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Distraction Attenuates the Association between Trait Disinhibition and Reactive Physical Aggression

Olivia Subramani
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DISTRACTION ATTENUATES THE ASSOCIATION BETWEEN TRAIT DISINHIBITION AND REACTIVE PHYSICAL AGGRESSION

by

OLIVIA SUBRAMANI

Under the Direction of Dominic J. Parrott, Ph.D.

ABSTRACT

Research has implicated biased attention allocation as a proximal mechanism in the association between trait disinhibition and physical aggression. The current study tested a laboratory-based intervention manipulation that targets this putative cognitive mechanism by incentivizing a shift of attention from a provoking stimulus to a neutral stimulus during a laboratory aggression paradigm. Participants were 119 undergraduate men. The sum/difference method of hierarchical linear regression indicated that distraction from strong emotional stimuli attenuated the association between trait disinhibition and reactive physical aggression. This study is the first to provide experimental evidence of (a) the relation between trait disinhibition and reactive physical aggression, and (b) a potential method for attenuating this association.

These findings contribute to the broader literature by supporting biased attention allocation toward emotional cues as a mechanism for the relation between trait disinhibition and a variety of risk-taking behavior.

INDEX WORDS: Trait disinhibition, Physical aggression, Reactive aggression, Attentional biases

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OLIVIA SUBRAMANI

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by

OLIVIA SUBRAMANI

Committee Chair: Dominic Parrott

Committee: Robert Latzman

David Washburn

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Georgia State University

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DEDICATION

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1 INTRODUCTION

Personality models conceptualize stable traits or phenotypes that can be mapped onto underlying genetic and neurobiological substrates (Clark & Watson, 2008). The same structure of personality is thought to exist across both nonclinical and clinical populations (O'Connor, 2002). Thus, it is through intensity and inflexibility that traits may reach maladaptive levels of expression (for a review, see Miller & Lynam, 2001). Trait disinhibition is a broad dimension of personality that is highly heritable and has been established as a general risk factor for a variety of diagnosable disorders (e.g., antisocial personality disorder, borderline personality disorder, etc.), and pathological behaviors (e.g., drug use, risk-taking) (Krueger et al., 2005; Latzman, Vaidya, Malikina, Berg, & Lilienfeld, 2014; Latzman, Vaidya, Clark, & Watson, 2011; Sharma, Markon, & Clark, 2014; Vrieze, Vaidyanathan, Hicks, Iacono, & McGue, 2014; Whiteside & Lynam, 2001). Between 50-80% of incarcerated individuals meet criteria for disinhibitory psychopathology, demonstrating the importance of understanding the mechanisms by which high levels of trait disinhibition manifest in maladaptive behavior (Krueger et al., 2005; Hudson et al., 2014). Physical aggression is a central behavioral manifestation of trait disinhibition, and individuals high in this trait are more likely to experience interpersonal conflict and use violent tactics in relationships (Dennis, Chan, & Funk, 2006). Whereas a wealth of literature has demonstrated a robust association between trait disinhibition and aggressive behavior (for a review, see Krueger, Markon, Patrick, Benning, & Kramer, 2007), the exact mechanism(s) underlying this relationship remain unclear. The following review will concentrate on trait disinhibition as a predictor of physical aggression with the aim of elucidating this association and mechanisms by which it might be attenuated.

1.1 Theoretical Explanations for the Link between Trait Disinhibition and Aggression

Theoretical explanations for the relation between trait disinhibition and physical aggression span emotional and cognitive domains and include low agreeableness, emotional dysregulation (Lynam & Miller, 2004), oversensitivity to rewards (Gray, 1987), executive functioning deficits (Morgan & Lilienfeld, 2000), and attentional biases (MacCoon, Wallace, & Newman, 2004). A review of these models is presented below and includes both distal and proximal etiological mechanisms that explain the association between trait disinhibition and physical aggression. Ultimately, this study utilized a proximal model of trait disinhibition, which identifies attention allocation as a critical point of intervention to reduce reactive physical aggression.

The broad dimension of disinhibition vs. constraint can be decomposed into the distinct facets of low Accomplishment, low Self-control and low Agreeableness, which differentially predict aggression (Vaidya, Latzman, Markon, & Watson, 2010; Latzman et al., 2011, Latzman & Vaidya, 2013)**.** Low agreeableness has consistently been found to be the strongest predictor of proactive aggression while low self-control exhibited the strongest association with reactive aggression.

Negative affectivity, which is the tendency to experience emotions such as sadness, anxiety, and guilt, may be a contributing factor in the association between trait disinhibition and aggression (Sher & Trull, 1994). More specifically, negative urgency, which is defined as the tendency to impulsively lash out in the context of negative affect, is especially predictive of reactive physical aggression (Carlson, Pritchard, & Dominelli, 2013; Miller et al., 2003; Miller, Zeichner, & Wilson, 2012). Individuals high in trait disinhibition often overreact to both negative and positive stimuli (Cyders & Smith, 2008; Del Boca et al., 2004; Taylor et al., 1999;

Verona et al., 2002), and thus, tend to focus more on immediate gratification than long-term consequences, resulting in behaviors such as physical aggression and drug use (Lynam & Miller, 2004; Miller et al., 2003). In support of this premise, researchers have found that individuals high in trait disinhibition show an exaggerated amygdala response to threatening stimuli (Hicks & Patrick, 2006; Hyde, Hariri, Byrd, Vortuba-Drzal, & Manuck, 2014; Minzenberg, Fan, New, Tang, & Siever, 2007) and increased dopamine release in the nucleus accumbens in response to monetary rewards (Buckholtz et al., 2010).

In summary, the reviewed literature suggests that low agreeableness and disinhibited reactions to emotional stimuli result in behavioral manifestations of disinhibition such as physical aggression. Although research supports this association, there is still debate surrounding the process by which the experience of heightened emotional states leads to the enactment of maladaptive behaviors.

1.2 The Role of Attention-Allocation

Heightened emotional reactivity does not always manifest in maladaptive behavior such as physical aggression. The robust association between heightened emotional reactivity and aggressive behavior may be mediated by cognitive processes (Giancola, Parrott, & Roth, 2006). Although trait disinhibition is broadly associated with numerous executive functioning deficits, less is known about the specificity of such impairments (Ogilvie et al., 2011). In order to address this gap in the literature, researchers have specifically focused on the role of attention allocation as a mediator between traits and behavior. In this review, four models will be reviewed that posit allocation of attention to internal and external cues as an impetus for behavior: (1) Context-Appropriate Balance of Attention (CABA; MacCoon, Wallace, & Newman, 2004), (2) Attentional Control Theory (Eysenck, Derakshan, Santos, & Calvo, 2007), (3) Alcohol Myopia

Theory (AMT; Steele & Josephs, 1990), and (4) Dual Cognitive and Emotional System (Metcalfe & Mischel, 1999). Although operating within varied individual contexts such as acute alcohol intoxication, trait anxiety, and trait disinhibition, these well-supported models postulate the same basic process of attention allocation results in concomitant changes in behavior.

1.2.1 The CABA Model

The Context Appropriate Balanced Attention (CABA) model (MacCoon, Wallace, & Newman, 2004) proposes effective top-down allocation of attention as a self-regulatory mechanism necessary for facilitating adaptive emotional responses, behaviors, and cognitions. These responses can be represented as neural networks, and range in levels of activation (MacCoon & Newman, 2006). The CABA model is derived, in part, from the well-supported view that selective attention capacity is limited; and thus, a trade-off exists between the processing of cues in the individual's dominant versus non-dominant networks (Driver, 2001). After stimuli are encoded, higher-order regulatory processes direct attention to cues consistent with goal directed behavior (Duncan, 1980). Classic Stroop tasks (Stroop, 1935) provide a good example of this phenomenon. Individuals must allocate attention to a non-dominant network (i.e., color of the font) while inhibiting their currently more highly activated, and thus dominant, network (i.e., reading the word) (Cohen, Dunbar & McClelland, 1990; Cohen & Huston, 1992).

The CABA model suggests individuals high in trait disinhibition have a deficiency in their utilization of selective attention resources that manifests in failure to inhibit responses in contexts with salient reward or emotional cues. As the salience of rewards or emotional cues becomes stronger, individuals high in trait disinhibition disproportionately attend to these cues. In these situations, evocative reward or emotional cues are posited to "hijack" attention and thereby disrupt and replace the individual's current dominant network (i.e., goal-directed

behavior). Under conditions when attentional resources are highly taxed, limited capacity attentional resources will be selectively allocated to the cues that are easiest to process (MacCoon & Newman, 2006). For example, an individual's goal directed behavior (i.e., dominant network) could be to drive to work safely and efficiently. Another driver may cut in front of the individual (i.e., an emotional cue) and elicit anger in the individual. This emotional experience replaces the individual's previously dominant network, or goal directed behavior, which is to arrive at work safely. In most instances, the environment would also include inhibitory cues (i.e., non-dominant network), such as the person's knowledge that retaliating may cause an accident. According to the CABA model, individuals low in trait disinhibition likely have the ability to process both the emotional and inhibitory cues in order to form an adaptive behavioral response. In contrast, individuals high in trait disinhibition will over-attend to the more easily processed emotional cues at the expense of processing the inhibitory cues. Hence, the "spotlight of attention" in these individuals will be disproportionately shifted to emotional cues (e.g., anger) that elicit a "go" response to risky behavior. Consequently, this effect shifts attentional resources away from inhibitory cues (e.g., negative consequences) that elicit a critical "stop" response to that behavior. The individual may then respond to the emotional cue in a maladaptive manner, such as increasing speed to intimidate the other driver.

There is a wealth of data to support the CABA model's hypothesis that a deficit in top-down allocation of attention is associated with trait disinhibition (for reviews, see Baskin-Sommers & Newman, 2013; Newman & Lorenz, 2003). Research has shown individuals high in trait disinhibition have difficulty inhibiting a previously adaptive dominant response in the presence of negatively-valenced emotional stimuli (Baskin-Sommers & Newman, 2014). However, trait disinhibition was only associated with impaired performance in the presence of

negative emotional cues under conditions when attentional resources were highly taxed. These results demonstrate that trait disinhibition is most likely to manifest in disinhibited behavior in situations that elicit psychological states (e.g., intense emotion) and consume limited-capacity attentional resources.

Research indicates that the attention deficit associated with trait disinhibition is manifested in an over-allocation of attention to pre-existing priorities at the expense of processing unexpected stimuli (Avila & Parcet, 2001; Baskin-Sommers, Wolf, Buckholtz, Warren, & Newman, 2012). In other words, individuals high in trait disinhibition have a reduced ability to update their behavior when it is no longer adaptive. These individuals consistently show attenuated neurobiological responses to unexpected stimuli (Baskin-Sommers, Krusemark, Curtin, Lee, Vujnovich, & Newman, 2014; Bernat, Nelson, Steele, Gehring, & Patrick, 2011; Patrick et. al, 2006) and biased attention toward expected rewards at the cost of attending to and processing unexpected stimuli (Avila & Parcet, 2002). The ability to disengage from expected stimuli (i.e., inhibit a dominant response) is necessary for adaptive self-regulation. Individuals high in trait disinhibition showed deficits when their goal directed behavior was to identify two target stimuli rapidly presented at varying time intervals in an "attentional blink" paradigm. The task measured participants' ability to disengage attention from the first target in order to recognize the second. The "attentional blink" refers to the inability to detect the second target when it immediately follows the first. Trait disinhibition was positively associated with a greater attentional blink, supporting the idea that such individuals over-allocate attention to goal directed behavior at the expense of processing unexpected stimuli (Baskin-Sommers et al., 2012).

P3 amplitude is largely thought to be an indicator of stimulus evaluation, or a "stop-and-pause" reaction. Trait disinhibition has been associated with reduced p3 amplitude in situations

with infrequent or unexpected stimuli (Baskin-Sommers et al., 2014). These results are in keeping with the CABA model's postulate that high trait disinhibition is associated with maladaptive responses (i.e., inability to "stop and think" to update behavior) in the presence of emotional or motivational cues. Interestingly, these findings seem to contradict a major tenet of the CABA model in that disinhibition was only associated with a maladaptive physiological response (i.e., reduced p3 amplitude) under conditions of low cognitive load. In contrast, the high cognitive load condition resulted in maladaptive responses (i.e., reduced p3 amplitude) in all participants. This suggests that acute demands on attention may not be necessary to engender trait disinhibition's association with maladaptive behavior and that such demands on attention may serve as a general mechanism leading to maladaptive responses regardless of trait levels of disinhibition.

Together, the results surrounding the moderating effect of tasks or situations that tax cognitive resources on the association between disinhibition and maladaptive responding are equivocal (Baskin-Sommers et al., 2014; Baskin-Sommers & Newman, 2013; Baskin-Sommers et al., 2012). Studies conducted outside the CABA framework of disinhibition have also indicated that taxes on working memory lead to an increase in maladaptive behaviors including poor decision-making on a laboratory task (Friberg, Gerst, & Finn, 2013) and higher rates of delay discounting (Finn, Gunn, & Gerst, 2015). However, these findings cut across levels of trait disinhibition, suggesting a more general association between consumption of limited-capacity attentional resources and maladaptive behavior. That is, it is possible that the association between trait disinhibition and trait-level reduced working memory capacity may account for maladaptive behavior, regardless of acute demands on working memory.

1.2.2 Attentional Control Theory

According to Attentional Control Theory (Eysenck et al., 2007), emotional states result in increased influence of bottom-up attention and decreased influence of top-down attentional control. Emotional states are posited to tax cognitive resources such that available resources are allocated to the most salient cues. For instance, individuals with high trait anxiety are more likely to attend to threatening cues. Corbetta and Shulman (2002) define "attentional set" as cognitive "representations involved in selection of task-relevant stimuli and responses" (p. 202). Similar to CABA theory, Attentional Control Theory implicates top-down allocation of attention as necessary to maintain goal-directed attentional sets. Cue salience is determined by the intrinsic value of the stimulus or the extent to which the stimulus resembles something of intrinsic value.

Attentional Control Theory has received substantial empirical support. Studies demonstrate that trait anxiety impairs performance on various tasks that require appropriate allocation of attention in the presence of negative stimuli (Calvo & Eysenck, 1996; Eysenck & Graydon, 1989; Hopko, Ashcraft, Gute, Ruggiero, & Lewis, 1998). However, similar to findings that support the CABA model, this association only occurs when cognitive resources are highly taxed. For example, trait anxiety was only associated with impaired performance on cognitively demanding tasks (Darke, 1988b; Derakshan, Ansari, Hansard, Shoker, & Eysenck, 2009). Researchers have also tested the effects of performing two tasks simultaneously on performance. Because dual tasks require more attentional control, they can be considered more likely to consume limited-capacity attentional resources than one task alone. Results indicate that trait anxiety is associated with impaired performance during a dual-task condition (Wood, Mathews,

& Dagleish, 2001), particularly when the secondary task is highly taxing of limited cognitive resources (Ashcraft & Kirk, 2001).

1.2.3 Alcohol Myopia Theory

Alcohol Myopia Theory posits that acute alcohol intoxication leads to a disruption in working memory that hinders the simultaneous processing of both instigative and inhibitory cues in the environment (Steele & Josephs, 1990). Thus, attention is allocated to the most salient or easiest to process cues, which, as previously mentioned, often include goal-directed behavior cues, reward cues or provocation cues (Taylor & Leonard, 1983; Fleming et al., 2013). For example, intoxicated participants show more physical aggression when salient external cues promote, rather than inhibit, violence (Giancola, Duke & Ritz, 2011). Further, intoxicated participants who are distracted away from provocative stimuli show attenuated physical aggression (Gallagher & Parrott, 2011; Giancola & Corman, 2007; Phillips & Giancola, 2008; Zeichner, Pihl, Niaura, & Zacchia, 1982).

Similar to individuals high in trait disinhibition, as conceptualized within the CABA framework, intoxicated individuals have difficulty disengaging from emotional stimuli in order to update behavior. During an task that measured physical aggression, intoxicated participants who overheard their ostensible opponent state that he planned to administer the highest shocks possible were more aggressive than those who overheard their opponent state that he planned to administer the lowest shocks possible. In actuality, all participants received a mild level of shocks. In this particular example, alcohol intoxication was purported to impede the ability to perceive and process new information (i.e., mild shocks received) that indicated an adaption in behavior (i.e., administer mild shocks in return) (Leonard, 1989).

1.2.4 Desynchronized Dual Cognitive and Emotional System

Metcalfe and Mischel (1999) posit a dual system as responsible for appropriate regulation of behavior. The first is a "hot" emotional system, responsible for quick reactions to aversive (e.g., pain, provocation) and appetitive (e.g., sexual pleasure, drugs) unconditioned stimuli (Metcalfe & Jacobs, 1996). The second is a "cool" cognitive system, responsible solely for cognitive processing of stimuli (e.g., processing implicit memories, metacognitive monitoring), which is crucial for overriding emotional responses that are maladaptive. Pertinent to aggressive behavior, elicitation of an intense emotional state (e.g., anger) may affect the synchronicity of the dual cognitive and emotional systems, limiting the ability of the "cool" cognitive system to override emotional responses. Metcalfe and Mischel (1999) hypothesized that reducing the salience of the emotional cue may attenuate the effect of a "hot" stimulus. One method to reduce cue salience, and thus increase likelihood that the "cool" cognitive system inhibits a maladaptive "go response," is to distract attention away from the "hot" stimulus (Mischel, 1974). Consistent with this hypothesis, attention allocation has been shown to be a crucial factor in self-regulation (Mischel, 1974; Rodriguez, Mischel, & Shoda, 1989).

1.3 Integration of Attention-Allocation Models

The CABA model and Attentional Control Theory similarly posit emotional states as taxing cognitive resources such that fewer resources are available for allocation of attention. AMT posits that alcohol intoxication impairs cognitive functioning and restricts attentional focus; thus, the available attentional resources are myopically focused on the most salient internal and external cues. Alcohol is one of the many possible agents that can tax attentional resources, leading to the common downstream effect of allocation of limited attentional resources to the most salient cues in the environment. The Dual Cognitive and Emotional

Systems literature shows emotional states result in a disruption in the ability to cognitively override maladaptive responses, and that distraction from emotional cues reduces maladaptive behavior. All four theories posit that certain variables result in the downstream effect of biased allocation of limited attentional resources.

The extant literature has established that biological or psychological constructs which demand limited cognitive resources are associated with reduced attentional capacity, such that behavior is more likely to be motivated by salient environmental cues (Cabson, Curtin, Lang, & Patrick, 2003; Fleming et al., 2013; Finn, 2002). Within the aggression literature, several studies have demonstrated that increased cognitive load facilitates or inhibits physical aggression commensurate with the salience of instigatory or inhibitory cues, respectively (Giancola & Corman, 2007; Giancola et al., 2011).

1.4 Distraction as an Intervention

The preceding review has demonstrated that the association between trait disinhibition and physical aggression is mediated by inappropriate allocation of limited attentional resources. Thus, an intervention which shifts attention to adaptive external and/or internal cues should inhibit aggressive responding among individual high in trait disinhibition. Recent work within the aggression literature has capitalized on attentional mechanisms in order to reduce physical aggression. Consistent with AMT, a significant amount of research has shown that shifting attention away from aggressive-promoting cues reduces physical aggression disproportionately in intoxicated individuals (Gallagher & Parrott, 2011; Giancola & Corman, 2007; Giancola et al., 2011).

This process may also play out in sober individuals. Research indicates that in healthy individuals nonspecific physiological heightened arousal during a sober state may also narrow

attention to salient cues. When individuals increased their heart rate through vigorous exercise, they showed more physical aggression in the presence of salient provocative cues as compared to those who did not experience heightened arousal. Further, when salient cues were peace promoting and thus inhibiting, high arousal was associated with less physical aggression (Ward et al., 2008). Heightened arousal is a phasic state that can be compared to an internal emotional state or acute alcohol intoxication, so it is not surprising that these results align with the models described above. Notably, the Dual Cognitive and Emotional System explanation of behavior deemphasizes the role of limited cognitive resources and focuses instead on intense emotional states as disrupting appropriate allocation of attention. Thus, studies which have found that distraction from emotional cues reduces maladaptive behavior are consistent with this model.

However, distracting attention away from provocatory cues via completion of a separate distraction task can be considered a dual task paradigm. As previously discussed, proponents of Attentional Control Theory consider a dual-task to be inherently more cognitively taxing than an isolated task. The finding that distraction tasks reduce physical aggression disproportionately in intoxicated individuals may challenge the basic premise of the CABA Model and Attentional Control Theory: that inappropriate allocation of attentional resources only occurs under instances of when cognitive resources are highly taxed.

1.5 Overview of the Study and Hypotheses

The preceding review demonstrates that there are many well-validated theoretical explanations for the relation between trait disinhibition and aggressive behavior. The purpose of the current study was to (1) examine one cognitive mechanism (i.e., attention allocation) purported to mediate the trait disinhibition-physical aggression link, and (2) examine the circumstances in which trait disinhibition predicts physical aggression. As findings surrounding

the role of cognitive load in the attention-allocation deficits seen in individuals with high trait disinhibition (and high trait anxiety) are equivocal (Ashcraft & Kirk, 2001; Baskin-Sommers et al., 2012; Baskin-Sommers et al., 2014; Baskin-Sommers & Newman, 2013), it is important to tease apart the specific type of cognitive load that results in inappropriate allocation of attention and thus maladaptive behavior. Specifically, the current study examined the trait disinhibition-physical aggression link using a dual-task paradigm in which the secondary task is inherently inhibitory (i.e., distraction task). In addition, this study manipulated the strength of the emotional cues.

The CABA model and Attentional Control Theory posit that trait disinhibition will be more strongly associated with physical aggression in the presence of highly salient emotional stimuli (e.g., strong physical provocation). Further, these models predict an exacerbated association between trait disinhibition and physical aggression in a dual task paradigm, because more cognitive resources are needed to complete simultaneously two tasks. In contrast, previous findings, including those within the Alcohol Myopia and Dual Cognitive Emotional Systems frameworks, show that distraction away from emotional cues reduces maladaptive behavior (Bushman, 2002; Gallagher & Parrott, 2011; Giancola & Corman, 2007; Metcalfe & Michel, 1999; Mischel, 1975; Rodriguez, Mischel, & Shoda, 1989). Previous studies have not examined cognitively taxing tasks that may inherently inhibit maladaptive responses. For example, when examining test-anxiety within an Attentional Control Theory framework, researchers have not manipulated a secondary task that demands cognitive resources but is inherently anxiety reducing. The current study examined the independent and interactive effects of trait disinhibition, emotional cues, and a cognitive distraction manipulation on laboratory-based physical aggression. Participants were randomly assigned to one of two distraction conditions

(i.e., distraction, no-distraction) and physically provoked via the receipt of low intensity and high intensity electric shocks from a fictitious opponent (i.e., weak and strong emotional cues) from their opponent. Physical aggression was operationalized by the intensity and duration of shock participants deliver to their ostensible opponent. Based on the reviewed literature, the following hypotheses were advanced:

Hypothesis 1. Consistent with the well-accepted relation between trait disinhibition and physical aggression, a positive association between trait disinhibition and physical aggression was expected.

Hypothesis 2. Past laboratory-based studies have shown that distraction from provocation reduces physical aggression (Bushman, 2002; Giancola & Corman, 2007). Thus, distracted participants were expected to be less aggressive than non-distracted participants.

Hypothesis 3. A Trait Disinhibition x Distraction x Provocation interaction was predicted. Specifically, under conditions of high provocation, a positive association between trait disinhibition and physical aggression was expected among participants in the non-distraction condition. We predicted that this association would be significantly attenuated among participants in the distraction condition. Under conditions of low provocation, trait disinhibition and physical aggression was not expected to be associated in either distracted or non-distracted participants.

2 EXPERIMENT

2.1 Participants and Recruitment

Participants were 151 undergraduate males aged 18 and older. An undergraduate sample was deemed appropriate as trait disinhibition is especially likely to be high in early adulthood (Kessler et al., 2005, Slade, 2007). Prior to data collection, a power analysis (Erdfelder et al., 1996) was used estimate a sample size that would provide adequate power to detect a Trait Disinhibition x Distraction x Provocation interaction effect, which requires the most power of the hypothesized effects. Parameters of the power analysis were $\alpha = .05$, power = .80, and $f^2 = .15$ A moderate effect size (f^2) was chosen based on three sources of data. First, provocation is one of the most powerful elicitors of laboratory-based aggression and typically associated with large effect sizes (d = .56 to .76; Anderson & Bushman, 1997; Bettencourt & Miller, 1996). Second, previous research has established a medium-sized association (r's ranging from .26-.44) between aggression and a broad trait disinhibition factor in both undergraduate and clinical samples (Venables & Patrick, 2012; Wilson et al., 2011). Third, the distraction manipulation used in the current study has only been employed in laboratory-based studies that have examined its effect on physical aggression among intoxicated and non-intoxicated men (Bushman, 2002; Gallagher & Parrott, 2011; Giancola & Corman, 2007). In these studies, effect sizes of distraction on laboratory-based physical aggression among intoxicated participants ranged from d = .45 to 1.4. As previously reviewed, trait disinhibition and acute alcohol intoxication are posited to affect attentional processes through similar mechanisms; thus, estimation of a moderate effect size was deemed appropriate given these data. Results of this power analysis indicated that a total sample

of 77 was necessary. As noted below, the final sample for the present study was consistent with this estimate.

An exclusively male sample was recruited for several reasons. First, previous research has shown men to be more aggressive than women, especially when physical aggression is measured in the laboratory (Bettencourt & Miller, 1996; Giancola et al., 2009). Second, the effect of provocation on aggression has been reliably larger in men as compared to women (Bettencourt & Kernahan, 1997; Bettencourt & Miller, 1996; Eagly & Steffen, 1986). Third, men have higher rates of trait disinhibition than women (Newman et al., 1996). Collectively, these data suggest that the effect of trait disinhibition on laboratory-based aggression will be strongest in men. Thus, men represent the ideal sample to examine a novel, distraction-based method to reduce laboratory-based physical aggression.

Participants were recruited from the Georgia State University's SONA System, an online participant pool of undergraduate students enrolled in Introduction to Psychology courses. Students responded via an online scheduling system to a two-part research study entitled "Reaction Time Under Competitive Conditions." Only participants who reported being male and at least 18 years of age during a prescreening questionnaire on SONA were eligible to participate. Participants completed a battery of questionnaires (Session 1) and an experimental session on a separate day (Session 2). All participants received course credit for their time.

Of the 151 participants who completed Session 1, 133 presented to the laboratory for Session 2. Of these participants, 6 (5%) were not deceived (see below). In addition, there was an equipment malfunction for 2 (2%) participants, electronic files for 2 (2%) participants were lost due to a power outage, two participants (2%) withdrew from participation after providing informed consent, and two participants (2%) did not follow task instructions. Removal of these

participants resulted in a final sample of 119 participants. Participants ranged in age from 18 to 35 (*M* = 20.23, *SD* = 3.43), and in years of education from 12 to 24 (*M* = 14.52, *SD* = 1.88). The racial composition of this sample consisted of African Americans (35%), Caucasians (28%), Asians (22%), and individuals who identified as more than one race (8%). Ninety percent of the sample had never been married.

2.2 Experimental Design

The present study used a mixed experimental correlational design and included one between subjects independent variable (distraction condition), one within subjects independent variable (level of provocation), and one continuous predictor (trait disinhibition). Trait disinhibition was assessed by self-report in Session 1. Upon arrival to Session 2, participants were randomly assigned to either the distraction or no distraction condition.

2.3 Materials

2.3.1 Demographic Form

This form assesses participants' age, race, ethnicity, highest level of education, income level, and religious affiliation.

2.3.2 Externalizing Spectrum Inventory – Brief Form (ESI-BF; Patrick et al., 2013).

This 160-item self-report scale measures lifetime history of externalizing psychopathology in a hierarchical structure. Participants rate items on a 0 (*False)* to 3 (*True)* scale, with higher scores reflecting greater externalizing psychopathology (after reversing scores on false-keyed items). The ESI-160 assesses the multifaceted nature of externalizing psychopathology using a higher order construct of general disinhibition and conceptually distinct subscales: the 19-item callous aggression subscale (α = .92) and 18-item substance abuse

subscale (α = .95). The 20-item general disinhibition subscale (α = .94), which is highly correlated with the ESI total score (*r* = .98) but negligibly correlated with callous aggression (*r* = .02), is recommended as a measure of trait disinhibition in studies measuring aggression as an outcome as it does not include aggression-related items. As such, the general disinhibition scale was used measure trait disinhibition in the present study. This scale demonstrated high internal consistency in the present sample (α = .79). Sample items include: "I have had problems at work because I was irresponsible" and "I get in trouble for not considering the consequences of my actions".

The ESI has been repeatedly administered to undergraduate samples with high internal consistency (Meehan et al., 2013; Nelson, Patrick, & Bernat, 2011). External correlates of the ESI include higher self-reported incidence of childhood aggressive conduct, antisocial behavior in adulthood, and alcohol dependence and illicit drug use (Hall, Bernat, & Patrick, 2007). Research indicates that higher scores on the ESI are associated with reduced p3 amplitude in response to unexpected stimuli in an undergraduate sample, a deficit largely that is largely considered a biomarker of trait disinhibition (Nelson et al., 2011).

2.3.3 Aggression Questionnaire (AQ; Buss & Perry, 1992).

This 29-item, self-report measure assesses participants' disposition toward physical aggression, verbal aggression, anger, and hostility. Participants rate items on a scale of 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*) with higher scores reflecting higher trait aggression. Pertinent literature indicates that scores on the Physical Aggression subscale (α = .85) scores are positively related to laboratory-based physical aggression in men (Giancola, 2002). Thus, administration of this measure allowed for the identification of differences in trait physical aggression between distraction conditions that could

potentially confound laboratory-based physical aggression. In the present sample, the alpha reliability coefficient for the subscale was .88.

2.3.4 Taylor Aggression Paradigm (TAP; Taylor, 1967).

A modified version of the TAP (Giancola & Zeichner, 1995) was used to assess direct physical aggression. The hardware for the task was developed by Coulbourn Instruments (Allentown, PA) and the computer software was developed by Vibranz Creative Group (Lexington, KY). In the TAP, participants compete in a reaction time task in which electrical shocks are administered to and received from a "fictitious" opponent (for more information, see "Deception Manipulation" below). Participants are seated at a table in a small room, facing a computer screen and keyboard. The numbers "1" through "10" on a computer keyboard are labeled from "low" to "high" to allow participants to determine the level of shock intensity to administer. The duration of the shock administered is dependent on the length of time participants press the key. Participants receive visual feedback on the computer monitor indicating whether they "won" or "lost" a trial as well as the shock level selected and received. The TAP and other similar shock-based laboratory paradigms have been repeatedly shown to be safe and valid measures of aggressive behavior (e.g., Anderson & Bushman, 1997; Parrott, Miller, & Hudepohl, 2015).

In the present study, physical aggression was defined as the summation of standardized scores for the average intensity and duration of shocks selected (i.e., TAP physical aggression). This was done because a combination of intensity and duration has been shown to be a more robust indicator of aggression (e.g., Carlson, Marcus-Newhall, & Miller, 1989; Gallagher & Parrott, 2011). Shock intensity and duration have been found to be highly correlated and are thus purported to capture different aspects of the overall construct of physical aggression

(Carlson, Marcus-Newhall, & Miller, 1989). The intensity of shock administered is an overt measure of aggression because participants make a conscious decision and that decision is made known to their ostensible opponent. In contrast, the duration of shock administered is a covert or implicit measure of aggression because it is based on a less controlled behavior and is not explicitly made known to their ostensible opponent. Thus, it is likely that the combined shock intensity and duration variable captured more of the overall construct of aggression and should be considered as a more valid measurement of aggression in this study.

2.3.5 Deception Manipulation

To disguise the true aims of the study, participants were given a fictitious cover story. They were told that the purpose of the study was to examine reaction time under competitive conditions. Further, participants were informed that they would undergo a pain threshold test prior to the reaction time task. Immediately before assessment of their pain thresholds, participants were able to hear their opponent's responses over an intercom system. The "opponent's" voice was pre-recorded by a male confederate. All participants heard the same experimenter-confederate verbal exchange. Prior research has confirmed the success of this deception manipulation (Parrott & Zeichner, 2005; Parrott & Giancola, 2004).

2.3.6 Provocation

All participants in the present study received low and high physical provocation from their opponent. During the first block, participants received shocks that were one second in duration and ranged from 55% (a "1") to 60% (a "2") of the highest tolerated shock intensity. During the second block, participants received shocks that were one second in duration and ranged from 95% (a "9") to 100% (a "10") of the highest tolerated shock intensity. Each block consisted of 16 trials (8 wins and 8 loses). There were two "transition trials" between the blocks.

Participants lost both of the transition trials and received respective shock intensities of "5" and "6." Thus, there were a total of 34 trials. This sequence of trials was intended to give the appearance of an increasingly provoking aggressive interaction.

2.3.7 Distraction Task

A validated distraction task was employed to shift attention away from provocation, ostensibly allowing for activation of non-dominant adaptive responses. While engaged in the TAP, participants in the distraction condition were instructed to attend to a computerized memory-sequencing task. This task was presented on a laptop computer located on the participants' desk. In this task, a 3 x 3 matrix of 2-cm light-gray squares were presented on a white computer screen. On each trial, four squares illuminated (in black) in a random sequencing order. Participants were asked to attend to and memorize the sequencing order of each trail. Directly following the sequencing presentation, participants used a computer mouse to click on the squares in the order in which they illuminated. The trials proceeded continuously regardless of whether the participant responded to the sequence. In order to prevent confounding emotional responses, performance feedback was not provided. To ensure participants actively engaged in the task, distraction condition participants were told that they would receive a bonus of $10 or 1.0 extra credits if they performed better than 80% of subjects who had already been tested. In reality, all participants in the Distraction condition received the preferred form of compensation. This task has successfully been used as a distractor in previous studies of laboratory-based physical aggression (e.g., Gallagher & Parrott, 2011; Giancola & Corman, 2007).

2.4 Procedure

The study was completed on two separate days. During Session 1, participants presented to the laboratory and were greeted by an experimenter and provided informed consent. After informed consent, participants completed a questionnaire battery on a computer using Qualtrics, an online survey administrator (Qualtrics, Provo, UT). The experimenter provided instructions on how to operate the computer program that administered the questionnaire battery and was available to answer any questions during the session. Upon completion of the questionnaire battery, the experimenter confirmed the participants' appointment date and time for Session 2.

Upon arrival to the laboratory for Session 2, participants were escorted to a room separate from the aggression laboratory and asked to present a picture ID. Informed consent was obtained. Participants were told the fictitious cover story and were escorted to the experimental room for the aggression task. While en route to the experimental room, the experimenter pointed to both the opponent's room and the participants' room and stated, "That is the room where your opponent will complete his tasks today, and this is the room where you will complete your tasks today." The opponent's room was adjacent to the participants' room. Participants were seated at a desk facing a computer.

Participants then received instructions for the TAP. All participants were told that they would practice the competitive reaction time task first with the other participant. In the TAP, participants were instructed that shortly after the words *"Get Ready"* appeared on the computer screen, the words *"Press the Spacebar"* would appear at which time they would press, and hold down, the spacebar. Following this, the words *"Release the Spacebar"* appeared at which time they were told to release the spacebar as quickly as possible. A "win" was signaled by the words *"You Won. You Get to Give a Shock"* and a "loss" was signaled by the words *"You Lost. You*

Get a Shock." Participants were told that a winning trial allowed them to deliver a shock to their opponent and a losing trial resulted in receiving a shock from their opponent. They were told that they had a choice of 10 different shock intensities to administer at the end of each winning trial. Participants could not elect to not shock their opponent. However, participants were told about the possibility of pressing shock button "1" (out of ten), which would deliver a "hardly noticeable" low intensity shock to their opponent that was "definitely not painful." Following receipt of instructions for the TAP, participants in the Distraction condition partook in the "practice" trials of the Distraction Task until they demonstrated an understanding of the task.

To account for individual differences in sensitivity to electric shock, participants underwent an assessment of their subjective pain ratings before the start of the TAP. This procedure was conducted while participants were seated in the testing room and the experimenter was in an adjacent control room. They communicated through an intercom. Assessment of participants' pain thresholds was accomplished via administration of 1-sec electric shocks in an increasing stepwise intensity from the lowest available shock setting, which was imperceptible, until the shocks reached a reportedly painful level. All shocks were administered through two electrodes that were attached to the index and middle fingers of the non-dominant hand using Velcro straps. Participants were asked to inform the experimenter when the shocks were "first detectable" and then when they reached a "painful" level. The overall pain threshold procedure lasted approximately 2-3 minutes.

Following the pain threshold assessment, participants proceeded immediately to the experimental TAP trials. The distraction group was reminded to concurrently play the "Tile Game" (i.e., the distraction task) on the adjacent laptop computer. The sequence of TAP trials was the same for both the distraction and no-distraction conditions. A specially designed "volt

meter" and the illumination of one of the 10 "shock lights" [ranging from 1 (low) to 10 (high)] on the computer screen signaled to the participant the shock that he or the opponent selected. A randomly generated win/loss sequence was predetermined and incorporated into the computer program that executed the task. All participants received the same sequence. A computer controlled the initiation of trials, administration of shocks to participants, and recording of their responses. Again, the purpose of the competitive task was to lead participants to believe that they were engaging in an adversarial interaction with another individual. The task took approximately 10 minutes.

For aggression data to be valid, it must be demonstrated that participants believed that they were competing against another individual on a "reaction time" task and that this task was not a measure of aggression. Deception was determined by the administration of a brief verbal interview prior to the debriefing of the participant. Specifically, participants were asked whether or not they thought the task was a good measure of reaction time. Additionally, participants were asked to describe their impression of their opponent and whether they thought he was reasonable during the reaction time task.

Participants then received a thorough verbal and written debriefing. During debriefing, participants were told that the purpose of the study was to measure the effect of distraction on physical aggression. Participants were told that at no time during the procedure did they actually administer an electric shock to anyone, and that their responses were "normal" and consistent with those of others in the study. To minimize participants' distress of being deceived by manipulations, they were told that 95% of the participants in these types of projects are similarly deceived. They were also informed that they were not told, at the beginning of the study, that the TAP measures aggression because many people artificially alter their responses if they are aware

of this information. The experimenter then addressed any comments or concerns. Participants were then thanked for their time and compensated through the SONA system.

3 RESULTS

3.1 Manipulation Check

3.1.1 Aggression tasks check

Prior to debriefing, participants were interviewed to confirm their belief that they were competing against another participant on a "reaction time" task and that this task was not a measure of aggression. First, participants were asked whether or not they thought the task was a good measure of reaction time. Second, they were asked about their overall impression of their "opponent". The main criteria for exclusion were participants' beliefs that they were not actually competing against another person or that the task was a measure of aggression. As noted above, of the 133 participants who presented to the laboratory session, 6 (5%) indicated that the task was not a measure of reaction time and/or that they were not actually competing against another participant.

3.1.2 Distraction task check

Participants in the distraction condition displayed significantly longer reaction times during the TAP (M = 664.94, SD = 56.89) than participants in the control condition (M = 583.82, SD = 59.88), $t(117) = 7.57$, $p < .001$. This finding suggests that the distraction task sufficiently drew attention away from provocatory cues. Reaction time on the TAP has been previously used as a manipulation check of distraction (Giancola & Corman, 2007).

3.2 Preliminary Analyses

Random group assignment was expected to produce an equal distribution of pertinent demographic and dispositional variables across experimental groups (Whitley & Kite, 2013). To confirm this assumption, we conducted independent *t*-tests with distraction condition as a

between subjects variable and dispositional physical aggression and trait disinhibition as the dependent variables. No significant group difference emerged for dispositional physical aggression or trait disinhibition (See Table 1). A chi-square analysis did not detect significant group differences in racial composition, ethnicity, or marital status. Likewise, no significant differences emerged for age and years of education. As such, subsequent analyses did not control for these variables. The correlation between mean shock intensity and mean shock duration was computed across and within experimental conditions. Overall mean shock intensity and overall mean shock duration (i.e., across all conditions) were significantly correlated, $r = .22$, $p < .05$. The correlation coefficient at low levels of provocation ($r = .25$, $p = .007$) was larger than at high levels of provocation ($r = .14$, $p = .13$), but this difference was not significant, $p = .19$. Further analysis of the non-significant correlation under conditions of high provocation revealed that this correlation coefficient was larger in control ($r = .25$, $p = .053$) relative to distracted participants ($r = .079$, $p = .55$), but this difference was not significant, $p = .17$.

3.3 Analytic Plan

3.3.1 Centering and coding of predictor variables

Dummy coding was used to standardize the categorical variable of distraction (Aiken & West, 1991). The distraction condition was coded as "0" and the control condition was coded as "1". The continuous predictor variable (i.e., trait disinhibition) was mean centered by subtracting the mean score of the variable from the raw score of the variable. According to Aiken and West (1991), mean centering first-order continuous variables is advantageous for both statistical and substantive reasons. Most importantly, this procedure reduces multicollinearity between the interaction and lower-order terms and improves the interpretability of regression equations. Further, the computation of interactions with raw scores yields incorrect regression

coefficients because they are not scale invariant. In the current analyses, the interaction term was calculated by obtaining the cross-products of the mean-centered trait disinhibition variable and dummy coded distraction variable. When using this procedure, it is important to interpret the unstandardized, and not the standardized, regression solution. As such, the parameter estimates for the interaction effect are reported as unstandardized *b*s. In contrast, estimates of main effects and simple slopes are reported as standardized *β*s.

3.3.2 Sum/Difference regression method (Hope, 1975; Judd et al., 2001)

In order to evaluate the independent and interactive effects of trait disinhibition, distraction, and provocation on men's physical aggression, separate hierarchical regression models were computed with *TAP physical aggression* as the dependent variable. Specifically, the sum/difference regression method was used to analyze between- and within-subjects main effects and interactions because it allows for examination of the repeated measures outcome variable (i.e., TAP physical aggression under conditions of low and high provocation). The first hierarchical model examined between-subjects effects on the outcome variable, which was the sum of TAP physical aggression administered during the low and high provocation trials (DV1 = Low Provocation + High Provocation). This effectively controlled for the effect of provocation and allowed for analysis of between-group differences in aggression. The second hierarchical model examined within-subjects effects on the outcome variable, which was the difference between TAP physical aggression administered during the low and high provocation trials (DV2 = High Provocation- Low Provocation). Thus, the dependent variable was the intraindividual change in TAP physical aggression administered from low levels to high levels of provocation.

In Step 1 of both models, the main effects of trait disinhibition and distraction condition were entered. In Step 2, the interaction term was entered. Significant interaction terms were

explicated following the procedures outlined by Aiken and West (1991). The simple slopes analysis tested whether the slope of the regression line was significantly different from zero. The omnibus interaction term revealed whether the simple slopes were different from each other.

3.4 Regression Analyses

3.4.1 Between-subjects effects

The first step of the model for the between-subject effects (i.e., DV1) was not significant. R^2 = .004, F (2, 116) = .217, p = .81. Step 2 of the model was not significant. ΔR 2 = .01, F (3, 115) = .562, p = .64. The Trait Disinhibition x Distraction interaction was not significant, (b = .600, p = .27).

3.4.2 Within-subjects effects

The first step in the model for the within-subject effects (DV2) was not significant, R^2 = .03, F (2, 116) = 1.91, p = .15. The Trait Disinhibition x Provocation (b = -.107, p = .44) and Condition x Provocation (b = .355, p = .08) interaction terms were not significant.

The second step of the model was significant, ΔR^2= .04, F (3, 115) = 2.85, p < .05. In this step, a significant Trait Disinhibition x Condition x Provocation interaction was detected (b = .42, p = .034), indicating that the moderating effect of distraction on the association between trait disinhibition and physical aggression varied significantly between levels of provocation. Under conditions of low provocation, examination of simple slopes revealed that the relation between trait disinhibition and physical aggression was not significant among non-distracted (β = .051, p = .71) or distracted men (β = -.004, p = .98). These two associations did not significantly differ from each other, b = .087, p = .77 (see Figure 1). Under conditions of high provocation, examination of simple slopes revealed that the relation between trait disinhibition and physical

aggression was positive and significant among non-distracted men (β = .26, p < .05), but slightly negative and not significant among distracted men (β = -.075, p = .55). These two associations did not significantly differ from each other, b = .513, p = .07 (see Figure 2).

In summary, the omnibus three-way interaction term revealed that the pattern of covariation in the association between trait disinhibition and physical aggression, particularly among highly provoked participants, varied significantly between the distraction and control conditions. That is, in line with Hypothesis 3, distraction attenuated the association between trait disinhibition and physical aggression under levels of high provocation; and, under conditions of low provocation, trait disinhibition and aggression were not associated in either distracted or non-distracted participants. Consistent with previous literature (Baskin-Sommers & Newman, 2013), these data suggest that highly emotional cues are necessary to engender trait disinhibition's association with physical aggression. Collectively, these data also indicate that distraction from such cues reduced the association between trait disinhibition and physical aggression.

4 CONCLUSIONS

This study examined the independent and interactive effects of trait disinhibition, provocation, and a cognitive distraction manipulation on laboratory-based physical aggression. The primary aim of this study was to target a cognitive mechanism (i.e., attention allocation) purported to mediate the trait disinhibition-aggression link as a point of intervention for reducing this trait-behavior association. A secondary aim of this study was to distinguish between two lines of research, both of which implicate biased attention allocation as a mechanism that increases risk for maladaptive behavior (i.e., physical aggression).

4.1 Does Distraction Reduce the Effect of Trait Disinhibition on Aggression?

Results did not support Hypothesis 1, which posited that trait disinhibition would be associated with higher levels of aggression. Likewise, results were also counter to Hypothesis 2, which posited that participants in the distracted condition would be less aggressive than those in the control condition. Instead, these null main effect tests were qualified by a significant higher order interaction. Consistent with Hypothesis 3, this interaction indicated that trait disinhibition predicts physical aggression under high provocation among non-distracted, but not distracted, men. Moreover, it indicated that trait disinhibition does not predict physical aggression under low provocation regardless of distraction condition. Collectively, these findings support previous research that has specified that trait disinhibition is associated with maladaptive responding in the presence of emotional or motivationally significant stimuli (Lynam & Miller, 2004; Gray, 1987; MacCoon, Wallace, & Newman, 2004). The distraction manipulation significantly attenuated the positive association between trait disinhibition and aggression under high provocation. The effectiveness of this intervention is consistent with previous research

within the Dual Cognitive-Emotional Systems and Alcohol Myopia frameworks, both of which have found that distraction from emotional cues leads to concomitant changes in behavior.

Although there is robust support for the association between trait disinhibition and various forms of aggression, the extant literature is dominated by reliance upon self-report measures of aggression (Derefinko, DeWall, Metze, Walsh, & Lynam, 2011; Krueger et al., 2007). The present study is among the first to demonstrate this association using a behavioral measure of aggression in a controlled laboratory setting. Further, the experimental design allows for isolation of the effects of distraction and high provocation on the association between trait disinhibition and reactive physical aggression.

Theoretical models of attention suggest that selective attention may operate in multiple stages (Driver, 2001). Although the current study provides evidence that shifting attention away from provocatory cues leads to concomitant changes in behavior, inferences cannot be drawn about the specific stage of attentional processing on which distraction operates. We present three possible scenarios: (1) Distraction affects input of negative stimuli such that participants in the current study did not perceive that they were being highly provoked; (2) Distraction reduces processing resources such that individuals may have perceived that they were being highly provoked but could not process this information as deeply or consistently as those in the control condition. In this way, distraction may have disrupted the process by which perceived provocation facilitates negative affect and subsequent aggressive responding; (3) Distraction affects output of a physically aggressive response, in that participants are aware they are being provoked, experience negative affect about this provocation, but are more concerned with engaging in the distraction task than attending to the aggression task.

Within the Dual Cognitive-Emotional Systems framework, Metcalfe and Mischel (1999) state that external distraction draws excitation away from a currently activated "hot spot" such as provocation. Since activation is divided between the "hot spot" and the newly activated network, affect-laden thoughts may be less accessible. Indeed, shifting focus away from emotional cues has been found to reduce negative affect ostensibly by disrupting negative thoughts (Ayduk, Mischel, & Downey, 2002). This mechanism would be consistent with the second scenario.

It is possible that a similar attentional mechanism may be at play in the current study. Correlational and descriptive data based on participants' shock selections provide evidence in support of this view. Specifically, comparably sized correlation coefficients between shock intensity and shock duration were observed among all participants under low provocation (r = .25) and among highly provoked participants in the control condition (r = .25); however a smaller correlation coefficient was observed among highly provoked and distracted participants (r = .08). This suggests that under conditions of high provocation distraction disentangled the baseline relationship between these two indices of aggression. Descriptive data further elucidate this. Under high provocation, individuals in the distraction condition chose significantly higher shock intensities (M = 6.53) than those in the control condition (M = 5.57), $p < .05$, but pressed the shock button for significantly less time (M = 438.86) than control participants (M = 829.63) (See Table 2). Together, these data suggest that individuals in the distraction condition perceived high provocation and responded accordingly on an explicit index of aggression (i.e., shock intensity). However, the descriptive shock duration data suggest that distracted participants were less likely than control participants to persist in their delivery of a shock during a given aggressive response. Distraction may have impeded deeper processing such that delivery of an

explicit intensity was possible but the processing required to persist in that delivery was not possible.

4.2 Theoretical Implications

A secondary aim of the present study was to distinguish between two lines of research, both of which implicate biased attention allocation as a mechanism that increases risk for maladaptive behavior (i.e., aggression). One line of research posits that the association between trait disinhibition and aggressive behavior is exacerbated when limited cognitive resources are taxed (The CABA Model; MacCoon, Wallace, & Newman, 2004; Attentional Control Theory; Eysenck et al., 2007) while the other (Alcohol Myopia Theory, Steele & Josephs, 1990; Dual Cognitive and Emotional Systems Framework, Metcalfe & Mischel, 1999) posits that this association will be attenuated when limited cognitive resources are taxed, primarily because cognitively taxing tasks distract attention away from provocatory cues. As presented below, results generally support this latter line of research.

In the control condition, the association between trait disinhibition and aggression was more positive under high provocation (β = .26) than low provocation (β = .051), generally supporting the CABA model's postulate that trait disinhibition is associated with maladaptive responding in the presence of emotional or motivationally significant stimuli (MacCoon, Wallace, & Newman, 2004). Within the CABA framework, this finding is consistent with the view that emotional load from high provocation taxed attentional resources, thereby resulting in biased attention toward the most salient cues. This bias in attention led to impaired or maladaptive responding. One possible scenario is that individuals high in trait disinhibition may have attended to immediate and gratifying consequences of perpetrating aggression, whereas

individuals lower in trait disinhibition may have attended to more long-term consequences that would suggest inhibition of aggression.

However, as previously noted, results also supported our hypothesis that distraction would attenuate the positive association between trait disinhibition and aggression when participants were highly provoked. This finding is partially inconsistent with the CABA self-regulatory model of trait disinhibition, in that introduction of a task that placed a higher demand on cognitive resources did not exacerbate the association between trait disinhibition and aggression. This finding is also in contrast to the tenet of Attentional Control Theory that more broadly states that demands on limited-capacity attentional resources (i.e., a dual task paradigm) lead to an overallocation of attentional resources onto salient emotional stimuli, resulting in impaired cognitive control.

4.3 Clinical Implications

The current study provided evidence for an effective point of intervention to reduce aggression in men who endorse high trait disinhibition. Our findings suggest that moving attention away from provocatory cues onto a neutral stimulus inhibits aggressive responding in highly provoked men who report high levels of trait disinhibition. Given this finding, several strategies that would target this attention-based mechanism can be proposed. For example, highly disinhibited individuals could wear a bracelet that symbolizes their commitment to non-aggressive responses in service of their long-term goals. This bracelet could facilitate an opportunity for individuals to engage in a crucial "stop and think" cognition. Further, treatment providers could capitalize on technological advances to deliver more accessible in-the-moment interventions for reducing aggression. For example, an application on an individual's phone could provide a math problem or memory game. However, these interventions would require the

individual to recognize the change in his or her internal state that increases the likelihood of an aggressive response, and to utilize that information to initially engage in the intervention.

4.4 Limitations

Several limitations of the present study merit attention. First, although crucial to the theoretical explanation of our findings, attention allocation was not directly assessed. Future studies may utilize multiple methods of assessing attention bias (e.g., eye tracking, dot-probe task) to bolster conclusions about the narrowing of attention onto salient cues. Second, the design of the current study may have resulted in a confound of reward cues by condition. The distraction task was incentivized to increase the likelihood of a shift in attention away from the aggression paradigm. Given extant literature that links trait disinhibition with increased sensitivity to rewards, it is possible that the attenuating effect of distraction on the trait disinhibition-aggression association occurred because reward cues were more salient than provocatory cues. Future studies could address this limitation by utilizing a more neutral distracting stimulus, such as background noise or muffled conversations, thereby eliminating reward sensitivity as a possible confound. According to the Dual Cognitive and Emotion Systems framework, activation of both "hot" (i.e., affect-laden content) and "cool" (i.e., neutral content) networks serves to decrease salience of a hot stimulus (e.g., provocation). Thus, it could be expected that a neutral distraction would similarly reduce the association between trait disinhibition and aggression.

However, it should be noted that this confound raises an interesting theoretical question about the role of emotional cues in the association between trait disinhibition and physical aggression. Extant literature suggests that impulsivity is comprised of several facets including the tendency to engage in rash action in the presence of negative stimuli (i.e., negative urgency)

and the tendency to engage in rash action in the presence of positive stimuli (i.e., positive urgency) (Cyders & Smith, 2008). Whereas the current study examined a mechanism of disinhibited behavior in the context of strong negative or provocatory cues, it is possible that a similar mechanism may operate in the context of strong positive or reward cues. Future research could examine the latter claim by manipulating a condition in which physical aggression is incentivized such that perpetration of physical aggression is instrumental in achieving a secondary goal. Given the current findings, it would be expected that distraction from reward cues would similarly reduce the relation between trait disinhibition and physical aggression.

Conclusions

This study is among the first to provide evidence of an experimental link between trait disinhibition and aggression as well as a potential method for attenuating this association. Distraction from highly provoking cues reduced the robust association between trait disinhibition and aggression. The current findings also provide new data to inform competing theories on biased attention allocation as a mechanism for maladaptive behavior. The present findings support future research that considers attention allocation as a putative mechanism, and thus a crucial intervention point, in the association between trait disinhibition and aggression.

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Table 1 Participant demographics and descriptives

	Control (n = 61)		Distraction (n = 58)			
	Mean	*SD*	Mean	*SD*	*t*	*p*
Age	20.58	.13	19.87	.51	-1.10	.27
Years of education	14.41	1.70	14.64	2.06	.63	.53
BAQ	20.03	6.60	20.16	6.83	.31	.75
Disinhibition	.61	.36	.66	.39	.71	.48

Note: ** $p < .001$, * $p < .05$. Disinhibition is the per item mean on the ESI Disinhibition scale. Scale ranges from 0-3 with higher scores indicating higher levels of trait disinhibition.

Table 2 Dependent variable descriptives

	Control (n =61)		Distraction (n = 58)			
	Mean	*SD*	Mean	*SD*	*t*	*p*
Average Shock Intensity (Low)	2.59	1.57	3.42	2.05	2.50*	.014
Average Shock Duration (Low)	445.55	615.93	326.46	451.84	-1.20	.23
Average Shock Intensity (High)	5.57	2.96	6.53	2.26	1.99*	.045
Average Shock Duration (High)	829.63	936.85	438.86	639.38	-2.64**	.009
Proportion of 10's (Low)	.02	.09	.05	.15	.91	.37
Proportion of 10's (High)	.26	.28	.29	.24	.51	.62

Note: ** $p < .001$, * $p < .05$.

Table 3 Regression model for between-subjects effects of disinhibition and condition on aggression

Predictor variable	***b***	***β***	***p***	R^2	***p***
Step 1				004	.81
Disinhibition	.167	.058	.54		
Condition	-.096	-.017	.86		
Step 2				.014	.64
Disinhibition	-.120	-.042	.75		
Condition	-.096	-.017	.86		
Disinhibition x Condition	.600	.143	.27		

Note: ** $p < .001$, * $p < .05$.

Table 4 Regression model for within-subjects effects of disinhibition, condition, and provocation on reactive aggression

Predictor variable	***b***	***β***	***p***	R^2	***p***
Step 1				015	.15
Provocation	-.182		.21		
Disinhibition x Provocation	.097	.088	.34		
Condition x Provocation	.355	.161	.08		
Step 2				.045	.04
Disinhibition x Provocation	-.107	-.097	.44		
Condition x Provocation	.355	.162	.08		
Disinhibition x Condition x Provocation	.427	.267	.03		

Note: ** $p < .001$, * $p < .05$.

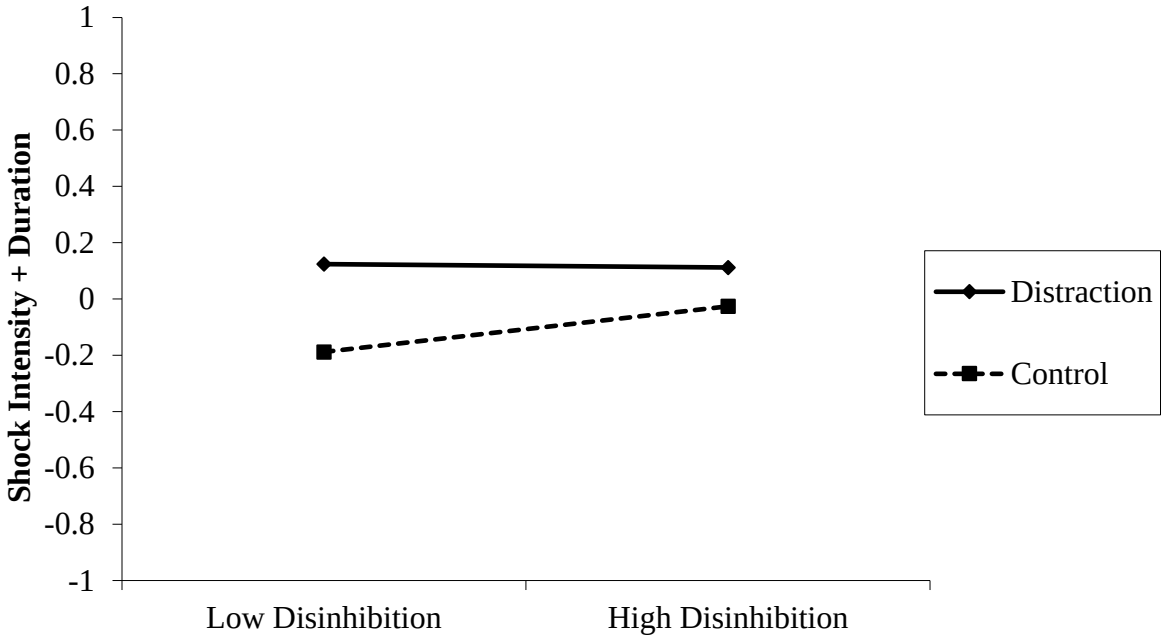

Figure 1 Distraction does not moderate the relation between trait disinhibition and physical aggression under low provocation.

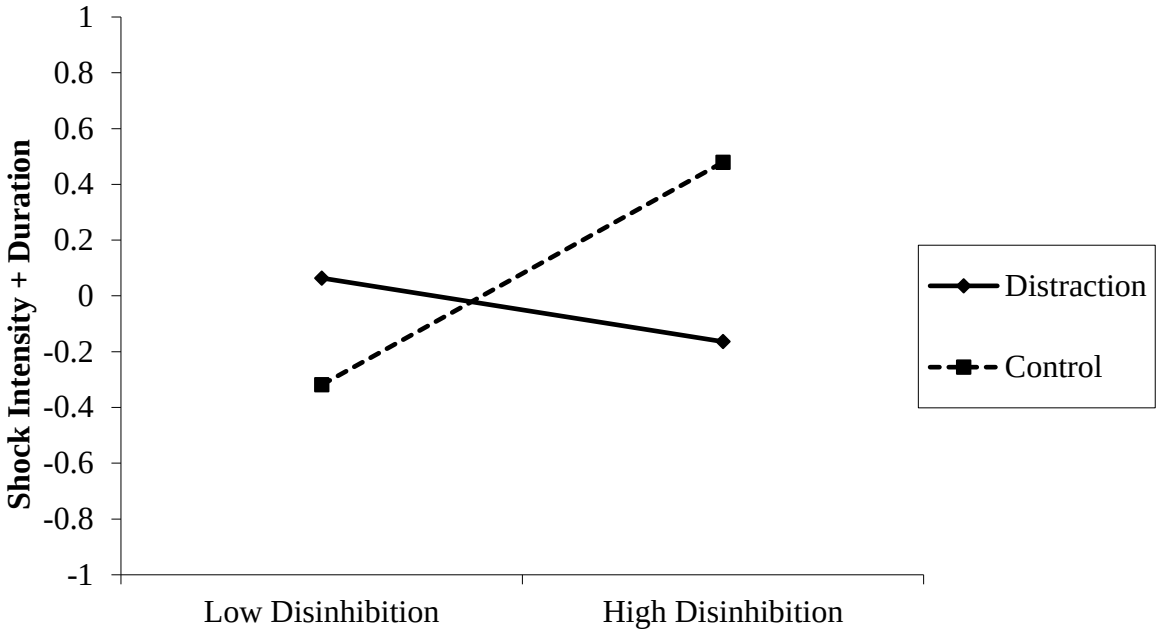

Figure 2 Distraction moderates the association between trait disinhibition and physical aggression under high provocation.

APPENDICES

Appendix A: Externalizing Spectrum Inventory-BF

ESI-bf

Directions: This questionnaire contains statements that different people might use to describe themselves. Each statements is followed by four choices: T t f F. The meaning of these four different choices is as follows:

T = True t = somewhat true f = somewhat false F = False

For each statement, circle the choice that describes you best. There are no right or wrong answers; just choose the answer that best describes you.

Remember: Circle only one choice per statement.

Like this: T (t) f F

Answer all of the items. Please work rapidly and do not spend too much time on any one statement.

1.	I have had problems at work because I was irresponsible.	T	t	f	F
2.	I enjoy pushing people around sometimes.	T	t	f	F
3.	Things are more fun if a little danger is involved.	T	t	f	F
4.	I've enjoyed getting drunk now and then, just for fun.	T	t	f	F
5.	I sympathize with others' problems.	T	t	f	F
6.	I have lied to avoid paying back loans.	T	t	f	F
7.	I have snorted drugs.	T	t	f	F

8.	I've had urges to use marijuana that were hard to resist.	T	t	f	F
9.	I have stolen something out of a vehicle.	T	t	f	F
10.	I get in trouble for not considering the consequences of my actions.	T	t	f	F
11.	I've smoked marijuana at parties.	T	t	f	F
12.	I control myself and think before I do something.	T	t	f	F
13.	I've been hurt so many times I can't trust anymore.	T	t	f	F
14.	People I've worked for would describe me as highly reliable.	T	t	f	F
15.	I don't see any point in worrying if what I do hurts someone else.	T	t	f	F
16.	Others have told me I'm a rebellious person.	T	t	f	F
17.	I have brought a weapon into a fight.	T	t	f	F
18.	I have borrowed money with no thought of paying it back.	T	t	f	F
19.	I have missed work without bothering to call in.	T	t	f	F
20.	After trying to cut down on alcohol, I've had physical problems like sweating or feeling shaky.	T	t	f	F
21.	My drug use led to problems at work or school.	T	t	f	F
22.	I've injured people to see them in pain.	T	t	f	F
23.	I've gone out of my way to get marijuana.	T	t	f	F
24.	I sometimes insult people on purpose to get a reaction from them.	T	t	f	F
25.	I feel bored a lot of the time.	T	t	f	F

26.	It doesn’t bother me to see someone else in pain.	T	t	f	F
27.	I have enjoyed smoking marijuana with friends.	T	t	f	F
28.	I have taken money from someone's purse or wallet without asking.	T	t	f	F
29.	I've quit a job without giving two weeks notice.	T	t	f	F
30.	I get blamed for things that I don't do.	T	t	f	F
31.	I don’t drink.	T	t	f	F
32.	I have gotten things from people by making them feel sorry for me.	T	t	f	F
33.	I have taken a drug like LSD or magic mushrooms.	T	t	f	F
34.	I seek out thrills almost everywhere I go.	T	t	f	F
35.	I don't lie very much.	T	t	f	F
36.	Others have told me they are concerned about my lack of self-control.	T	t	f	F
37.	I’ve used downers like Valium or Xanax for non-medical reasons.	T	t	f	F
38.	Most of the time, I have good self control.	T	t	f	F
39.	I have used a weapon against someone who insulted me.	T	t	f	F
40.	It doesn’t bother me when people around me are hurting.	T	t	f	F
41.	I often get bored quickly and lose interest.	T	t	f	F
42.	I've often ended up drinking more than I should.	T	t	f	F
43.	I usually let people know when I'll be late.	T	t	f	F

44.	I have taken items from a store without paying for them.	T	t	f	F
45.	I've let people down who trusted me.	T	t	f	F
46.	I gave up things I used to enjoy because of drugs.	T	t	f	F
47.	When I want something, I want it right now.	T	t	f	F
48.	I taunt people just to stir things up.	T	t	f	F
49.	I've gotten in trouble because I missed too much school.	T	t	f	F
50.	I've gotten drunk.	T	t	f	F
51.	I often disobey rules.	T	t	f	F
52.	I have tried smoking marijuana.	T	t	f	F
53.	I've lost control of my alcohol use.	T	t	f	F
54.	I have hit someone in the face or head in anger.	T	t	f	F
55.	I have never bought drugs.	T	t	f	F
56.	I have damaged someone's things because it was exciting.	T	t	f	F
57.	I gave up things I used to enjoy because of marijuana.	T	t	f	F
58.	I have lied to get someone to sleep with me.	T	t	f	F
59.	I let others know if I'm running behind.	T	t	f	F
60.	My drinking led to problems at home.	T	t	f	F
61.	I return insults.	T	t	f	F
62.	I have broken into a house, school, or other building.	T	t	f	F
63.	I enjoy a good physical fight.	T	t	f	F
64.	I've used drugs when it might be hazardous, like while driving a car.	T	t	f	F

65.	People often abuse my trust.	T	t	f	F
66.	I quickly get bored if I don't have something to do.	T	t	f	F
67.	I've gone on drinking binges.	T	t	f	F
68.	One or more times in my life, I have beaten someone up for bothering me.	T	t	f	F
69.	I hate waiting to get things that I want.	T	t	f	F
70.	I have spread rumors about people who were competing with me.	T	t	f	F
71.	Even when I don’t do anything wrong, I still get blamed for it.	T	t	f	F
72.	I’ve taken an illegal drug that gave me a rush and made me more awake.	T	t	f	F
73.	I have lost a friend because of irresponsible things I've done.	T	t	f	F
74.	I have snuck marijuana or hash into a public event.	T	t	f	F
75.	I rarely lie.	T	t	f	F
76.	I don't have much sympathy for people.	T	t	f	F
77.	I usually think a lot about decisions before I make them.	T	t	f	F
78.	When I say I’ll do something, I always follow through.	T	t	f	F
79.	I've had legal problems because of my drug use.	T	t	f	F
80.	I do lots of things just to get a thrill.	T	t	f	F
81.	I've had legal problems because I couldn't resist my impulses.	T	t	f	F

82.	I've spent big parts of my day using marijuana.	T	t	f	F
83.	I've broken something belonging to someone else to get back at them.	T	t	f	F
84.	I have robbed someone.	T	t	f	F
85.	At times I've drunk enough alcohol to pass out.	T	t	f	F
86.	Many people consider me a rule breaker.	T	t	f	F
87.	At times I kept drinking alcohol even though it caused problems with family or friends.	T	t	f	F
88.	I don’t mind if someone I dislike gets hurt.	T	t	f	F
89.	I've gotten high using marijuana.	T	t	f	F
90.	I have good control over myself.	T	t	f	F
91.	I’ve never taken illegal drugs.	T	t	f	F
92.	I have a hard time waiting patiently for things I want.	T	t	f	F
93.	I have been in trouble with the police for physically hurting someone who angered me.	T	t	f	F
94.	I've asked someone to help bail me out of debt.	T	t	f	F
95.	My impulsive decisions have caused problems with loved ones.	T	t	f	F
96.	At some point in my life, I couldn't get high from a drug dose that worked before.	T	t	f	F
97.	I have gotten money from people by threatening to tell their secrets.	T	t	f	F

98.	I think about things before I do them.	T	t	f	F
99.	When someone hits me, I hit back.	T	t	f	F
100.	How other people feel is important to me	T	t	f	F
101.	My marijuana use led to legal problems.	T	t	f	F
102.	I'm not one who drinks much.	T	t	f	F
103.	I vandalized someone's house or things because they were rude to me.	T	t	f	F
104.	I get unfairly blamed for things.	T	t	f	F
105.	I've had to drink more than I used to in order to get the same buzz.	T	t	f	F
106.	People think of me as dependable.	T	t	f	F
107.	I have taken a purse or wallet from someone who was carrying it.	T	t	f	F
108.	I don't care much if what I do hurts others.	T	t	f	F
109.	I have no interest in trying drugs.	T	t	f	F
110.	For me, honesty really is the best policy.	T	t	f	F
111.	I’m not someone who breaks the rules.	T	t	f	F
112.	I jump into things without thinking.	T	t	f	F
113.	I've told lies about someone just to see how it would affect them.	T	t	f	F
114.	My drug use has caused problems with my family.	T	t	f	F
115.	I would enjoy being in a high-speed chase.	T	t	f	F

116.	I gave up things I used to enjoy because of my drinking.	T	t	f	F
117.	My marijuana use has led to problems at home, work, or school.	T	t	f	F
118.	I have failed to show up to court when I was supposed to.	T	t	f	F
119.	I've bought items used for smoking marijuana.	T	t	f	F
120.	I have damaged someone's property because I was angry with them.	T	t	f	F
121.	It's easy for me to relate to other people's emotions.	T	t	f	F
122.	I have not tried drinking hard liquor.	T	t	f	F
123.	I've hurt someone's feelings on purpose to get back at them.	T	t	f	F
124.	I've failed to make payments on a loan.	T	t	f	F
125.	I keep appointments I make.	T	t	f	F
126.	I like having a drink of alcohol to relax.	T	t	f	F
127.	I plan before I act.	T	t	f	F
128.	I have used more drugs for longer than I meant to.	T	t	f	F
129.	I have been in trouble with the law for something I did on impulse.	T	t	f	F
130.	I often get in trouble for breaking rules.	T	t	f	F
131.	I have knocked someone's things to the ground for fun.	T	t	f	F
132.	I have smacked someone who upset me.	T	t	f	F
133.	I get bored easily.	T	t	f	F
134.	I get blamed for things that I did not do wrong.	T	t	f	F

135.	People use me.	T	t	f	F
136.	I've taken drugs to get over the bad effects of quitting a drug.	T	t	f	F
137.	I don’t drink at parties.	T	t	f	F
138.	I like risky activities.	T	t	f	F
139.	My lack of self-control gets me in trouble.	T	t	f	F
140.	It's difficult for me to tell a lie.	T	t	f	F
141.	At times, marijuana has been more important to me than work, friends, or school.	T	t	f	F
142.	I have destroyed property just for kicks.	T	t	f	F
143.	I've often missed things I promised to attend.	T	t	f	F
144.	I have conned people to get money from them.	T	t	f	F
145.	I have broken into someone's home and taken things.	T	t	f	F
146.	I am sensitive to the feelings of others.	T	t	f	F
147.	I've broken the law to get money for drugs.	T	t	f	F
148.	I truly feel others' emotions.	T	t	f	F
149.	I have a habit of breaking rules.	T	t	f	F
150.	I'm not a drinker.	T	t	f	F
151.	I've made a fool of someone because it made me feel good.	T	t	f	F
152.	I often act on immediate needs.	T	t	f	F
153.	I have bought marijuana.	T	t	f	F
154.	I have stolen something worth more than $10.	T	t	f	F

155.	I'll take my chances at getting hurt if it means having more fun.	T	t	f	F
156.	When I want something, nothing else seems important.	T	t	f	F
157.	I've been fired from more than one job.	T	t	f	F
158.	After trying to cut down on drinking alcohol, I've felt sad or irritable.	T	t	f	F
159.	I'm honest with others.	T	t	f	F
160.	I've trembled and gotten sweaty when I stopped using drugs.	T	t	f	F

Appendix B: BAQ

Instructions: For each of the following below, please circle a number that best indicates how the statement applies to you. Answer according to the following scale:

1 - Extremely uncharacteristic of me

2 -

3 - Moderately characteristic of me

4 -

5- Extremely characteristic of me

1. Once in a while I can't control the urge to strike another person	1	2	3	4	5
2. I tell my friends openly when I disagree with them	1	2	3	4	5
3. I flare up quickly but get over it quickly	1	2	3	4	5
4. I am sometimes eaten up with jealously	1	2	3	4	5
5. Given enough provocation, I may hit another person	1	2	3	4	5
6. I often find myself disagreeing with people	1	2	3	4	5
7. When frustrated, I let my irritation show	1	2	3	4	5
8. At times I feel I have gotten a raw deal out of life	1	2	3	4	5
9. If somebody hits me, I hit back	1	2	3	4	5
10. When people annoy me, I may tell them what I think of them	1	2	3	4	5
11. I sometimes feel like a powder keg ready to explode	1	2	3	4	5

12. Other people always seem to get the breaks	1	2	3	4	5
13. I get into fights a little more than the average person	1	2	3	4	5
14. I can't help getting into arguments when people disagree with me	1	2	3	4	5
15. I am an even-tempered person	1	2	3	4	5
16. I wonder why sometimes I feel so bitter about things	1	2	3	4	5
17. If I have to resort to violence to protect my rights, I will	1	2	3	4	5
18. My friends say that I'm somewhat argumentative	1	2	3	4	5
19. Some of my friends think I'm a hothead	1	2	3	4	5
20. I know that "friends" talk about me behind my back	1	2	3	4	5
21. There are people who pushed me so far that we came to blows	1	2	3	4	5
22. Sometimes I fly off the handle for no good reason	1	2	3	4	5
23. I am suspicious of overly friendly strangers	1	2	3	4	5
24. I can think of no good reason for ever hitting a person	1	2	3	4	5
25. I have trouble controlling my temper	1	2	3	4	5
26. I sometimes feel that people are laughing at me behind my back	1	2	3	4	5
27. I have threatened people I know	1	2	3	4	5
28. When people are especially nice, I wonder what they want	1	2	3	4	5
29. I have become so mad that I have broken things	1	2	3	4	5

Appendix C: Distraction Task