heterogeneous mixture of disorders, including conduct disorder, substance use disorders, and antisocial personality disorder. In prison populations, externalizing disorders are much more prominent than psychopathy [e.g. the prevalence of antisocial personality disorder (50-80%) is more than double the prevalence of psychopathy in male prisoners]. By definition, the externalizing construct is not intended to identify a specific disorder or set of symptoms. Rather, it is intended to identify a heritable predisposition (i.e., latent variable) to diverse forms of disinhibitory psychopathology (Gorenstein & Newman, 1980, Iacono, Malone, McGue, 2008). In some cases, this latent variable is identified by extracting the common variance associated with conduct disorder, adult antisocial behavior, and symptoms of substance disorder (Iacono et al., 2008). In other cases, externalizing is identified using measures of personality/temperament that include low constraint, impulsivity, negative emotionality, high extraversion, and high neuroticism. When defined in this way, investigators identify externalizing using broad spectrum measures of personality such as the Mutidimensional Personality Questionnaire (MPQ; Patrick, Curtin, Tellegen, 2002) or, more recently, questionnaires designed to assess the array of predisposing traits more directly (e.g., Externalizing Spectrum Inventory, Krueger, Markon, Patrick, Benning & Kramer, 2007).

The distinction between psychopathy and externalizing is complicated by virtue of their overlapping behavior problems. Nearly all incarcerated individuals with psychopathy, qualify for conduct disorder and antisocial personality disorder and most also qualify for one or more substance use disorders (Smith & Newman, 1990). Thus, if using these behavioral symptoms alone, it would be extremely difficult to distinguish between psychopathy and externalizing. However, as already noted, the callous-unemotional traits serve to differentiate psychopathy from the more emotionally reactive style (e.g., high reward seeking and negative emotionality) associated with externalizing. Moreover, while laboratory-based characterizations of psychopathy and externalizing commonly emphasize etiologically relevant attentional, executive functioning, and emotion-related dysfunction (Gorenstein & Newman, 1980; Newman, 1997; Patrick, 2007), close inspection of the specific pattern of process-level results associated with psychopathy and externalizing reveal that they are remarkably different. As a result of the differences in assessment and process-level functioning, we believe that progress in understanding the serious behavior problems associated with psychopathy and externalizing depends upon disentangling the divergent etiological pathways associated with their disinhibitory psychopathology.

The primary goal of this chapter is to distinguish between the cognitive-affective processes contributing to psychopathy and externalizing, respectively. Toward this end, we 1) review key findings in psychopathy and externalizing for the purpose of identifying their respective attentional, executive functioning, and affective abnormalities, 2) introduce an integrative model of cognitive-affective interactions as a framework for specifying and distinguishing the dysfunctional interactions operating in psychopathy and externalizing, respectively, and 3) based on the proposed model discuss treatment implications for these

syndromes. Before continuing, it is important to note that the scope of the studies reviewed in this chapter is not all-inclusive. We specifically examine reports that help us characterize and distinguish the dysfunctional cognition-emotion interactions operating in psychopathy and externalizing. In our view, failure to distinguish the dysfunctional cognitive-affective interactions associated with psychopathy and externalizing is a primary factor impeding etiological understanding as well as the development of more successful treatment strategies in both domains.

ATTENTION

To understand the proposed roles for attention in the etiology of psychopathy and externalizing, it is important to first clarify the processes that may be operating in psychopathy and externalizing. Models of selective attention suggest that there is a continuum of early and late influences (Yiend, Koster & Barnicot, 2011). Early selective attention may act as a “fixed bottleneck” that, once established, blocks the processing of secondary information that is not goal-relevant (Driver, 2001). Such selection is presumed to involve the serial processing of incoming information. Alternatively, selective attention may operate at a later stage (e.g. Luck & Hillyard, 1999). In traditional models of late selection, information is initially encoded in parallel and then selection occurs after stimulus identification or semantic encoding (Corbetta, Miezin, Dobmeyer, Shulman & Petersen, 1991; Duncan, 1980) as a function of memory and response selection processes that bias attention in a manner consistent with one’s top-down, goal-directed focus (Driver, 2001). Of particular relevance, the distinction between these stages highlights the extent to which selective attention reflects a relatively automatic gating (early) out of distracting stimuli as opposed to the influence of higher-order regulatory processes (late) that sustain a goal-relevant focus of attention. The following review suggests that psychopathic individuals are

uniquely associated with an early attention bottleneck, whereas externalizing individuals are primarily associated with dysfunction at a later stage of attention.

According to Newman and colleagues (e.g., Newman & Baskin-Sommers, 2011), an early attention bottleneck plays a crucial role in moderating the behavior and decision making deficits associated with psychopathy. Psychopaths are oblivious to potentially meaningful peripheral information because they fail to reallocate attention while engaged in goal-directed behavior (MacCoon, Wallace & Newman, 2004; Newman, 1998; Patterson & Newman, 1993). This difficulty balancing simultaneous demands to process goal-directed and peripheral information creates a bias whereby psychopaths are unresponsive to information unless it is a central aspect of their goal-directed focus of attention (Jutai & Hare, 1983; Kiehl, Hare, McDonald & Brink, 1999).

An important implication of the attention bottleneck is that the emotion deficits commonly associated with psychopathy may vary as a function of attentional focus. A recent experiment by Newman, Curtin, Bertsch, and Baskin-Sommers (2010) involving fear potentiated startle (FPS) provides striking support for this hypothesis. Of note, existing evidence suggests that FPS is generated via the amygdala (Grillon, Ameli, Goddard, Woods, & Davis, 1994). The task used in this study required participants to view and categorize letter stimuli that could also be used to predict the administration of electric shocks. Instructions engaged either a goal-directed focus on threat-relevant information (i.e., the color that predicted electric shocks) or an alternative, threat-irrelevant dimension of the letter stimuli (i.e., in a low load condition, participants responded to indicate letter case; in a high load condition, participants responded to indicate whether or not a letter stimulus matched one that occurred 2-back). The results provided no evidence of a psychopathy-related deficit in FPS under conditions that focused attention on

the threat-relevant dimension. However, PCL-R psychopathy scores were significantly and inversely related to FPS under conditions that required participants to focus on an alternative, threat-irrelevant dimension of stimuli (i.e., when threat cues were peripheral) (Figure 1A).

Although the results from Newman et al. (2010) provided some of the strongest evidence to date that psychopaths' fear deficit is moderated by attention, the study did not specify the attentional mechanism underlying this effect. Baskin-Sommers, Curtin, and Newman (2011a) specified this attentionally-mediated abnormality in a new sample of offenders by measuring FPS in four conditions that crossed attentional focus (threat versus alternative focus) with early versus late presentation of goal-relevant cues. First, the authors replicated the key findings reported by Newman et al. (2010): Psychopaths' deficit in FPS was virtually non-existent under conditions that focused attention on the threat-relevant dimension of the experimental stimuli (i.e., threat-focus conditions), but was pronounced when threat-relevant cues were peripheral to their primary focus of attention (i.e., alternative-focus conditions). More specifically, the psychopathic deficit in FPS was only apparent in the early alternative-focus condition, in which threat cues were presented after the alternative goal-directed focus was already established (Figure 1B). This implicates an early attention bottleneck as a proximal mechanism for deficient response modulation in psychopathy (see Newman & Baskin-Sommers, 2011). Additionally, Larson and colleagues (2011) have recently completed an imaging study using this paradigm with an independent sample of inmates. Preliminary results suggest that psychopathic as compared to nonpsychopathic individuals display significantly lower activation in the right dorsal amygdala in the early alternative focus condition, but there was no difference in amygdala activation between psychopathic and nonpsychopathic individuals in the early threat focus condition. These results corroborate the idea that attention moderates the fearlessness of

psychopathic individuals, as evidenced by the appearance and disappearance of deficits in FPS and amygdala activation as a function of a person's focus of attention.

There is equally clear evidence that the core inhibitory deficit in psychopathy is moderated by attention. Using a go/no-go learning task, Newman and Kosson (1986) examined passive avoidance (i.e., inhibition of punished responses) learning under reward-and-punishment and punishment-only conditions. When participants were focused on avoiding punishment (punishment-only), there were no group differences in passive avoidance. However, when punishment was peripheral to the primary focus of earning rewards (reward-and-punishment), psychopaths committed significantly more passive avoidance errors than controls. Thus, psychopaths' deficit in passive avoidance learning, like their FPS deficits, is moderated by their focus of attention (see also Arnett, Smith & Newman, 1997; Newman, Patterson, Howland & Nichols, 1990). Psychopathic individuals also display deficits in reversal learning (Budhani, Richell & Blair, 2006; Hornak, O'Doherty, Bramham, Rolls, et al., 2004) and in gambling tasks (Bechara, Damasio, Tranel & Damasio, 1997; Mitchell, Colledge, Leonard & Blair, 2002; Newman, Patterson & Kosson, 1987; cf. Lösel & Schmucker, 2004; Schmitt, Brinkley & Newman 1999), which also require participants to reallocate goal-directed attention.

Despite strong evidence for the role of an attention bottleneck in moderating affective reactivity in psychopathy, the evidence reviewed to this point does not preclude the possibility that a fundamental deficit in emotion processing undermines their motivation or capacity to redirect attention (Blair & Mitchell, 2009; Lykken, 1995). However, there is now substantial evidence demonstrating that psychopaths display similar attentional abnormalities on laboratory tasks involving motivationally neutral peripheral information.

In standard versions of the color-word and number Stroop tasks, participants first perceive the conflicting elements and must then reprioritize attention to the appropriate element of the display (i.e., late selective attention; MacLeod, 1998). Thus, the quality of one's response depends on the ability to resolve the conflict prior to making a response using executive functions, such as cognitive control (Botvinick, Braver, Barch, Carter & Cohen, 2001). Under such conditions, psychopathic and non-psychopathic individuals show comparable levels of interference (Blair, Newman, Mitchell, Richell, et al., 2006; Hiatt, Schmitt & Newman, 2004; Smith, Arnett & Newman, 1992). Conversely, on Stroop-like tasks that facilitate early selection of goal-relevant information by spatially or temporally separating the incongruent elements of the display, psychopathic individuals display significantly less interference than non-psychopathic individuals, who still show significant interference under these conditions (Hiatt et al., 2004; Mitchell et al., 2006, Newman, Schmitt & Voss, 1997, Vitale, Brinkley, Hiatt & Newman, 2007). Such findings suggest that for psychopaths an early attention bottleneck effectively blocks the processing of conflicting information, reducing the salience of the conflict and obviating the need to use executive functions to inhibit the distracting/conflicting information. Therefore, in certain contexts, psychopathic individuals are effectively oblivious to distraction and remain focused on their goal, whereas non-psychopathic individuals answer the automatic call for processing and are influenced by the conflict regardless of experimental context (Patterson & Newman, 1993).

Corroborating this attention bottleneck-based interpretation of the Stroop data, Zeier, Maxwell and Newman (2009) used a modified Erikson flanker task with an attentional cuing manipulation to examine whether an early attention bottleneck is a crucial factor differentiating sensitivity to response conflict in psychopathic individuals. On some trials, pre-trial cuing was

used so that participants could orient attention to the location of the task-relevant target before the target and distracting flanker stimuli were presented (i.e., early selection). On other trials, the pre-trial cues directed attention to both the target and distractor locations (i.e., late selection). Whereas psychopathic participants displayed significantly less interference than controls in the former condition, they displayed non-significantly more interference in the latter condition.

Similarly, Wolf et al. (2011) evaluated the early attention bottleneck hypothesis using a more traditional assessment of attention, the attentional blink (AB) task. In the AB paradigm, participants identify targets in a rapid serial visual presentation (RSVP). Because distractors are presented almost immediately after targets, they elicit a response conflict between attending to the target and attending to the distractors. The magnitude of the AB appears to reflect the consequences of prioritizing attention to the first target (T1) over competing demands to reallocate attention in order to process all stimuli in the RSVP; the greater the conflict and resulting prioritizing of T1, the greater the AB. As predicted by the attention bottleneck hypothesis, psychopathic offenders displayed a significantly smaller AB (i.e., less conflict and fewer missed targets) than non-psychopathic offenders and this difference was apparent from the earliest possible post-conflict lag time (i.e., lag 2, the second stimulus presented after T1). Such evidence is consistent with the idea that once they focus attention on goal-relevant information, psychopathic individuals are essentially oblivious to goal-irrelevant information that elicits conflict in others.

Combined, these studies show that psychopathic participants are significantly less sensitive to information if it is peripheral to a pre-established focus of goal-directed behavior. Moreover, the fact that this abnormality applies to affectively-neutral as well as affectively-significant peripheral information implicates an early attentional bottleneck that undermines the

processing of goal-incongruent cues regardless of affective significance (Hiatt et al., 2004; Jutai & Hare, 1983; Mitchell et al., 2006; Vitale et al., 2007).

The attentional abnormality in externalizers tends to be quite different. Not only do they perform differently than psychopathic individuals on the Baskin-Sommers et al. (2011a) fear conditioning paradigm and other tasks, like AB, but they appear to display a different set of attention-related problems. Research on externalizing-specific performance implicates strong attentional orienting to salient and/or motivationally significant cues (Derryberry & Reed, 1994; Tiffany & Conklin, 2000) and a tendency to over-allocate attentional resources to events of motivational significance (Avila & Parcet, 2001; Baskin-Sommers, Wallace, MacCoon, Curtin & Newman, 2010; Wallace & Newman, 1997). Thus, once a stimulus is identified as intrinsically important, engagement of higher-order cognitive processes is required to regulate a response. This later stage of attentional selection, which links up with executive functions to sustain a goal-relevant focus, appears dysfunctional in externalizing.

Using the Baskin-Sommers et al. (2011a) instructed fear paradigm, a pattern distinct from the psychopathy effect emerged among externalizers. When threat information was the primary focus of attention and presented first, trait externalizing (i.e., high negative affect and low constraint) was significantly associated with greater FPS. Conversely, under conditions that instructed participants to focus on threat-relevant information but presented an irrelevant letter prior to the threat-relevant cues, externalizing was associated with non-significantly smaller FPS (Baskin-Sommers et al., 2011b). One interpretation of these findings is that externalizers have an intrinsic bias that primes them to orient attention towards motivationally significant information more strongly than other individuals. This recruitment of attention that prioritizes the goal-relevant processing of threat-information, in turn, impairs other executive control processes, and

results in emotional hyper-reactivity. Conversely, when a stimulus occurs that is at odds with this goal, such as an irrelevant distracting letter, it is necessary to alter the focus of attention and employ executive functions to facilitate goal-directed behavior. In externalizing this reallocation of attention and effort appears to disrupt fluent processing, resulting in an attenuated threat response. Such findings suggest that attentional processes, and their interaction with executive control processes, are at the root of the externalizing-related dysfunction. Moreover, in light of the fact that the externalizing effect was specific to the early threat focus condition whereas the psychopathy effect was specific to the early alternative focus condition, the results indicate that the abnormal attention responses associated with psychopathy and externalizing are clearly distinct.

Similarly, externalizing-related performance on the AB paradigm is easily differentiated from psychopaths' and consistent with the purported externalizing-based attentional bias. Individuals with high externalizing (as measured by MPQ-based Impulsive Antisociality; Benning, Patrick, Blonigen, Hicks, & Iacono, 2005 or Antisocial Personality Disorder) displayed a significantly greater AB (i.e., less accurate T2 identification) than individuals with low externalizing scores. Thus, externalizers appear to over-allocate attention to salient information (i.e., T1) and this attentional response temporarily (AB lasts for approximately 300-400 ms) impairs information processing, resulting in an inability to update expectations concerning the present situation. This study further clarifies the attentional dysfunction operating in externalizing and, moreover, distinguishes it from the abnormalities associated with psychopathy.

Adaptive self-regulation requires a balance of attention to goal-relevant and peripheral information (MacCoon et al, 2004). On the one hand, adaptive behavior requires “that we respond to objects that are outside the current focus of attention, i.e., those that do not match

current settings for selecting stimuli and responses” (p. 306; Corbetta, Patel & Shulman, 2009). On the other hand, effective goal-directed behavior requires not becoming overly distracted by stimuli outside the current goal-directed focus or over-allocating attentional resources to particularly salient information. The former appears especially relevant for psychopathy. The early attention bottleneck facilitates the selection of goal-relevant information at the expense of overlooking information that might otherwise modulate their goal-directed behavior. Externalizing individuals do not show this type of deficit. Rather, they are characterized by a tendency to over-commit attentional resources to salient environmental events at the expense of processing other goal-relevant information (i.e., the latter requirement for adaptive self-regulation). In other words, both psychopathy and externalizing are associated with disordered attentional processing, but the characteristic attentional dysfunction in psychopathy involves an early attention bottleneck that interferes with information intake whereas externalizing is associated with a later selective attention dysfunction that interferes with executive control.

EXECUTIVE FUNCTION

Morgan and Lilienfeld (2000) define executive functioning as an “umbrella term that refers to the cognitive processes that allow for future, goal-oriented behavior” (p.114). More specifically, executive functions are a constellation of higher-order cognitive processes that facilitate the planning, initiation, and regulation of behavior (Giancola & Tarter, 1999).

When studying externalizing it is hard to ignore the substantial behavioral, imaging, and event-related potential evidence that such individuals have impaired executive functioning (Iacono, Malone & McGue, 2008). First using behavioral tasks, executive functions such as, working memory (e.g., measured by go/no-go discrimination tasks) and cognitive control (e.g., measured by Stroop interference) have been shown to be particularly deficient in externalizing

individuals (Dolan, Bechara & Nathan, 2007; Endres, Rickert, Bogg, Lucas & Finn, 2011; Morgan & Lilienfeld, 2000). Second, neuroimaging studies involving externalizing individuals (e.g., antisocial personality disorder, Raine, Lencz, Bihrlé, LaCasse, & Colletti, 2000) detect both structural and functional abnormalities in regions of frontal cortex that have been associated with executive functions (e.g. anterior cingulate cortex (ACC); Raine, et al., 2000; Davidson, Pizzagalli, Nitschke & Kalin, 2003; orbitofrontal cortex (OFC); Seguin, 2004). Lastly, event-related potential studies consistently report inverse relationships between increased levels of externalizing and the amplitude/latency of the P300 and error-related negativity (ERN).

Externalizing is regularly associated with deficits in P300 during oddball paradigms (i.e., participants respond to target stimuli that occur infrequently and unpredictably within a series of target/frequent stimuli) and task-relevant stimuli in non-oddball tasks (Bernat, Nelson, Steele, Gehring & Patrick, 2011; Costa, Bauer, Kuperman, Porjesz, O'Conner, Hesselbrock, et al., 2000; Patrick, Bernat, Malone, Iacono, Krueger, & McGue, 2006; Polich, Pollock, & Bloom, 1994). A deficiency in this component suggests disruptions in updating of working memory and integrating information into existing networks (Bernat, Nelson, Steele, Gehring & Patrick, 2011). Correspondingly, even though posterior brain regions typically generate the P300, the externalizing-related P300 amplitude reduction is often largest at frontocentral sites suggesting this P300 indexes the executive functioning deficit typically associated with anterior brain regions (e.g., ACC; Nelson, Patrick & Bernat, 2011). Additionally, reports of significant externalizing-related reductions in ERN suggest inefficient executive function processing related to conflict monitoring and error detection (Hall, Bernat & Patrick, 2007). Neurally, the ERN is primarily linked to the ACC (Dehaene, Posner, & Tucker, 1994) and supplementary motor area, with other structures, including the PFC playing a supporting role (Gehring & Knight, 2000).

Thus, a deficit in ERN is thought to reflect a deficit in the ACC's executive processes.

Overall, individuals with executive functioning deficits are less able to override maladaptive response inclinations in order to maintain more appropriate and personally beneficial behavior. Consequently, they are at higher risk for persistent rule breaking and committing acts of violence. Thus, deficits in executive functioning may underlie the emotional dysregulation, lack of conscience, and decision-making deficits that have been found to characterize antisocial, externalizing behavior.

Despite the general association between antisocial syndromes/externalizing and executive function deficits (Morgan & Lilienfeld, 2000; see also Blair, 2001), psychopathic individuals generally do not display deficits on the executive functioning tasks (Brinkley, Schmitt, & Newman, 2005; Dvorak-Bertsch, Sadeh, Glass, Thornton, & Newman, 2007; Hiatt, Schmitt, & Newman, 2004; Sutker, Moan, & Allain, 1983; Hart, Forth, & Hare, 1990; Munro, Dywan, Harris, McKee, Unsal, & Segalowitz, 2007; Smith, Arnett, & Newman, 1992; Blair et al., 2006). Thus, despite the high level of antisocial behavior displayed by psychopathic individuals, they do not appear to manifest primary deficits in executive functioning, and in some cases display superior performance on tasks that measure executive functioning (see Stroop discussion above, Hiatt et al., 2004).

Further evidence that executive functioning deficits may be less strongly associated with psychopathy than externalizing relates to differences in the ERP findings. There have been a handful of ERP studies on psychopathy that focus on P300 (Jutai, Hare, & Connolly, 1987; Kiehl, Hare, McDonald, & Liddle, 1999; Kiehl, Smith, Hare, & Liddle, 2000; Raine & Venables, 1988) and the results are more equivocal than those for externalizing. Jutai et al. (1987) found no significant difference between psychopaths and nonpsychopaths in the amplitude or latency of

the P300 (see also Munro, 2010). Raine and Venables (1988) reported increased amplitude of parietal P300 in psychopathic versus nonpsychopathic individuals to visual target stimuli elicited during a continuous performance task [see also Raine, Venable & Williams (1990) for faster P300 latency effects in predicting psychopathic behavior]. And still other studies show significantly smaller P300 responses in psychopathic versus nonpsychopathic individuals during visual and auditory oddball tasks (Kiehl, Hare, McDonald, & Liddle, 1999). The evidence linking psychopathy and ERN activity is equally mixed. Some evidence suggests that psychopathic individuals show comparable ERN activity to nonpsychopathic individuals in non-affective tasks (Brazil, de Bruijn, Bulten, von Borries, et al., 2009; Munro, et al., 2007), whereas other evidence reveals attenuated ERN activity, particularly in tasks that have an affective component (Munro, et al., 2007). Unfortunately, the results of these studies allow few firm conclusions owing, in large part, to the heterogeneity of the participants and the variety of tasks employed (e.g. oddball, S1-S2-motor response, and aversive differential conditioning tasks).

Conventional wisdom highlights the importance of a person's ability to focus on goal-directed behavior and screen out salient distractors (i.e., executive functioning) in order to regulate the expression of violent behavior, inappropriate drug use, harmful antisocial behavior, and shortsighted reward seeking (Banfield, Wyland, Macrae, Munte & Heatherton, 2004; MacCoon et al., 2004; Rueda, Posner & Rothbart, 2005). In light of the existing evidence in externalizers, there is reason to believe that this mechanism contributes to the behavior problem associated with these individuals. However, another group with marked disinhibition, psychopaths, do not appear to be deficient in this regard. To the contrary, once their attention is engaged in goal-directed behavior, psychopathic individuals are abnormally resistant to the influence by peripheral information that routinely modulates the goal-directed behavior of others.

As described above, psychopathy appears to reflect abnormalities at an earlier stage of selective attention that moderate executive functioning. Early selection of goal-relevant stimuli diminishes the need for executive functioning to screen out distracting stimuli. Additionally, the psychopath's obliviousness to peripheral information may interfere with recognizing the importance of engaging executive functions to regulate maladaptive responses. Thus, despite what appears to be a normal capacity for executive functioning, psychopathy may often appear to display both superior executive functioning (when early selection obviates the need for utilizing executive functions) and executive functioning deficits (when the need to employ executive functions has not be registered). Paralleling our review of attentional abnormalities, the literature on executive functioning highlights important distinctions between psychopathy and externalizing.

EMOTION

Emotion is central to the variety of human experiences. It exerts a powerful influence on behavior, decision-making and reasoning. Here too, however, there is reason to believe that emotion's contributions to the disinhibited behavior of psychopathic and externalizing individuals are different.

The disinhibited behavior of psychopathic individuals has most often been understood in the context of the low-fear model (Lykken, 1957). In line with this view, psychopaths display poor fear conditioning (Lykken, 1957), minimal autonomic arousal (i.e., electrodermal response) in anticipation of aversive events (e.g., loud noises, electric shocks; Hare, 1978), and problems learning to inhibit punished responses (Newman & Kosson, 1986). Additionally, and arguably the most cited evidence of psychopaths' affective deficits, is the fact that psychopaths display emotion-modulated startle deficits in picture-viewing paradigms (Patrick, Bradley & Lang, 1993).

In contrast to controls, who display greater startle responses to noise probes while viewing unpleasant versus neutral pictures, this startle potentiation appears to be lacking in psychopathic participants (see Patrick, 1994). However, this deficit appears to be time limited. Specifically, psychopaths display startle potentiation deficits when probes are presented shortly after picture onset (e.g., 1.5 seconds), but they display normal emotion modulated startle when probes are presented later in the picture viewing interval (e.g., 4 seconds; Levenston, Patrick, Bradley & Lang, 2000). The restricted nature of the emotion modulated startle deficit may suggest that a fundamental deficit in the defensive response is not completely accurate and that the processes governing picture viewing in psychopathic individuals are more complex (see Newman & Baskin-Sommers, 2011 for an attention-related explanation of this finding).

Consistent with the emotion modulated startle deficit, there is also preliminary evidence that psychopaths display less amygdala activation than controls during aversive conditioning, moral decision-making, social cooperation, and memory for emotionally salient words (Birbaumer, Veit, Lotze, et al., 2005; Glenn, Rain & Schug, 2009; Kiehl, Smith, Hare, Mendrek et al., 2001; Rilling, Glenn, Jairam, Pagnoni, et al., 2007). However other studies indicate that the amygdala is hyper-reactive when psychopaths view certain emotionally salient information (Muller, Sommer, Wagner, Lange, Taschler, Roder, et al., 2003).

In contrast to the typically hypo-reactive affective style in psychopathy, externalizing is more often associated with hyper-reactivity to affective cues. In approach motivation contexts, such as reward- or drug-seeking, externalizing individuals are characterized by reward hypersensitivity (Buckholtz, Treadway, Cowem, Woodward, et al., 2010; Endres, Rickert, Bogg, Lucas & Finn, 2011; Martin & Potts, 2004; Volkow & Li, 2004). For example, impulsive individuals choose immediate rewards over larger delayed rewards (Martin & Potts, 2004).

Substance-dependent individuals perform poorly on the Iowa Gambling Task, preferring larger immediate payoffs despite their association with periodic costly punishments that ultimately result in a net loss (Bechara, 2001). Consistent with the assumption that drug cues are rewarding to substance-dependent individuals, they also show increased heart rate and sweat-gland activity in response to drug-related cues in cue-reactivity paradigms (Carter & Tiffany, 1999).

In the presence of reward incentives neurotic extraverts (traits associated with externalizing) commit more passive avoidance errors than introverts do (Newman, Widom, & Nathan, 1985) and fail to pause following punished errors (Nichols & Newman, 1986). On the surface this seems similar to the findings reported above for psychopathic offenders, however, research suggests that the passive avoidance deficit in neurotic extraverts is mediated by reward sensitivity, whereas the psychopathy effect is not (Newman, Patterson, Howland, Nichols, 1990; Patterson, Kosson, & Newman, 1987). These findings suggest that externalizing traits may be associated with a fundamental hypersensitivity to rewards.

Importantly, externalizing-related hyper-reactivity is not limited to reward contexts. Evidence also exists showing increased skin conductance and heart rate in response to stressful events (Taylor, Carlson, Iacono, Lykken, & McGue, 1999; Verona, Patrick & Lang, 2002). This suggests that the emotional hyperactivity displayed by externalizers may not be specific to reward, but rather a more general hypersensitivity to motivationally significant information.

A very clear difference between psychopaths and externalizers in affective response styles becomes apparent. Simply put, psychopaths are hypo-reactive to emotion information, while externalizers are hyper-reactive. However, this simple statement can be criticized for being both too specific and not specific enough. For example as noted above, evidence suggests that the psychopathy-related affective deficit is moderated by attention. In externalizing, there is

evidence that both attentional and executive function processes influence affective responding. Thus, focusing on a single deficit (i.e., just emotion, just attention, just executive function) cannot fully capture the process-level dysfunctions that result in behavioral disinhibition.

INTEGRATIVE MODEL: THE IMPORTANCE OF COGNITION-EMOTION INTERACTIONS

The above review highlights many important research findings related to psychopathy and externalizing. In both syndromes there is evidence that dysfunction at the level of attention, executive function, and/or affect contribute to disinhibition. Moreover, it appears that psychopathy and externalizing are related to divergent patterns of dysfunction. However, within the research on both syndromes, there is a tendency to focus on one specific process. Of course, though, these processes do not operate in a vacuum. There is a wealth of existing research suggesting that attention, executive function, and affect are interrelated processes. Dysfunction associated with any one component may disrupt processing associated with any other component. Understanding how these processes affect each other is too important to ignore and, ultimately, it is the relationships (i.e., interactions) among these processes that determine the specific behavior problems related to these distinct syndromes. To the extent that we can distinguish the predisposing cognition-emotion interactions associated with these syndromes and conceptualize their impact on behavior, we are poised to unravel the problem of disinhibitory psychopathology.

Toward this end, we outline an integrative model (Figure 2) to illustrate how attention, executive functioning and affect are interrelated and how the consequences of dysfunction at one process level may affect function at another process level. We believe that this model has a number of advantages. First, it moves away from the typical unitary focus and emphasizes the need for considering multiple processes when attempting to understand disinhibition. Second, it provides a framework for identifying a controlling variable that may initiate the cascade of

process-level dysfunction that ultimately results in behavioral disinhibition. The notion of a controlling variable may seem ironic as we propose a movement away from the unitary process approach. However, identifying a controlling variable does not mean that it is the only process needed to understand a person's disinhibitory psychopathology. Rather, this approach provides an opportunity to clarify the impact of inter-related processes on disinhibition. For each syndrome, the model will help us elucidate the multiple interacting influences and specify the divergent pathways that culminate in disinhibited behavior.

As described above, psychopathy is associated with emotion hypo-reactivity, an early attentional bottleneck, and non-specific anomalies in executive functions. We propose that the attention bottleneck is the distinctive controlling variable in psychopathy-related disinhibition (Figure 2). This is not to deny that psychopathy is often associated with executive function and emotion processing anomalies. However, these anomalies may be usefully understood as a consequence of an early attention bottleneck. Once the bottleneck is established, it blocks the processing of secondary information that is not goal-relevant. Thus, psychopathic individuals are oblivious to a variety of potentially important stimuli unless they are a central aspect of their pre-potent focus of attention. To the extent that the bottleneck filters information at an early stage of attention, executive functioning is essentially circumvented, as there are fewer perceived conflicts and thus fewer demands for executive control. Of note, we have found that the psychopaths' deficits in passive avoidance learning, conflict monitoring, electrodermal activity, FPS, and amygdala activation may all be made to appear and disappear in laboratory contexts as a function of experimental manipulations that control the focus of attention. The central role of attention in influencing psychopathic responses across experimental contexts highlights its role as a controlling variable in psychopathy. This understanding of the cognition-emotion

interactions characterizing psychopathic individuals not only provides an integrative context for understanding laboratory-based findings, but may also provide a better context for conceptualizing the often cold-hearted behavior of a psychopath.

The psychopaths' behavior is highly paradoxical. Their behavior is often deliberate; yet, at times they can be quite impulsive and have little perspective on how their behavior affects themselves and others. This is evident in the strong association between psychopathy and instrumental aggression (i.e., aggression that is deliberate and goal-directed; Blair, 2001) and pre-meditated murder (i.e. Woodworth & Porter, 2002). While an attention bottleneck may allow psychopathic individuals to be more effective at filtering out distraction and focusing narrowly on personal goals (i.e., deliberateness of behavior), it may also leave them vulnerable to over-allocating attention to goal-relevant cues at the expense of processing other context-relevant information (i.e., impulsivity of behavior). This inflexible focus on personal goals may also underlie the self-centered, callous traits associated with psychopathy. More generally, a deficit in the ability to process multiple aspects of a situation may leave psychopaths oblivious to the potentially devastating consequences (i.e., other's distress response) of their behavior. Given this attentional perspective, it is interesting to speculate that the harmful behavior of psychopathic individuals (i.e., instrumental aggression, fraud) may not reflect innate callousness. Rather, they are callously oblivious to information that is not directly and immediately related to their goal. That is, psychopathic individuals' abnormal cognition-emotion interaction, guided by an abnormal attention bottleneck, may effectively preclude response inhibition, conflict monitoring, affective processing, and self-regulation.

In contrast to psychopathy, the process-level dysfunctions in externalizing appear best characterized by an over-allocation of attentional resources (i.e., late selective attention), deficits

in executive functions, and hyper-emotionality. At this time, determining which of these processes is the controlling variable in their disinhibition is less clear-cut than it is for psychopathy. Relatively few studies have systematically attempted to disambiguate whether it is emotional hyper-reactivity, attention or executive function that is the controlling variable in externalizing disinhibition. However, one scenario that seems to be associated with many of the externalizing findings, may be that the over-allocation of limited capacity processing resources to salient stimuli exacerbates emotional reactions and, consequently, decreases cognitive resources available for processing subsequent stimuli (Figure 2). That is, when expecting motivationally significant/salient information, externalizers over-allocate attentional resources, which in turn, may also impair executive functions that normally moderate responding, including inhibition, shifting, and control. Ultimately, the impact of information on behavior will depend upon the application of resources associated with executive function, but the proposed model suggests that these downstream executive function effects in the dysfunctional cascade begin with an over-allocation of resources at the attentional stage. Although novel and speculative at this time, this proposal is consistent with externalizers' strong attentional orienting to salient cues, dysfunction in identifying T2 stimuli in the attentional blink task, difficulty classifying rare or unexpected stimuli in the oddball task, and problems shifting their focus to inhibit drug craving and violent responses. Moreover, much like in psychopathy, this unique understanding of the interactions between cognition and emotion in externalizing individuals may provide a more nuanced understanding for why they behave the way they do.

Externalizers are reactive in their behavior and tend to let emotions get the best of them. As such, externalizing individuals are prone to excessive reward (e.g., monetary) seeking, reactive aggression (i.e., aggression often in response to frustration or threat), and other strong

urges (e.g., drug cravings) that overwhelm their inhibitory controls (i.e., executive functions). Describing individuals with such problems, Skeem et al. (2004) note that they are “anxious, emotionally volatile, hostile, and impulsive, and they are heavy substance abusers” (pg. 399). Thus, unlike psychopaths, externalizing individuals do not engage in disinhibited behavior (i.e., gambling, substance use reactive aggression) because of intentional premeditated goals or obviousness to the drawbacks associated with these behaviors. Rather, they may be disinhibited because of an inability to engage in cognitive control under affectively charged circumstances, stemming from an over-commitment of attentional resources to motivationally salient information (e.g., a drug, a threat), resulting in affective hyper-reactivity (e.g., substance use, aggression). While more research needs to be done to support this point of view, ultimately, the behavior of externalizers is clearly a function of abnormal cognition-emotion interactions, rather than a deficit in a single process, that hampers effective self-regulation.

The purpose of outlining an integrative model for characterizing crucial cognition-emotion interactions in psychopathy and externalizing is to specify the dysfunctional processes that contribute to each syndrome and understand how these processes form a network that culminates in distinct patterns of disinhibition. In addition to confirming that they are different syndromes, the unique empirical and behavioral correlates of psychopathy and externalizing highlight their distinct and complex cognitive-affective deficits. Moreover, the specification of these distinct interactions may aid in the development of targeted intervention and treatment programs to address the dysfunctional processes.

TREATMENT

To date, many of the canonical behavioral and cognitive treatments for disinhibitory psychopathology have proven ineffective, particularly with psychopaths. Individuals with

externalizing disorders are usually perceived as resistant to treatment, especially psychotherapy. Moreover, alcoholics with antisocial features have significantly worse outcomes in treatment than alcoholics without these features (Compton, Cottler, Jacobs, Ben-Abdallah, & Spitznagel, 2003). For psychopaths, it has been proposed that “popular prison treatment and socialization programs may actually make psychopaths worse than they were before...group therapy and insight oriented programs help psychopaths develop better ways of manipulating, deceiving and using people but do little to help them understand themselves” (Hare, 2006, p. 717). Supporting this notion, not only are psychopaths more likely to re-offend, but after treatment they re-offend at a higher rate and more violently than non-treated psychopaths (Hughes, Hughes, Hollin & Champion 1997; Ogloff, Wong & Greenwood, 1990; O’Neil, Lidz & Heilbrun, 2003; Rice, Harris & Cormier, 1992). Nonetheless, with advancing knowledge regarding the cognition-emotion interactions that undermine externalizers’ and psychopaths’ ability to self-regulate, new treatment options are on the horizon (Hare & Neumann; 2009; Skeem, Poythress, Edens, Lilienfeld & Cale, 2003; Wallace & Newman, 2004; Wallace, Schmitt, Vitale & Newman, 2000; Wallace, Vitale & Newman, 1999).

Among those treatment possibilities being explored currently is that of cognitive remediation. Cognitive remediation refers to an approach that trains the individual in particular cognitive skills, such as paying attention to contextual cues, applying working memory, and sustained attention (Klingberg, 2010; Wykes & van der Gaag, 2001). In healthy adults, Klingberg and colleagues have shown that working memory training not only improves overall working memory capacity, but also changes the functioning of dopamine neurotransmission and brain plasticity (McNab, Varrone, Farde, Jucaite, Bystritsky, Forssberg, & Kingberg, 2009). Research on disorders with known cognitive abnormalities, such as attention deficit-

hyperactivity disorder and schizophrenia, has begun to assess the efficacy of cognitive remediation as a treatment strategy (Stevenson, Whitmont, Bornholt, Livesey & Stevenson; 2002; Wykes, Reeder, Williams, Corner, Rice & Everitt, 2003). For example, the application of working memory training has demonstrated durable improvement in memory (Wykes, Reeder, Landau, Everitt, Knapp, Patel & Romeo, 2007).

Given the dysfunctional cognition-emotion interactions associated with externalizing and psychopathy, it may be possible to develop cognitive remediation treatments that target the specific deficits of these individuals. Thus, as seen in Klingberg et al. (2009), with explicit practice and skill building in attentional selection, executive functioning, and reactivity to affective information improvement in these functions may be reflected in brain-related measures and ultimately behavior.

Externalizing individuals are over-reactive to affective and motivationally salient information and have poor executive function capabilities. For example, a training task that focuses on exposure to distressing cues and requires executive functions to regulate responses and emotion reactivity might be quite effective. Along this line, distress tolerance tasks, such as the Paced Auditory Serial Addition Test (PASAT), provide a means to measure performance, and overtime improvement, on difficult or frustrating cognitive tasks (Zvolensky, Vujanovic, Bernstein & Leyro, 2010). Preliminary evidence suggests that the latency of task engagement on the PASAT predicts the ability to maintain substance use abstinence (Daughters, Lejuez, Kahler, Strong & Brown, 2005).

Psychopathic individuals are oblivious to affective, inhibitory, and punishment cues (Newman & Kosson, 1986) that contraindicate ongoing goal-directed behavior (i.e., mismatch information; Baskin-Sommers et al., 2010; Hiatt et al., 2004; Newman et al., 2010). Although the

possibility has yet to be directly investigated, it is plausible that tasks which emphasize balancing attention between primary and peripheral information (i.e., affective and neutral) and paying attention to rule changes, may induce changes in specific attentional pathways that are associated with attention to contextual information; and, thus reduce the disinhibited behavior of psychopathic individuals. Corroborating this idea is evidence from work with the card perseveration task (Newman, Patterson & Kosson, 1987). Under typical conditions psychopathic individuals selected significantly more cards at the expense of losing more money. However, in another condition, where participants were forced to pause 5 seconds before selecting the next card, psychopathic individuals did not display a disinhibited response style and performed like nonpsychopathic individuals. Thus, when psychopaths' were forced to stop and reflect, there was a change in the quality of their decision-making.

In fact, Newman and collaborators have designed cognitive-affective interventions that are believed to target the specific cognitive, affective, decision-making, and self-regulation deficits associated with externalizing and psychopathy, respectively. The potential advantage of such treatment is that, it is based on an etiological theory that targets the unique deficits associated with externalizing and psychopathy.

CLOSING REMARKS

The concept of equifinality is used with reference to syndromes involving similar phenotypic expressions (e.g., violence, impulsivity, substance abuse), but which appear to reflect different etiological/developmental pathways. In this regard, it is noteworthy that cognitive-affective accounts of psychopathy and externalizing appear to be relatively distinct. Based on existing evidence, externalizing-related disinhibition involves affective hyper-reactivity, a tendency to over-allocate attention toward motivationally salient information (e.g., threat,

rewards, drug cues) and a deficit in executive functions (e.g., cognitive control, inhibition, working memory). Ultimately the cascade of events results in behavioral as well as emotional dysregulation. Alternatively, for psychopathy, we propose that their disinhibition stems from an early attention bottleneck that precludes the processing of peripheral information, including affective information. This results in a myopic perspective on goal-directed behavior and poor decision-making.

Externalizing and psychopathy are behaviorally similar disorders associated with etiologically distinct pathways. Although the general processes associated with these pathways may be discussed using similar terms (i.e., attention, executive function, and affective dysfunction), it is clear that they function differently in each and combine to produce two relatively distinct syndromes. It is important for future research to keep these multifaceted relationships (i.e., cognition-emotion interactions) in mind and work towards a specified understanding of the diverse pathways to disinhibition. Moreover, with regard to disinhibitory psychopathology more generally, understanding these cognition-emotion interactions will aid in working towards specified treatment and prevention programs.

References

- Ávila, C. & Parcet, M. A. (2001). Personality and inhibitory deficits in the stop-signal task: The mediating role of Gray's anxiety and impulsivity. *Personality and Individual Differences, 29*, 975-986.
- Banfield, J., Wyland, C.L., Macrae, C.N., Munte, T.F., & Heatherton, T.F. (2004). The cognitive neuroscience of self-regulation. In R.F. Baumeister & K.D. Vohs (Eds), *The Handbook of Self-Regulation* (pp. 62- 83.) New York: Guilford Press.
- Baskin-Sommers, A., Wallace, J., MacCoon, D., Curtin, J., & Newman, J. (2010). Clarifying the factors that undermine behavioral inhibition system functioning in psychopathy. *Personality Disorders: Theory, Research, and Treatment, 1*, 203–217.
- Baskin-Sommers, A. R., Curtin, J. J., & Newman, J. P. (2011a). Specifying the attentional selection that moderates the fearlessness of psychopathic offenders. *Psychological Science, 22*, 226-234.
- Baskin-Sommers, A.R., Curtin, J.J, Larson, C.L., Stout, D, Kiehl, K. & Newman, J.P. (2011b). Characterizing the anomalous cognition-emotion interactions in externalizing. *Biological Psychology*. Submitted.
- Bechara, A. (2001). Neurobiology of decision making: risk and reward. *Seminars in Clinical Neuropsychiatry 6*, 205–216.
- Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy, *Science, 275*, 1293–1295.
- Benning, S. D., Patrick, C. J., Blonigen, D. M., Hicks, B. M., & Iacono, W. G. (2005). Estimating facets of psychopathy from normal personality traits: A step toward community-epidemiological investigations. *Assessment, 12*, 3–18.

- Bernat, E. M., Nelson, L. D., Steele, V., and Patrick, C. J. (2011). Externalizing psychopathology and gain/loss feedback in a simulated gambling task: Dissociable components of brain response revealed by time-frequency analysis. *Journal of Abnormal Psychology, 120*, 352-64.
- Birbaumer, N. Veit, R., Lotze, M. Erb, M., Christiane, H. Grodd, W. Flor, H. (2005). Fear conditioning in psychopathy: A functional magnetic resonance imaging study. *Archives of General Psychiatry, 62*, 799-805.
- Blair, K.S. Newman, C.C., Mitchell, D.G.V., Richell, R.A., Leonard, A., Morton, J. & Blair, R.J.R. (2006). Differentiating among prefrontal substrates in psychopathy: Neuropsychological test findings. *Neuropsychology, 20*, 153-165.
- Blair, R.J.R. & Mitchell, D.V.G. (2009). Psychopathy, attention and emotion. *Psychological Medicine, 39*, 543-555.
- Botvinick, M. M., Cohen, J. D., Carter, C. S. (2004) Conflict monitoring and anterior cingulate cortex: An update. *Trends in Cognitive Science, 8*, 539–546.
- Brazil, I.A., de Bruijn, E.R.A., Bulten, B.H., von Borries, A.K.L., van Lankveld, J.J.M., et al., (2009). Early and late components of error-monitoring in violent offenders with psychopathy. *Biological Psychiatry, 65*, 137–143.
- Brinkley, C.A., Schmitt, W.A., & Newman, J.P. (2005). Semantic processing in psychopathic offenders. *Personality and Individual Differences, 38*, 1047-1056.
- Buckholtz et al. (2010). Dopaminergic network differences in human impulsivity. *Science, 329*, 532.
- Budhani, S., Richell, R.A., Blair, R.J. (2006). Impaired reversal but intact acquisition: probabilistic response reversal deficits in adult individuals with psychopathy. *Journal of Abnormal Psychology, 115*, 552–558.

- Carter, B.L., & Tiffany, S.T. (1999). Meta-analysis of cue reactivity in addiction research. *Addiction, 94*, 327-340.
- Compton, W. M. III, Cottler, L. B., Jacobs, J. L., Ben-Abdallah, A., & Spitznagel, E. L. (2003). The role of psychiatric disorders in predicting drug dependence treatment outcomes. *American Journal of Psychiatry, 60*, 890–895.
- Costa, L., Bauer, L., Kuperman, S., Porjesz, B., O'Connor, S., Hesselbrock, V., Rohrbaugh, J., & Begleiter, H. (2000). Frontal P300 decrements, alcohol dependence, and antisocial personality disorder. *Biological Psychiatry, 47*, 1064-1071.
- Corbetta, M., Miezin, F.M., Dobmeyer, S., Shulman, G.L., & Petersen, S.E. (1991). Selective and divided attention during visual discriminations of shape, color, and speed: Functional anatomy by positron emission tomography. *The Journal of Neuroscience, 11*, 2383–2402.
- Corbetta, M., Patel, G., & Shulman, G.L. (2008). The reorienting system of the human brain: From environment to theory of mind. *Neuron, 58*, 306-324.
- Daughters, S. B., Lejuez, C. W., Bornovalova, M. A., Kahler, C. W., Strong, D. R., & Brown, R. A. (2005). Distress tolerance as a predictor of early treatment dropout in a residential substance abuse treatment facility. *Journal of Abnormal Psychology, 114*, 729-734.
- Davidson, R. J., Pizzagalli, D., Nitschke, J. B., & Kalin, N. H. (2003). Parsing the subcomponents of emotion and disorders of emotion: Perspectives from affective neuroscience. In R. J. Davidson, K. R. Scherer, & H. H. Goldsmith (Eds.), *Handbook of Affective Sciences* (pp. 8-24). New York: Oxford University Press.
- Dehaene, S., Posner, M. I., & Tucker, D. M. (1994). Localization of a neural system for error detection and compensation. *Psychological Science, 5*, 303-305.

- Derryberry, D., & Reed, M.A. (1994). Temperament and attention: orienting toward and away from positive and negative signals. *Journal of Personality and Social Psychology, 66*, 1128-1139.
- Deveney, C.M., & Pizzagalli, D.A. (2008). The cognitive consequences of emotion regulation: An ERP investigation. *Psychophysiology, 45*, 435-444.
- Dvorak-Bertsch, J. D., Sadeh, N., Glass, S.J., Thornton, D., & Newman, J.P. (2007). Stroop tasks associated with differential activation of anterior cingulate do not differentiate psychopathic and non-psychopathic offenders. *Personality and Individual Differences, 42*, 585-595.
- Dolan, S.L., Bechara, A., & Nathan, P.E. (2008). Executive dysfunction as a risk marker for substance abuse: the role of impulsive personality traits. *Behavioral Sciences and the Law, 26*, 799-822.
- Driver, J. (2001). A selective review of selective attention research from the past century. *British Journal of Psychology, 92*, 53-78.
- Duncan, J. (1980). The locus of interference in the perception of simultaneous stimuli. *Psychological Review, 87*, 272-300.
- Endres, M. J., Rickert, M. E., Bogg, T., Lucas, J., & Finn, P. R. (2011). Externalizing psychopathology and behavioral disinhibition: Working memory mediates signal discriminability and reinforcement moderates response bias in approach-avoidance learning. *Journal of Abnormal Psychology, 120*, 336-351.
- Gao, Y. & Raine, A. (2009). P3 event-related potential impairments in anti-social and psychopathic individuals: A meta-analysis. *Biological Psychology, 82*, 199-210.
- Gehring, W. J., & Knight, R. T. (2000). Prefrontal - cingulate interactions in action monitoring. *Nature Neuroscience, 3*, 516-520.
- Giancola, P. R. & Tarter, R. E. (1999). Executive cognitive functioning and risk for substance abuse. *Psychological Science, 10*, 203-205.

- Glenn, A.L., Raine, A., & Schug, R.A. (2009). The neural correlates of moral decision-making in psychopathy. *Molecular Psychiatry*, *14*, 5-6.
- Gorenstein, E. E., & Newman, J. P. (1980). Disinhibitory psychopathology: a new perspective and a model for research. *Psychological Review*, *87*, 301-315.
- Grillon, C., Ameli, R., Goddard, A., Woods, S.W., & Davis, M. (1994). Baseline and fear-potentiated startle in panic disorder patients. *Biological Psychiatry* *35*, 431–439.
- Hall, R.J., Bernat, E.M., and Patrick, C.J. (2007). Externalizing psychopathology and the error-related negativity. *Psychological Science*, *18*, 326-33
- Hare, R. D. (2006). Psychopathy: A clinical and forensic overview. *Psychiatric Clinics of North America*, *29*, 709-724.
- Hare, R.D. & Neumann, C.S. (2009). Psychopathy: Assessment and forensic implications. *The Canadian Journal of Psychiatry*, *54*, 791-802.
- Hiatt, K.D., Schmitt, W.A., & Newman, J.P. (2004). Stroop tasks reveal abnormal selective attention among psychopathic offenders. *Neuropsychology*, *18*, 50–59.
- Hart, S. D., Forth, A. H., & Hare, R. D. (1990). Performance of criminal psychopaths on selected neuropsychological tests. *Journal of Abnormal Psychology*, *99*, 374-379.
- Hornak, J., O’Doherty, J., Bramham, J., Rolls, E. T., Morris, R. G., Bullock, P. R., & Polkey, C. E. (2004). Reward-related reversal learning after surgical excisions in orbito-frontal or dorsolateral prefrontal cortex in humans. *Journal of Cognitive Neuroscience*, *16*, 463–478.
- Hughes, G., Hughes, T., Hollin, C., & Champion, H. (1997). First-stage evaluation of a treatment programme for personality disordered offenders. *Journal of Forensic Psychiatry*, *8*, 515-527.

- Iacono, W. G., Malone, S. M. & McGue, M. (2008). Behavioral disinhibition and the development of early-onset addiction: Common and specific influences. *Annual Review of Clinical Psychology, 4*, 325-348.
- Jutai, J.W., & Hare, R.D. (1983). Psychopathy and selective attention during performance of a complex perceptual-motor task. *Psychophysiology, 20*, 146–151.
- Jutai, J. W., Hare, R. D., & Connolly, J. F. (1987). Psychopathy and event-related brain potentials (ERPs) associated with attention to speech stimuli. *Personality & Individual Differences, 8*, 175-184.
- Keil, A., Bradley, M.M., Junghöfer, M., Russmann, T., Lowenthal, W. & Lang, P.J. (2007) Cross-modal attention capture by affective stimuli: evidence from event-related potentials. *Cognitive, Affective, & Behavioral Neuroscience, 7*, 18–24.
- Kiehl, K.A., Hare, R.D., McDonald, J. J., & Brink, J. (1999). Semantic and affective processing in psychopaths: An event-related potential (ERP) study. *Psychophysiology, 36*, 765-774.
- Kiehl, K. A., Smith, A. M., Hare, R. D., & Liddle, P. F. (2000). An event-related potential investigation of response inhibition in schizophrenia and psychopathy. *Biological Psychiatry, 48*, 210-221.
- Kiehl, K. A., Smith, A. M., Hare, R. D., Mendrek, A., Forster, B. B., Brink, J., & Liddle, P. F. (2001). Limbic abnormalities in affective processing by criminal psychopaths as revealed by functional magnetic resonance imaging. *Biological Psychiatry, 50*, 677–684.
- Klingberg, T. (2010). Training and plasticity of working memory. *Trends in Cognitive Science, 14*, 317-324.
- Krueger, R.F., Hicks, B. M., Patrick, C.J., Carlson, S.R., Iacono, W.G., & McGue, M. (2002). Etiologic connections among substance dependence, antisocial behavior and personality: Modeling the externalizing spectrum. *Journal of Abnormal Psychology, 111*, 411-424.

- Krueger, R.F., Markon, K.E., Patrick, C.J., & Iacono, W.G. (2005). Externalizing psychopathology in adulthood: a dimensional-spectrum conceptualization and its implications for DSM-V. *Journal of Abnormal Psychology, 114*, 537-550.
- Krueger, R.F., Markon, P, K.E., Patrick., C.J., Benning, S.D. & Kramer, M.D. (2007). Linking antisocial behavior, substance use, and personality: An integrative quantitative model of the adult externalizing spectrum. *Journal of Abnormal Psychology, 116(4)*, 645-666.
- Luck, S. J., & Hillyard, S. A. (1999). The operation of selective attention at multiple stages of processing: Evidence from human and monkey electrophysiology. In M. S. Gazzaniga (Ed.), *The New Cognitive Neurosciences*, 2nd Edition (pp. 687-700). Cambridge, MA: MIT Press.
- Lykken, D.T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology, 55*, 6-10.
- Lykken, D.T. (1995). *The Antisocial Personalities*. Lawrence Erlbaum Associates, Hilldale, NJ.
- MacCoon, D.G., Wallace, J.F., & Newman, J.P. (2004). Self-regulation: Context-appropriate balanced attention. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 422-444). New York, NY: Guilford Press.
- MacLeod, C. M. (1998). Training on integrated versus separated Stroop tasks: The progression of interference and facilitation. *Memory & Cognition, 26*, 201-211.
- Martin, L.E., & Potts, G.F. (2004). Reward sensitivity in impulsivity. *Neuroreport, 15(9)*, 1519-1522.
- McNab, F., Varrone, A., Farde, L., Jucaite, A., Bystritsky, P., Forssberg, H., Klingberg, T. (2009). Changes in cortical dopamine D1 receptor binding associated with cognitive training. *Science, 323*, 800-802.

- Mitchell, D.G., Colledge, E., Leonard, A., & Blair, R.J. (2002). Risky decisions and response reversal: Is there evidence of orbitofrontal cortex dysfunction in psychopathic individuals? *Neuropsychologia*, *40*, 2013–2022.
- Morgan, A.B., & Lilienfeld, S.O. (2000). A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical Psychology Review*, *20*, 113-136.
- Muller, J.L., Sommer, M., Wagner, V., Lange, K., Taschler, H., Roder, C.H., et al. (2003). Abnormalities in emotion processing within cortical and subcortical regions in criminal psychopaths: Evidence from a functional magnetic resonance imaging study using pictures with emotional content. *Biological Psychiatry*, *54*, 152–162.
- Munro, G.E.S., Dywan, J., Harris, G.T., et al., (2007). ERN varies with degree of psychopathy in an emotion discrimination task. *Biological Psychology*, *76*, 31-42.
- Nelson, L.D., Patrick, C.J., & Bernat, E.M. (2011). Indexing externalizing psychopathology as a multivariate psychophysiological phenotype. *Psychophysiology*, *48*, 64-73.
- Newman, J.P., Widom, C.S., & Nathan, S. (1985). Passive-avoidance in syndromes of disinhibition: Psychopathy and extraversion. *Journal of Personality and Social Psychology*, *48*, 1316-1327.
- Newman, J.P., & Kosson, D.S. (1986). Passive avoidance learning in psychopathic and nonpsychopathic offenders. *Journal of Abnormal Psychology*, *95*, 257–263.
- Newman, J. P., Patterson, C. M., Howland, E. W., & Nichols, S. L. (1990). Passive avoidance in psychopaths: The effects of reward. *Personality and Individual Differences*, *11*, 1101-1114.
- Newman, J.P. (1997). Conceptual models of the nervous system: Implications for antisocial behavior. In D. M. Stoff, J. Breiling, & J. D. Maser (Eds.). *Handbook of Antisocial Behavior*. (pp. 324 335). New York: John Wiley & Sons, Inc.

- Newman, J.P., Schmitt, W.A., & Voss, W. (1997). The impact of motivationally neutral cues on psychopathic individuals: Assessing the generality of the response modulation hypothesis. *Journal of Abnormal Psychology, 106*, 563-575.
- Newman, J.P. (1998). Psychopathic behavior: An information processing perspective. In D. J. Cooke, R. D. Hare, & A. Forth (Eds.), *Psychopathy: Theory, Research and Implications for Society* (pp. 81-104). The Netherlands: Kluwer Academic Publishers.
- Newman, J.P., & Lorenz, A.R. (2003). Response modulation and emotion processing: Implications for psychopathy and other dysregulatory psychopathology. In R. J. Davidson, K. Scherer, & H. H. Goldsmith (Eds.), *Handbook of Affective Sciences* (pp. 1043-1067). Oxford University Press.
- Newman, J.P., Curtin, J.J., Bertsch, J.D., & Baskin-Sommers, A.R. (2010). Attention moderates the fearlessness of psychopathic offenders. *Biological Psychiatry, 67*, 66-70. PMID: PMC2795048.
- Newman, J.P. & Baskin-Sommers, A.R. (2011). Early selective attention abnormalities in Psychopathy: Implications for self-regulation. In M. Poser (Ed). *Cognitive Neuroscience of Attention* (pp.421-440). Guilford Press: New York.
- Nichols, S., & Newman, J.P. (1986). Effects of punishment on response latency in extraverts. *Journal of Personality and Social Psychology, 50*, 624-630.
- Ogloff, J., Wong, S., & Greenwood, A. (1990). Treating criminal psychopaths in a therapeutic community program. *Behavioral Sciences & the Law, 8*, 181-190.
- O'Neil, M., Lidz, V., & Heilbrun, K. (2003). Adolescents with psychopathic characteristics in a substance abusing cohort: Treatment process and outcomes. *Law and Human Behavior, 27*, 299-313.
- Patrick, C. J. (1994). Emotion and psychopathy: Startling new insights. *Psychophysiology, 31*, 319-330.

- Patrick, C.J. (2007). Getting to the heart of psychopathy. In H. Herve & J.C. Yuille (Eds.), *The psychopath: Theory, research, and social implications* (pp. 207–252). Hillsdale, NJ: Erlbaum.
- Patrick, C.J., Bradley, M. M., & Lang, P.J. (1993). Emotion in the criminal psychopath: Startle reflex modulation. *Journal of Abnormal Psychology, 102*, 82 – 92.
- Patrick, C.J., Zempolich, K.A., & Levenston, G.K. (1997). Emotionality and violent behavior in psychopaths: A biosocial analysis. In A. Raine, D. Farrington, P. Brennan, & S. A. Mednick (Eds.), *The biosocial bases of violence* (pp. 145-161). New York: Plenum.
- Patrick, C.J & Zempolich, K.A. (1998). Emotion and aggression in the psychopathic personality. *Aggression and Violent Behavior, 3*, 303–338.
- Patrick, C., Hicks, B., Krueger, R., & Lang, A. (2005). Relations between psychopathy facets and externalizing in a criminal sample. *Journal of Personality Disorders, 19*, 339-356.
- Patrick, C.J., Bernat, E., Malone, S. M., Iacono, W.G., Krueger, R.F., & McGue, M.K. (2006). P300 amplitude as an indicator of externalizing in adolescent males. *Psychophysiology, 43*, 84-92.
- Patterson, C.M., Kosson, D.S., & Newman, J.P. (1987). Reaction to punishment, reflectivity, and passive avoidance learning in extraverts. *Journal of Personality and Social Psychology, 52*, 565-576.
- Patterson, C.M., & Newman, J.P. (1993). Reflectivity and learning from aversive events: toward a psychological mechanism for the syndromes of disinhibition. *Psychological Review, 100*, 716-736.
- Pessoa, L. (2009). How do emotion and motivation direct executive control? *Trends in Cognitive Sciences, 13*, 160-166.
- Polich, J., Pollock, V. E., & Bloom, F. E. (1994). Meta-analysis of P300 amplitude from males at risk for alcoholism. *Psychological Bulletin, 115*, 55-73.

- Poythress, N. G. & Hall, J. (2011). Psychopathy and impulsivity reconsidered. *Aggression and Violent Behavior, 16*, 120-134.
- Pridmore, S., Chamber, A & McArthur, M. (2005). Neuroimaging in psychopathy. *Australian and New Zealand Journal of Psychiatry, 39*, 856-865.
- Raine, A., & Venables, P.H. (1988). Enhanced P3 evoked potentials and longer P3 recovery times in psychopaths. *Psychophysiology, 25*, 30-38.
- Raine, A., Venable, P.H. & Williams, M. (1990). Relationships between N1, P300, and contingent negative variation recorded at age 15 and criminal behavior at age 24. *Psychophysiology, 27*, 567-74.
- Raine, A., Lencz, T., Bihrlé, S., LaCasse, L., & Colletti, P. (2000). Reduced prefrontal gray matter volume and reduced autonomic activity in antisocial personality disorder. *Archives of General Psychiatry, 57*, 119-127.
- Rice, M., Harris, G., & Cormier, C. (1992). An evaluation of a maximum security therapeutic community for psychopaths and other mentally disordered offenders. *Law and Human Behavior, 16*, 399-412.
- Rilling, J.K., Glenn, A.L., Jairam, M.R., Pagnoni, G., Goldsmith, D.R., Elfenbein, H.A., & Lilienfeld, S.O. (2007). Neural correlates of social cooperation and non-cooperation as a function of psychopathy. *Biological Psychiatry, 61*, 1260–1271.
- Rueda, M.R., Posner, M.I., & Rothbart, M.K. (2005) The development of executive attention: contributions to the emergence of self regulation. *Developmental Neuropsychology 28*, 573-594.
- Schmitt, W.A., Brinkley, C.A., & Newman, J.P. (1999). Testing Damasio's somatic marker hypothesis with psychopathic individuals: Risk takers or risk averse? *Journal of Abnormal Psychology, 108*, 538–543.

- Seguin, J.R. (2004). Neurocognitive elements of antisocial behavior: Relevance of an orbitofrontal cortex account. *Brain and Cognition, 55*, 185-197.
- Skeem, J.L., Poythress, N., Edens, J.F., Lilienfeld, S.O. & Cale, E.M. (2003). Psychopathic personality or personalities? Exploring potential variants of psychopathy and their implications for risk assessment. *Aggression and Violent Behavior, 8*, 513–546.
- Skeem, J. L., Mulvey, E. P., Appelbaum, P., Banks, S., Grisso, T., Silver, E., et al. (2004). Identifying subtypes of civil psychiatric patients at high risk for violence. *Criminal Justice and Behavior, 31*, 392-437.
- Smith, S.S., Arnett, P.A., & Newman, J.P. (1992). Neuropsychological differentiation of psychopathic and nonpsychopathic criminal offenders. *Personality and Individual Differences, 13*, 1233-1245.
- Smith, S. S., & Newman, J. P. (1990). Alcohol and drug abuse/dependence in psychopathic and nonpsychopathic criminal offenders. *Journal of Abnormal Psychology, 99*, 430-439.
- Stevenson, C.S., Whitmont, S., Bornholt, L., Livesey, D., & Stevenson, R. J. (2002). A cognitive remediation programme for adults with attention deficit hyperactivity disorder. *Australian and New Zealand Journal of Psychiatry, 36*, 610-616.
- Sutker, P.B., Moan, C.E., & Allain, A.N. (1983). Assessment of cognitive control in psychopathic and normal prisoners. *Journal of Behavioral Assessment, 5*, 275-287.
- Sutton, S.K., Vitale, J.E., & Newman, J.P. (2002). Emotion among females with psychopathy during picture perception. *Journal of Abnormal Psychology, 111*, 610-619.
- Taylor, J., Carlson, S. R., Iacono, W. G., Lykken, D.T., & McGue, M. (1999). Individual differences in electrodermal responsivity to predictable aversive stimuli and substance dependence. *Psychophysiology, 36*, 193–198.

- Tiffany, S.T. & Conklin, C.A. (2000). A cognitive processing model of alcohol craving and compulsive alcohol use. *Addiction, 95*, 145–153.
- Verona, C.J. Patrick and A.R. Lang. (2002). A direct assessment of the role of state and trait negative emotion in aggressive behavior, *Journal of Abnormal Psychology, 111*, 249–258.
- Vitale, J.E., Brinkley, C.A., Hiatt, K.D., & Newman, J. P. (2007). Abnormal selective attention in psychopathic female offenders. *Neuropsychology, 21*, 301-312.
- Volkow, N.D. & Li, T.K. (2004). Drug addiction: The neurobiology of behavior gone awry. *Nature Reviews Neuroscience, 5*, 963–970.
- Wallace, J.F., & Newman, J.P. (1997). Neuroticism and the attentional mediation of dysregulatory psychopathology. *Cognitive Therapy and Research, 21*, 135-156.
- Wallace, J.F., Vitale, J.E., & Newman, J.P. (1999). Response modulation deficits: Implications for the diagnosis and treatment of psychopathy. *Journal of Cognitive Psychotherapy, 13*, 55-70.
- Wolf, R.C., Carpenter, R.W., Warren, C.M., Zeier, J., Baskin-Sommers, A.R., & Newman, J.P. (2011) Reduced susceptibility to the attentional blink deficit in psychopathic offenders: Implications for the attentional bottleneck hypothesis. *Neuropsychology*.
- Wykes, T., & Van der Gaag, M. (2001). Is time to develop a new cognitive therapy for psychosis? Cognitive remediation therapy. *Clinical Psychological Review, 21*, 1227-1238.
- Wykes, T., Reeder, C., Williams, C., Corner, J., Rice, C., & Everitt, B. (2003). Are the effects of cognitive remediation therapy (CRT) durable? Results from an exploratory trial in schizophrenia. *Schizophrenia Research 61*, 163 – 174.
- Zeier, J.D., Maxwell, J.S. & Newman, J.P. (2009) Attention moderates the processing of inhibitory information in primary psychopathy. *Journal of Abnormal Psychology, 118*, 554-563.

Zuckerman, M. (1978). Sensation seeking and psychopathy. In R.D. Hare & D. Schalling (Eds.), *Psychopathic behavior: Approaches to research* (pp. 165-185). New York: Wiley.

Zvolensky, M.J., Vujanovic, A.A., Bernstein, A., & Leyro, T. (2010). Distress tolerance: Theory, measurement, and relations to psychopathology. *Current Directions in Psychological Science, 19*, 406-410.

Figure 1.

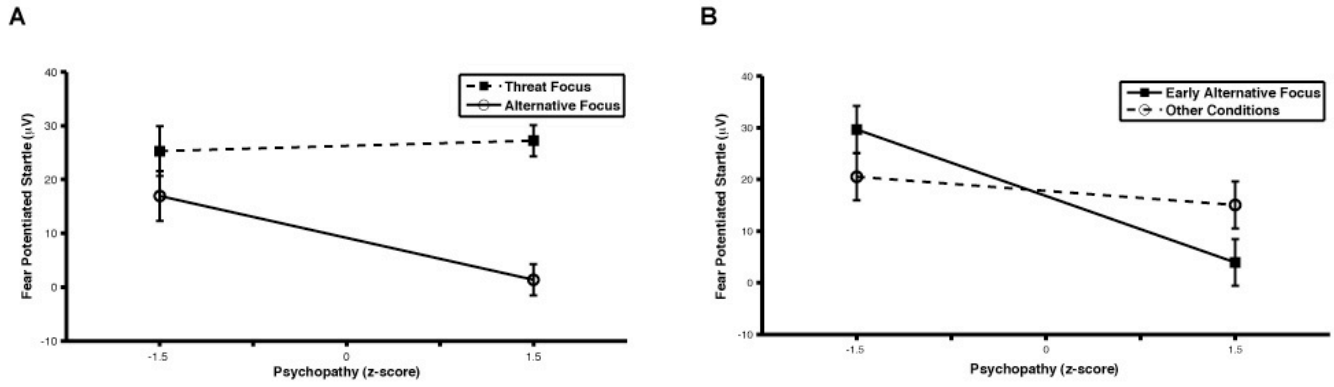


Figure 1. Fear-potentiated startle (FPS) as a function of PCL-R psychopathy (± 1.5 SD from the mean) and condition. *Note:* Panel A (Newman et al., 2010); Panel B (Baskin-Sommers et al., 2011a).

Figure 2.

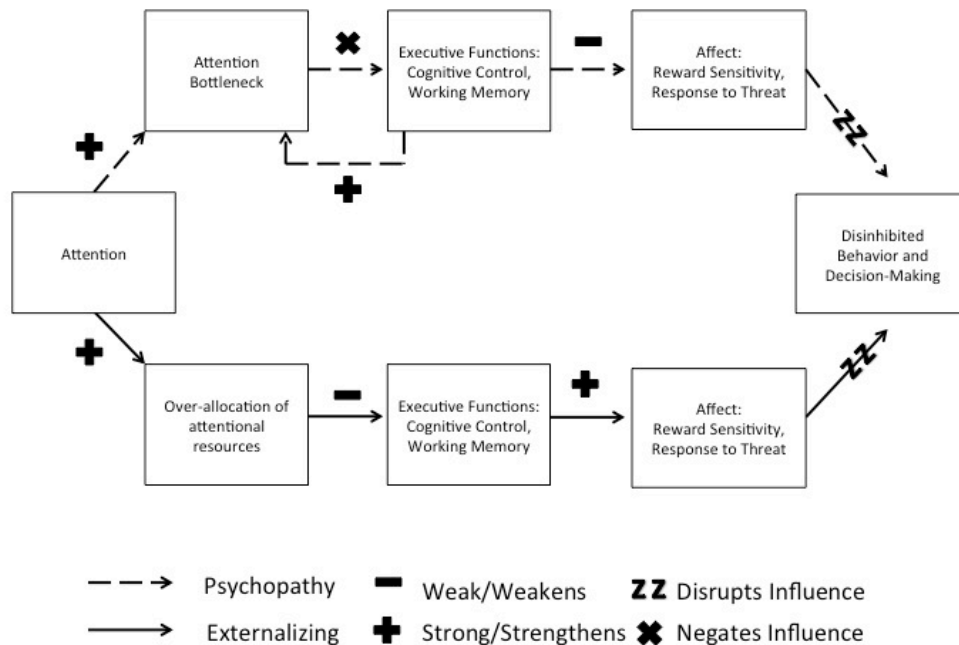


Figure 2. Integrative Model of Cognition-Emotion Interactions in Psychopathy and Externalizing.

Externalizers (solid line) may over-allocate attentional resources, which in turn impairs executive functions that normally moderate responding, including inhibition, shifting, and control and results in dysregulated affective responses and behavioral disinhibition. Psychopathy (dashed line) is characterized by an early attention bottleneck that disrupts the processing of information, particularly when it is peripheral to the primary goal. To the extent that the bottleneck filters information at an early stage of attention, executive functioning is essentially circumvented, although in some situations it may be used to reinforce the bottleneck. To the extent that affective information is not the main focus of attention, it receives little or no attention and has minimal impact on behavior. Ultimately, the bottleneck results in the disinhibited expression of dominant goal-directed responses.