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Visual attention to emotional stimuli in individuals high on psychopathic traits: Evidence from eye tracking

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VISUAL ATTENTION TO EMOTIONAL STIMULI

IN INDIVIDUALS HIGH ON PSYCHOPATHIC TRAITS:

EVIDENCE FROM EYE TRACKING

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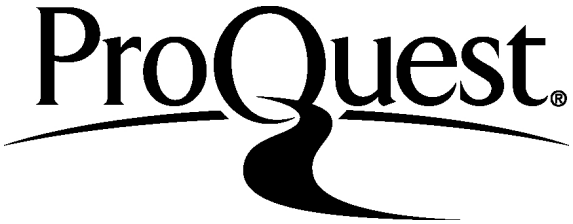

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Abstract

Researchers have described psychopaths as callous, cold-hearted individuals who show reduced empathic response to their victims. It is suggested that the inability to identify negative emotions, specifically fear, in individuals is what allows psychopaths to offend/take advantage of other people as they do not recognize the fear in victims that may otherwise deter victimization. This is the first study to examine how non-incarcerated individuals high on psychopathic personality traits process emotions. Additionally, eye-tracking technology was used to provide a more fine-grained assessment of attention. In contrast to hypotheses, the high psychopathic group did not differ from the low psychopathic or anxious control groups on any of the emotion processing tasks. This said, exploratory analyses revealed potentially interesting sex moderation effects. For example, men high on psychopathic personality spent more time looking at fearful eyes compared to men low on psychopathic personality and anxious men. Additionally, men low on psychopathic personality had more errors in identifying angry faces compared to men high on psychopathic personality and anxious men. Possible reasons for these findings as well as suggested areas of future research are discussed.

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People with psychopathy cost the public millions of dollars annually as many of them are incarcerated; however, "not all psychopaths are in prison. Some are in the Boardroom," (Babiak, Neumann & Hare, 2010, p. 174). Although fraudulent activity is not restricted to people with psychopathy, researchers are increasingly studying "corporate psychopathy" (Babiak, Neumann & Hare, 2010). Whereas researchers have estimated that 0.6-1.0% of the general population are psychopaths, approximately 3.5% of business professionals could be diagnosed with psychopathy (Gao & Raine, 2010). Similarities may exist between incarcerated individuals high on psychopathic personality and successful undergraduate students high on psychopathic personality. For example, stress immunity and social influence, two content scales of the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Widows, 2005), are evident in a variety of populations. Researchers have begun to extend the study of psychopathy to individuals who are successful in their careers, effectively navigate their world, attend college, and manage to avoid incarceration (Babiak, Neumann & Hare, 2010). Unfortunately, studies of the "successful psychopath" are sparse (DeMatteo et al., 2005, Gao & Raine, 2010).

Individuals with psychopathy are often characterized as manipulative, callous, fearless, and lacking empathy (Blair, Mitchell, & Blair, 2005; Lilienfeld & Widows, 2005). This lack of empathy is expected to play a role in both successful and unsuccessful psychopaths. These characteristics affect psychopaths' ability to interact with others in a meaningful way. Researchers have theorized that an Integrated Emotions Systems (IES) model may explain the empathy dysfunction and the fear dysfunction seen in people with psychopathy (Price, 2003). The IES model posits that neural systems involved in the processing of emotions may not function fully in those with psychopathy (Blair, Mitchell, & Blair, 2005). Specifically, the amygdala, which has been implicated in some emotional learning paradigms shows less activity

during aversive conditioning tasks in psychopathic individuals (Blair, Mitchell, & Blair, 2005). The amygdala is also involved in tasks that require *recognizing* and *processing* emotional expressions, and individuals with psychopathy have disturbances in both (Blair & Cipolotti, 2000). It is suggested that the inability to identify negative emotions, specifically fear, in individuals is what allows psychopaths to offend/take advantage of other people as they do not recognize the fear in victims that may otherwise deter victimization (Blair, Mitchell, & Blair, 2005).

It is possible that a deficiency in face processing contributes to the difficulty with recognizing emotions in others that is characteristic of psychopaths. For example, researchers have found that individuals with psychopathy as well as children with callous-unemotional traits, which is thought to be on a developmental continuum with adult psychopathy, have difficulty identifying and naming distressing emotions of others (i.e. fear, sadness) (Blair & Coles, 2000; Marsh & Blair, 2008; Stevens, Charman, & Blair, 2001). Additionally, individuals high on psychoticism (a trait similar to psychopathy in that they lack empathy and are coldhearted) have difficulty identifying and empathizing with, affective states in other people, particularly when the affect is negative (Miskovic & Schmidt, 2010). Moreover, individuals high on psychopathy show reduced responding to threatening stimuli (i.e. less autonomic response as measured by sweat) and deficits in empathy when shown sad faces (Blair, Mitchell & Blair, 2005). This deficit has been observed in response to fearful faces as well as difficulties in recognizing fear postures, and less reactivity to sounds and startle stimuli (Dadds et al., 2012). Further, although the emotional deficits of individuals with psychopathy have usually been examined with computerized images, the pattern has also been found in a naturalistic setting of callous-unemotional adolescent boys interacting with their parents (Dadds, Jambrak, Pasalich, Hawes & Brennan, 2011).

In addition to difficulty processing faces and recognizing emotions, individuals with psychopathy may have attentional biases for specific emotions. For example, there is evidence that individuals high on psychoticism show reduced attention to angry and happy faces as compared to normal controls (Miskovic & Schmidt, 2010). Accordingly, attentional dysfunction could explain the association between psychopathic traits such as disregard for social norms and an insensitive interpersonal style (Newman et al., 2010) as well as their difficulty with face processing and recognizing emotions.

One mechanism driving both the emotion processing difficulties and attentional biases in psychopathic individuals may be reduced attention to the eye regions of faces. The eye regions convey a wealth of emotional information and are often used to determine the emotion being conveyed. Specifically, several studies have shown that people focus on internal features of the face, in particular, the eyes, when completing tasks involving facial stimuli (Adolphs, 2006; Henderson et al., 2005; Sekiguchi, 2011; Stacey et al., 2005; Walker-Smith et al., 1977) and the eyes and mouth are particularly useful in discriminating between facial expressions (Adolphs, 2006). Supporting this hypothesis, boys exhibiting high levels of callous-unemotional traits spend less time looking at the eye region of facial stimuli than children low on callous-unemotional traits (Dadds, et al., 2008). This deficit in face processing has been shown in youth with callous unemotional traits who grow to become psychopaths (Dadds, et al., 2008). Perhaps importantly, this pattern was attenuated when individuals were directed to look at the eyes of the facial stimuli, suggesting that they can do it when instructed to do so but do not attend to eyes naturally on their own (Dadds, et al., 2008). To date, however, no study has examined patterns of attention to eye regions of faces in psychopathic adults. If individuals high on psychopathic

personality do not attend to the eyes, it could help to explain their deficits in emotional recognition and processing.

Limitations of Previous Research

Despite the breadth of research conducted on psychopathy, face processing, emotion recognition, and attentional biases, there are also some notable gaps in the literature. First, the majority of studies examine incarcerated individuals and few studies have examined psychopathic personality and processing of emotional stimuli in a non-incarcerated population (Sadeh & Verona, 2008). Therefore, the "successful psychopath", the one who has avoided detection by the criminal justice system has largely been ignored in the psychopathy literature. As psychopathic personality is seen as a dimensional construct, with extreme manifestations of normal personality traits, examining the non-incarcerated psychopath is pertinent to understanding the full spectrum of psychopathy.

Additional limitations to the current literature is that few studies examine psychopathic personality in women, although Cleckley's seminal work on psychopathy, *The Mask of Sanity* included case studies of psychopathic women (Cleckley, 1988). There are very few studies examining processing of emotions in psychopathic women, all have focused on incarcerated women, and the results of the studies are mixed. For example, one study indicated there were no differences between psychopathic and nonpsychopathic female offenders in startle response to unpleasant photos (Sutton, Vitale, & Newman, 2002). In another study, psychopathic women in an inpatient hospital performed worse than both a female psychopathic offender group and normal group on identifying sad expressions in briefly presented stimuli (Eisenbarth, Alpers, Segre, Calogero, & Angrilli, 2008).

A third limitation is that most studies have focused on psychopathic and non-psychopathic individuals, without the inclusion of any type of psychiatric control group. Without this type of control group, it is difficult to ensure that any differences observed between psychopathic and non-psychopathic groups is not due to general levels of psychopathology rather than being a specific feature of psychopathy. An appropriate psychopathology control group for a study examining psychopathic personality may be a group with moderate to severe anxiety. Whereas psychopathy is associated with low threat sensitivity, anxiety is associated with threat sensitivity (Lake, Baskin-Sommers, Li, Curtin, & Newman, 2011), suggesting that the two groups may differ on terms of attentional bias and emotion recognition.

A fourth limitation of research examining attentional biases has to do with the method of assessing these biases. The majority of studies examining attentional biases related to psychopathology have used the dot probe task (MacLeod, Mathews, & Tata 1986). In this computer-based task, emotional stimuli (e.g., faces) appear on the screen for a given amount of time (e.g., 1000ms) and then disappear. At this point, a probe appears in the location of one of the faces and participants are asked to respond as quickly as possible to the appearance of the probe. Preferential attention toward emotional stimuli is inferred when reaction times to probes replacing emotional stimuli are quicker than probes replacing neutral stimuli. However, recent research has questioned the psychometric properties of reaction time measures of attention (Brown et al., 2014; Kappenman, MacNamara, & Proudfit, in press; Price et al., in press; Waechter, Nelson, Wright, & Hyatt, 2014) and researchers have begun to used more direct measures of attentional allocation such as eye-tracking data, which allows a more comprehensive picture of attentional allocation (Armstrong & Olatunji, 2012). Specifically, in addition to measuring whether the person looks longer at one stimulus (e.g., facial display of emotion)

versus another, eye-tracking also allows one to determine how long the participant looks at different regions of a given stimulus (e.g., eye region of a face). Although gaze direction and attention are not synonymous constructs, attentional shift and eye movements are strongly correlated (Van der Stigchel & Theeuwes, 2005).

The Current Study

The current study examined the relation between psychopathic personality, attention and emotion. The study focused on three groups of non-incarcerated men and women: (i) those with high levels of psychopathy and low levels of anxiety, (ii) those with high levels of anxiety and low levels of psychopathy, and (iii) those with low levels of psychopathy and anxiety. Eye-tracking methods were used to examine the relation between psychopathic personality and face processing. First, attention biases for emotional faces were examined across groups. It was hypothesized that (i) individuals high on psychopathic personality would disengage more easily from faces showing distressing emotions (fearful, angry), (ii) individuals low on psychopathic personality would not have biases to particular faces and instead would attend equally across facial expressions, and (iii) individuals in the anxiety group would have difficulty disengaging from distressing (i.e. angry and fearful) faces. Next, biases in attention to the eye regions of faces were examined across groups. It was hypothesized that individuals high on psychopathic personality would spend less time looking at the eye region of faces (in both the dot-probe task, and the emotion recognition) compared to those low on psychopathic personality and the anxiety control group. Finally, difficulties in emotion recognition were assessed. It was hypothesized that individuals high on psychopathic personality would have more errors naming the distress emotions depicted (i.e. fear, anger) in an emotion recognition task as compared to the other two groups. As noted little research has been conducted examining psychopathic women. Therefore,

exploratory analyses were conducted to determine whether psychopathic men and women performed differently on the eye-tracking tasks.

Method

Participants

Participants were screened and recruited over 5 semesters, beginning in Fall of 2013 and finishing in Spring of 2014. Undergraduate students at an upstate NY University enrolled in psychology courses completed screening measures in mass testing, including the Psychopathic Personality Inventory-Revised Short Form (PPI-R: SF; Lilienfeld, 1996) and the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) and were awarded with research credit for their time. Additionally, students in other departments (i.e. Engineering, Management) were asked to complete the screening measures (less than 15 minutes of their time) for which they were entered into a drawing for one of several $50 gift cards. Finally, students were recruited from an Upstate NY community college with the same incentives as those students outside of the Psychology Department (i.e., in the Engineering and Management departments) of the upstate NY University. For this study, three groups of participants were recruited: high psychopathy (16 men, 15 women), low psychopathy (9 men, 22 women), and high anxiety (17 men, 16 women). To qualify for the high psychopathy group, individuals were required to score in the upper quartile of the PPI-R SV of all respondents and not have a moderate to severe anxiety score based on the STAI Trait. To qualify for the low psychopathy group, participant were required to score in the lower quartile of the PPI-R SV of all respondents and not have a moderate to severe anxiety score based on the STAI Trait. Finally, to qualify for the high anxiety group, participants were required to score in the moderate to severe range of anxiety on the STAI and not have a PPI-R SV score in the upper or lower

quartile. Of the 35 individuals (16 men, 19 women) who met criteria for the high psychopathy group, 31 enrolled in the study (16 men, 15 women). Of the 72 individuals (27 men, 45 women) who met criteria for the low psychopathy group, 31 enrolled in the study (9 men, 22 women). Finally, of the 62 individuals (27 men, 35 women) who met criteria for the anxiety group, 33 enrolled in the study (17 men, 16 women). Although participants were recruited using the PPI-R SV, they also completed the full version of the PPI-R as part of the laboratory visit as well as completing the STAI Trait again. The scores of all participants on these measures were consistent with their original group assignments. On the full version of the PPI-R, the high psychopathic group's average score was 341.5 out of possible 616, which is higher than an offender sample, M = 283.9 (Lilienfeld & Widows, 2005). Descriptive statistics for the three groups are presented in Table 1.

Measures

Levels of psychopathy were assessed using the Psychopathic Personality Inventory Revised-Short Version (PPI-R SV; Lilienfeld & Widows, 1996) and the full version of the PPI-R (Lilienfeld & Widows, 2005). The PPI-R SV is a 56-item, self-report questionnaire that measures psychopathic personality traits using an ordinal response set consisting of "False," "Mostly False," "Mostly True," and "True." The PPI-R SV has eight content scales that comprise the total score. The content scales consist of, Machiavellian Egocentricity, Rebellious Nonconformity, Blame Externalization, Carefree Nonplanfulness, Social Influence, Fearlessness, Stress Immunity, and Coldheartedness. The current study utilized scores from the PPI-R Short Version (PPI-R SV, Lilienfeld & Andrew, 1996), which is based directly on the PPI-R full version and has demonstrated good reliability in measuring self-reported psychopathic personality traits (Vaughn, Howard, & DeLisi, 2008). The PPI-R has been standardized on

incarcerated and non-incarcerated populations. For the community/college standardization (non-incarcerated) sample internal consistency ranges from .78 to .92 and temporal stability ranges from .82 to .93 (Lilienfeld & Widows, 2005). In the current study, PPI-R SV demonstrated good internal consistency (α =.78). As noted above, participants also completed the full version of the PPI-R as part of the laboratory assessment. The PPI-R exhibited excellent internal consistency in this sample (α =.96) and all individuals remained in their respective groups (i.e. high scorers on the PPI-R SV remained high scorers on the PPI-R and low scorers remained low). Levels of anxiety were assessed using the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). The STAI is a 40 item self-report measure that assesses level of anxiety, distinguishing between state (i.e. temporary condition) and trait (i.e. general tendency to perceive situations as threatening). Internal consistencies for state anxiety scale scores ranged from 0.83 to 0.92 and for trait anxiety scale scores ranged from 0.86 to 0.92 for male and female college students. The current study focused on trait anxiety and the STAI-Trait exhibited good internal consistency in this study (α =.89).

Attentional biases were assessed with a dot probe task during which eye tracking was used to assess patterns of gaze. Prior to starting the eye tracking component of the experiment, subjects' eyes were calibrated to ensure accurate measurement. Individuals whose eyes could not be calibrated could not complete the eye-tracking tasks. Eye fixations were defined as at least 100 milliseconds. Participants' fixations were used to examine face processing and interest areas for each task. Stimuli for the dot-probe task consisted of pairs of facial expressions that contained one emotional (angry, fearful, or happy) and one neutral photograph from the same actor taken from a standardized stimulus set (Tottenham et al., 2009). Photographs from each actor (16 males and 16 females) were used to create angry-neutral, fearful-neutral, and happy-

neutral stimulus pairs (192 pairs total). The images were 80mm high x 70 mm wide and were 90 mm apart. Participants sat a distance of 90 cm away from the computer monitor with their chin on a chin rest. Each stimulus pair was presented in random order. Each trial began with the presentation of a central fixation cross, and participants were required to make a central fixation before stimuli were presented. Stimuli were presented for 1000 ms, followed by a probe (a half-closed or fully closed circle). Although previous dot-probe tasks use probes to *replace* the neutral or emotional images (Macleod, Mathews, & Tat, 1986), the current study *superimposed* the probe on the faces to examine disengagement more accurately. Following presentation of the dot probe on the screen, participants were asked to indicate which type of probe was presented as quickly as possible using a handheld controller. The probe was presented with equal frequency in the location of the emotional and neutral faces. Trials with response errors were excluded (3.93%) as were trials with response times less than 150 ms or greater than 1500 ms (3.49%).

Although previous research in children with psychopathic tendencies used 500ms for the dot probe task presentation of facial stimuli (Kimonis, Frick, Fazekas & Loney, 2006) extending the time of stimuli presentation prior to the probe's appearance to 1000ms allows for a more comprehensive examination of attentional disengagement. In addition, whereas in previous research the faces disappeared prior to the appearance of the probe, in this study, the faces remained on the screen after the appearance of the probe to more directly assess disengagement of attention. During this task, patterns of gaze allocation were assessed using a SR Research Eyelink 1000 System eye tracker. Due to an unanticipated error in programming, initial fixations could not be calculated; thus, comparisons could not be made. Therefore analyses focused on attentional biases and proportion of time spent looking at the eye region of each of the emotional faces. Attention bias was calculated as the time it took to disengage from the emotional face to

look at the probe that was on the neutral face. Additionally, a proportion was calculated to determine the amount of time spent looking at the eye region for each emotion. The following formula was used: Proportion spent looking at eyes = Time spent looking at eyes/Time spent looking at face. This proportion was calculated for angry, fearful, and happy faces.

Finally, participants' emotion recognition abilities were examined. In this task, faces displaying different emotions (angry, fearful, happy, neutral) were presented one at a time on the computer screen. Participants sat a distance of 90 cm away from the computer monitor with their chin on a chin rest. Each picture was presented in random order. Each trial began with the presentation of a central fixation cross, and participants were required to make a central fixation before stimuli were presented. In line with previous research, each face was presented for 2 seconds (Dadds, et al., 2008). A different set of facial stimuli were used to limit the opportunity for practice or experience effects. The photos were taken from the Japanese and Caucasian Faces of Emotional Expressions (JACFEE; Matsumoto & Ekman, 1998). The colored photographs consisted of Caucasian men and women in similar plain clothing. After the stimulus was removed from the screen, the participants were asked "What emotion was just shown to you?" Participants were instructed to press a button associated with a given emotion (1-angry, 2-fearful, 3-happy, 4-neutral). In addition to determining the accuracy of labeling of each emotion, the time spent looking at the eye region of each face across emotions was examined. A similar proportion was created for this task as was created for the dot probe task, to determine time spent looking at the eye region of each emotional face: Proportion spent looking at eyes = Time spent looking at eyes/Time spent looking at face.

Procedure

Those individuals who scored in the upper quartile range on the PPI-R SF (Lilienfeld, 1996) and those who score in the lower quartile range were invited to the lab to complete the full protocol. Additionally for the anxiety/control psychopathology group, individuals who score in the moderate or severe range of anxiety were offered the opportunity to complete the full protocol. Once in the laboratory, and after informed consent was obtained, all subjects completed questionnaires, and the eye-tracking components of the protocol: a dot probe task and an emotion recognition task.

Prior to each eye-tracking task, the participant's eyes had to be calibrated. This consisted of a two-dimensional calibration in which participants sat 90 cm away from the screen and rested their chin on a chin rest. Participants were asked to look at the fixation cross as it was presented on the screen. Nine fixation crosses appeared on the screen at various locations in random order. Once they had fixated at the cross, participants were instructed to press a button on a handheld controller. Once they did so, the fixation cross would disappear, and then reappear at one of the other locations. They were instructed to do this until all nine locations has been fixated upon. Next, there was a validation cycle that measured saccades to the nearest 0.3 degree of visual angle.

After the first calibration, the dot probe task began. Participants were shown 192 pairs of faces that contained one emotional (angry, fearful, or happy) and one neutral photograph from the same actor taken from a standardized stimulus set (Tottenham et al., 2009). Each stimulus pair was presented in random order. Each trial began with the presentation of a central fixation cross, and participants were required to make a central fixation before stimuli were presented. Stimuli were presented for 1000 ms, followed by a probe (a half-closed or fully closed circle).

Following presentation of the dot probe on the screen, participants were asked to indicate which type of probe was presented as quickly as possible using a handheld controller. The probe was presented with equal frequency in the location of the emotional and neutral faces. Their responses were recorded and their eye movements were tracked with a SR Eyelink 1000 System eye tracker.

After the dot probe task, participants received a short break. Then an additional calibration trial occurred to ensure accurate measurement of eye movements. Next the ratings task began. Subjects were shown 16 faces displaying different emotions (angry, fearful, happy, neutral) were presented one at a time on the computer screen. Each picture was presented in random order. Each trial began with the presentation of a central fixation cross, and participants were required to make a central fixation before stimuli were presented. After the stimulus was removed from the screen, the participants were asked "What emotion was just shown to you?" Participants were instructed to press a button associated with a given emotion (1-angry, 2-fearful, 3-happy, 4-neutral). The accuracy of their responses were recorded. Additionally, their eye movements were tracked with an SR Eyelink 1000 System eye tracker.

Results

A preliminary examination of the data revealed the presence of missing data, with up to 8% missing for any given variable due to participant nonresponse. We examined whether the data were missing at random, thereby justifying the use of data imputation methods for estimating missing values (cf. Shafer & Graham, 2002). Little's missing completely at random (MCAR) test, for which the null hypothesis is that the data are MCAR (Little & Rubin, 1987), was nonsignificant, $\chi^2(600) = 596.07$, $p = .54$, providing support for the imputation of missing

values. Given these results, maximum likelihood estimates of missing data were created and used in all subsequent analyses (see Shafer & Graham, 2002).

Hypothesis 1: Individuals high on psychopathic personality will disengage more easily from faces depicting distressing emotions (fearful, angry). Individuals low on psychopathic personality will not have biases to particular faces, and instead will attend equally across facial expressions.

This hypothesis was tested with a 3 (Group: High Psychopathic, Low Psychopathic, Anxiety Control) x 3 (Emotion: Angry, Fearful, Happy) repeated measures ANOVA with time to disengage attention from emotional faces serving as the dependent variable. In this analysis, the main effect of group was not significant, $F(2, 92) = 0.34$, $p = .71$, $\eta^2_p = .01$, nor was the main effect of emotion, $F(2, 184) = 1.01$, $p = .34$, $\eta^2_p = .01$. Finally, the group x emotion interaction was also nonsignificant, $F(4, 184) = 0.80$, $p = .53$, $\eta^2_p = .02$. Therefore, this hypothesis was not supported. Exploratory analyses were then conducted to examine the potential moderating role of participant sex. The group x emotion x sex interaction was not significant, $F(4, 178) = 0.76$, $p = .56$, $\eta^2_p = .02$.

Hypothesis 2*:* Individuals high on psychopathic personality will spend less time looking at the eye region of faces (in both the dot-probe task, and the emotion recognition) compared to those low on psychopathic personality and the psychopathology control group.

This hypothesis was also tested with two 3 (Group: High Psychopathic, Low Psychopathic, Anxiety Control) x 3 (Emotion: Angry, Fearful, Happy) repeated measures ANOVAs with duration of attention to the eye region for each emotion serving as the dependent variable. For the dot probe task, the main effect of group was not significant $F(2, 92) = 0.34$, $p = .72$, $\eta^2_p = .01$, nor was the main effect of emotion $F(2, 184) = 0.45$, $p = .64$, $\eta^2_p = .01$. Lastly, the

group x emotion interaction was nonsignificant $F(4, 184) = 0.69$, $p = .59$, $\eta^2_p = .02$. For the ratings task, although the main effect of group, $F(2, 92) = 1.05$, $p = .36$, $\eta^2_p = .02$, and the group x emotion interaction, $F(4, 184) = 1.04$, $p = .39$, $\eta^2_p = .02$, were not significant, there was a significant main effect of emotion , $F(2, 184) = 30.89$, $p < .001$, $\eta^2_p = .25$. Examining the form of this main effect revealed that participants in general spend more time looking at the eye region of angry faces (.60) than the eye region of fearful (.52) or happy faces (.49).

Finally, exploratory analyses were conducted to examine the potential moderating role of participant sex, focusing first on attention to the eye region in the dot probe task and then focusing on attention to eye region in the ratings task. Examining attention to eye regions in the dot probe task, there was not a significant sex x group x emotion interaction $F(4, 178) = .76$, $p = .56$, $\eta^2_p = .02$.

In contrast, examining attention to eye regions in the ratings task, there was a significant sex x group x emotion interaction, $F(4, 178) = 2.74$, $p = .03$, $\eta^2_p = .06$. To determine the form of this interaction, follow up tests were conducted to examine the sex x group interaction for each emotion separately. These analyses revealed that although the group x sex interaction was not significant for angry faces, $F(2, 95) = 0.46$, $p = .63$, $\eta^2_p = .01$, or happy faces, $F(2, 95) = 2.07$, $p = .13$, $\eta^2_p = .04$, it was significant for fearful faces, $F(2, 95) = 7.12$, $p = .001$, $\eta^2_p = .14$. Examining group difference in attention separately among men and women showed that there were nonsignificant group differences in attention to fearful faces in women, $F(2, 53) = 2.73$, $p = .08$, $\eta^2_p = .10$, and a significant group differences for men, $F(2, 42) = 5.30$, $p = .009$, $\eta^2_p = .21$. Post hot tests revealed that men high on psychopathic personality spent more time looking at fearful eyes (56%) compared to men low on psychopathic personality (50%) and anxious men (50%), with the latter two groups not differing significantly.

Hypothesis 3*:* Individuals high on psychopathic personality will have more errors naming the distress emotions depicted (i.e. fear, anger) in an emotion recognition task as compared to the other two groups.

This hypothesis was tested with a 3 (Group: High Psychopathic, Low Psychopathic, Anxiety Control) x 3 (Emotion: Angry, Fearful, Happy) repeated measures ANOVA with accuracy of naming each emotion as the dependent variable. The main effect of group was not significant, $F(2, 92) = 1.73$, $p = .18$, $\eta^2_p = .04$, nor was the main effect of emotion, $F(2, 184) = 2.86$, $p = .06$, $\eta^2_p = .03$. In addition, the group x emotion interaction was a nonsignificant trend, $F(4, 184) = 2.19$, $p = .07$, $\eta^2_p = .05$.

Finally, exploring the potential moderating role of participant sex, there was a significant main effect of sex, $F(1, 89) = 7.12$, $p = .009$, $\eta^2_p = .07$, which was qualified by a significant group x sex interaction, $F(2, 89) = 6.24$, $p = .003$, $\eta^2_p = .12$, and a significant group x sex x emotion interaction, $F(4, 178) = 5.12$, $p = .001$, $\eta^2_p = .10$. Examining the group x emotion interaction separately for men and women, it was significant for men $F(4, 78) = 4.57$, $p = .002$, $\eta^2_p = .19$, but not for women $F(4, 100) = 1.37$, $p = .25$, $\eta^2_p = .05$. Among men, the group difference in accuracy at recognizing anger was significant $F(2, 42) = 4.61$, $p = .02$, $\eta^2_p = .19$, with those in the low psychopathic personality group being less accurate at recognizing angry faces (89%) compared to men high on psychopathic personality (100%) and anxious men (99%). Among men, the group difference in accuracy at recognizing fear was not significant $F(2, 42) = .81$, $p = .45$, $\eta^2_p = .04$, and the model for happy faces would not run because all participants had 100% accuracy on the ratings task.

Discussion

The current study examined how non-incarcerated adults exhibiting high versus low levels of psychopathic personality traits would perform on a variety of emotion processing tasks. Research has suggested that individuals at risk of developing psychopathy, and those with psychopathy, may have difficulty identifying fear in others (Dadds, et al., 2008; Blair, Mitchell, Blair, 2005), which may be what allows them to take advantage of other people. This is the first study to examine emotion processing in *non*-incarcerated adults exhibiting high levels of psychopathic personality traits despite the value this research would have in understanding the similarities between these populations and their incarcerated counterparts.

We hypothesized that individuals high on psychopathic personality would disengage more easily from fearful and angry faces compared to those low on psychopathic personality or an anxious control group. This hypothesis was not supported and all groups attended equally across emotional faces. Although the precise reasons for the lack of significant group differences is not clear, there are at least two possibilities. First, it may have been due to the nature of the high psychopathy group, which was functioning well enough to attend college. Indeed, only one person in the study had a history of arrest and this person was in the anxious group (possession of marijuana). Therefore, it is possible that individuals who have remained unincarcerated despite high psychopathy are just as likely to disengage from emotional faces as their low psychopathy counterparts. Successful psychopathy, then, may be maintained by individuals' ability to at least feign typical reactions to emotional faces. That is, even if an individual high on psychopathy is having a particular physiological response (or lack of it) to witnessing emotion, he or she may be able to remain visually engaged with another person. Although there is a well-established body of research on emotion processing in incarcerated

populations, the current study provides some elucidation of the emotion processing among successful psychopaths. Perhaps what helps a successful psychopath avoid incarceration is linked to other characteristics, not just difficulty in identifying, processing, or empathizing with others' emotions. A second possible reason for the nonsignificant group differences has to do with the nature of the dot probe task used in this study. Specifically, whereas in a typical dot probe experiment, the faces disappear before the probe appears, in this study, the faces stayed on the screen and the probe was superimposed on one of the faces. Although this design decision was made to have a better measure of attentional disengagement, it may also have caused individuals to be hypervigilant in scanning the screen in order to detect the probe, which may have obscured group differences.

The second hypothesis was related to a mechanism hypothesized to contribute to difficulties identifying fear, specifically, the time they spent attending to the faces, and especially the eyes, of others (e.g., Dadds, et al., 2008). I hypothesized that individuals high on psychopathic personality would spend less time looking at the eye region of faces compared to the low psychopathic and anxious control groups. This hypothesis was also not supported. In the current study, adults with high psychopathy spent the same amount of time looking at the eyes as the low psychopathic personality and the anxiety control groups. However, exploratory analyses revealed sex differences in attention to emotional eyes, such that men high on psychopathic personality spent more time looking at the eyes of fearful faces as compared to men in the other two groups. There was no group difference among the women. This attention to fearful faces, although not originally hypothesized, may be an important finding. One thing to note is that the sample in the current study is young (average age of 19.6 years old), suggesting that although all participants are currently unincarcerated, it is not known whether these individuals will go on to

offend, in either a violent or non-violent way (e.g., Bernie Madoff). It is possible, then, that men who are high on psychopathy remain attentive to eyes of fearful faces to a) feign interest, as what is suggested by the findings of the first hypothesis, or b) to maybe gather more information about a potential victim. The current study does not allow for the testing of such hypotheses, but future work may consider longitudinal research with individuals high in psychopathy, or incorporate additional assessments to determine patterns of physiological arousal in conjunction with visual attention. For instance, are psychopathic men more likely to attend to the eyes while having a lower physiological response than others? Perhaps visual attention assessment is not capturing this neurological phenomenon, but eye-tracking technology paired with physiological arousal measures such as galvanic skin response or heart rate, or even brain imaging like fMRI or brain waves in EEG would provide a fuller picture of emotional processing of those high on psychopathic personality.

Our last hypothesis was that individuals high on psychopathic personality would have more errors in identifying angry and fearful faces compared to the low psychopathic and anxious groups. This hypothesis was not supported. However, exploratory analyses again suggested the presence of sex differences. Specifically, low psychopathic men were less accurate at naming emotions, specifically anger, compared to men in the high psychopathic and anxious groups. Although these differences were statistically significant, they were not necessarily clinically significant, as most individuals accurately identified all emotional faces. One explanation for the discrepancy between the current findings and previous research is that previous research was conducted with children, who may have had more difficulty identifying emotion due developmental phase, thereby reducing ceiling effects. Another possibility is that an inability to identify fear is specific to incarcerated individuals. Perhaps, for individuals high in psychopathy

who have remained unincarcerated, this ease of identifying emotions contributes to their successful psychopathy. Although they can recognize emotions with ease, recognition alone does not imply empathic response. These results are consistent with what has been speculated above. It may be that men high in psychopathy, more so than women or men low in psychopathy, are able to stay engaged in emotions, and readily identify emotions, not in the service of empathy and community, but in the service of attempting to read and ultimately control an interpersonal, emotional situation. Certainly, anecdotally, this is what successful psychopaths have done in their lives: make people feel included, understood, etc. only to then use that information to exploit or cheat someone.

This study is the first to examine non-incarcerated adults high on psychopathic personality and emotion processing. The current study provides a foundation for the study of successful psychopaths and emotion processing. Additionally, although undergraduate students were used, they were from two Universities and multiple departments, enhancing generalizability of the findings. Despite these strengths, there are some limitations that should be noted. First, a self-report screening tool of psychopathic personality was used, and has not been as well-validated as the full version of the measure. Self-report measurements in general are susceptible to validity issues, including positive and negative impression management, as well as careless or inconsistent response patterns. Although the full version allows for calculation of such scores, and lets a specific measure be included or exclude from the study, the screener version does not. As mentioned previously, the sample was relatively young (average age of 19.6 years old), and although all participants are not currently incarcerated, it is unknown whether these individuals will offend in the future, in either a violent or non-violent way. Indeed, in the current study, only one subject reported a criminal history –a woman in the Anxious group reported being arrested

for possession of marijuana. Therefore, the high psychopathy group was not only not incarcerated, but also did not appear to have a history of criminal activity. This said, the mean PPI-R score of the high psychopathology group was higher than that observed in a previous study of incarcerated individuals (Lilienfeld & Widows, 2005) suggesting that the lack of significant group differences in the current study may have been due more to fact that individuals in the high psychopathology group in this study were relatively well functioning rather than to them exhibiting lower levels of psychopathy.

Another potential limitation is that the emotional faces used in the ratings tasks were not subtle, but rather, fully expressed emotions. Therefore, although some significant group differences were observed, findings may have been stronger with more subtle displays of emotion. Future researchers might consider using morphed faces, which start at subtle expressions of emotions and transition to more blatant expressions of emotions, thus providing a wider range of information regarding the point at which emotions become identifiable, and to whom.

In summary, this is the first study to assess emotional processing of non-incarcerated adults high on psychopathic personality. Future research is needed to determine whether the deficits observed in incarcerated psychopaths will be observed in the non-incarcerated, higher functioning counterparts. The current results suggest that deficits in emotion processing may only be observed at greater levels of psychopathy or general impairment. The current results also highlight the need for additional research on psychopathic women as it appears that there are meaningful and important differences in emotion processing between psychopathic women and men. This research may ultimately inform early intervention or prevention programs for non-incarcerated individuals showing signs of psychopathy.

Table 1.
Demographic Information by Group and Sex

	High Psychopathy		Low Psychopathy		Anxious Control	
	Male (*n*=15)	Female (*n*=14)	Male (*n*=9)	Female (*n*=22)	Male (*n*=16)	Female (*n*=16)
Age (*M*, *SD*)	18.9 (0.9)	19.0 (1.1)	20.7 (6.1)	19.8 (1.5)	20.3 (2.9)	19.3 (1.5)
Race (% Caucasian)	68.8%	66.7%	80%	77.3%	62.5%	62.5%
PPI-R SV (*M*, *SD*)	160.0 (10.3)	157.7 (7.2)	98.3 (3.9)	92.7 (7.9)	122.7 (13.5)	111.3 (13.5)
PPI-R Full *(M, SD)*	351.8 (31.8)	328.7 (33.3)	247.3 (19.7)	236.2 (14.9)	286.9 (27.1)	255.8 (31.2)
STAI (*M*, *SD*)	31.8 (6.1)	36.8 (8.1)	44.5 (9.2)	41.0 (11.9)	56.9 (6.2)	61.2 (10.2)

Note. PPI-R SV = Psychopathic Personality Inventory - Revised Short Version. PPI-R = Psychopathic Personality-Revised Full Version. STAI = State Trait Anxiety Inventory-Trait Version.

Table 2.

Raw Data for Dot Probe Task by Group and Sex

		High Psychopathy		Low Psychopathy		Anxious Control	
		Male (*n*=15)	Female (*n*=14)	Male (*n*=9)	Female (*n*=22)	Male (*n*=16)	Female (*n*=16)
Time to Disengage (*M, SD*)	Angry	430.8 (87.4)	585.8 (310.7)	450.1 (297.4)	460.7 (368.2)	333.69 (116.9)	510.7 (240.8)
	Fearful	514.6 (231.4)	533.7 (434.7)	453.7 (219.9)	576.0 (244.5)	474.9 (150.2)	572.5 (370.9)
	Happy	420.5 (154.1)	369.9 (209.3)	480.6 (264.4)	319.2 (199.6)	454.0 (178.0)	420.3 (275.3)
Proportion (%) Attention to Eye Region (*M, SD*)	Angry	.09 (.12)	.18 (.15)	.12 (.13)	.17 (.18)	.16 (.16)	.22 (.15)
	Fearful	.20 (.16)	.17 (.17)	.12 (.17)	.19 (.17)	.15 (.16)	.21 (.15)
	Happy	.18 (.16)	.16 (.18)	.12 (.16)	.16 (.17)	.18 (.17)	.18 (.19)

Note. High Psychopathy = High psychopathic group. Low Psychopathy = Low psychopathic group. Anxious Control= Anxious control group.

Table 3.

Raw Data for Ratings Task by Group and Sex

		High Psychopathy		Low Psychopathy		Anxious Control	
		Male (*n*=15)	Female (*n*=14)	Male (*n*=9)	Female (*n*=22)	Male (*n*=16)	Female (*n*=16)
Proportion Attention to Eye Region (*M, SD*)	Angry	.60 (.09)	.60 (.10)	.63 (.07)	.59 (.05)	.61 (.06)	.59 (.08)
	Fearful	.56 (.07)	.49 (.07)	.50 (.05)	.53 (.08)	.50 (.05)	.56 (.07)
	Happy	.47 (.21)	.44 (.20)	.45 (.07)	.53 (.08)	.52 (.05)	.49 (.21)

Note. High Psy = High psychopathic group. Low Psy = Low psychopathic group. Anxious = Anxious control group.

References

Adolphs, R. (2006). Perception and emotion: How we recognize facial expressions. *Current Directions in Psychological Science, 15*(5), 222-226.

Armstrong, T & Olatunji, B.O. (2012). Eye tracking of attention in the affective disorders: A meta-analytic review and synthesis. *Clinical Psychology Review, 32*(8), 704-723.

Babiak, P., Neumann, C.S. & Hare, R.D. (2010). Corporate psychopathy: Talking the walk. *Behavioral Sciences & The Law, 28* (2), 174-193.

Blair, J., Mitchell, D., & Blair, K. (2005). *The Psychopathy: Emotion and the Brain*. Malden, MA: Blackwell Publishing.

Brown, H. M., Eley, T. C., Broeren, S., MacLeod, C., Rinck, M., Hadwin, J. A., & Lester, K. J. (2014). Psychometric properties of reaction time based experimental paradigms measuring anxiety-related information-processing biases in children. *Journal of Anxiety Disorders, 28*, 97–107.

Campbell, R., Elgar, K., Kuntsi, J., Terstegge, J., Coleman, M., & Skuse, D. (2002). The classification of 'fear' from faces is associated with face recognition skill in women. *Neuropsychologia, 40* (2), 575-584.

Cleckley, H.M. (1988) *The Mask of Sanity: An attempt to clarify some issues about the so-called psychopathic personality*. 5th Edition, C.V. Mosby Co., St. Louis.

Crossman, D.M., Howard, L., Lucas, M., & Donovick, P.J. (2011). *Psychopathic personality and attention: A college sample*. Unpublished manuscript.

Dadds, M.R., Allen, J.L., Oliver, B.R., Faulkner, N., Legge, K., Moul, C., Woolgar, M., & Scott, S. (2012). Love, eye contact and the developmental origins of empathy v. psychopathy. *The British Journal of Psychiatry, 200*, 191-196.

Dadds, M.R., Jambrak, J., Pasalich, D., Hawes, D.J., & Brennan, J. (2011). Impaired attention to the eyes of attachment figures and the developmental origins of psychopathy. *The Journal of Child Psychology and Psychiatry, 52* (3), 238-245.

Eisenbarth, H., Alpers, G.W., Segre, D., Calogero, A. & Angrilli, A. (2008). Categorization and evaluation of emotional faces in psychopathic women. *Psychiatry Research, 159*, 189-195.

Gronwall, D.M.A. (1977). Paced auditory serial-addition task: A measure of recovery from concussion. *Perceptual and Motor Skills*, 44, 367-373.

Hare, R. D. (2003). Manual for the Revised Psychopathy Checklist (2nd ed.). Toronto, ON, Canada: Multi-Health Systems.

Henderson, J.M., Williams, C.C., & Falk, R.J. (2005). Eye movements are functional during face learning. *Memory and Cognition, 33*(1), 98-106.

Hiatt, K.D., Schmitt, W.A., & Newman, J.P. (2004). Stroop tasks reveal abnormal selective attention among psychopathic offenders. *Neuropsychology, 18*, 50-59.

Jutai, J. W., & Hare, R. D. (1983). Psychopathy and selective attention during performance of a complex perceptual-motor task. *Psychophysiology, 20*(2), 146-151.

Kappenman, E. S., MacNamara, A., & Proudfit, G. H. (in press). Electrocortical evidence for rapid allocation of attention to threat in the dot-probe task. *Social Cognitive and Affective Neuroscience*.

Kosson, D.S. (1996). Psychopathy and dual-task performance under focusing conditions. *Journal of Abnormal Psychology, 105*, 391-400.

Kosson, D.S. (1998). Divided visual attention in psychopathic and nonpsychopathic offenders. *Personality and Individual Differences, 24*, 373-391.

Kosson, D.S. & Newman, J.P. (1986). Psychopathy and the allocation of attentional capacity in a divided attention situation. *Journal of Abnormal Psychology, 95*, 257-263.

Kosson, D.S. & Harpur, T.J. (1997). Attentional skills of psychopaths: Current evidence and developmental implications. In J.A. Burack & J.T. Enns (Eds.), Attention, development, and psychopathology (pp.379-402). New York: Guilford Press.

Lilienfeld, S.O. & Widows, M.R. (2005). *Psychopathic Personality Inventory- Revised Manual: Professional manual*. Lutz, FL: Psychological Assessment Resources.

Llanes, S., & Kosson, D.S. (2006). Divided visual attention and left hemisphere activation among psychopathic and nonpsychopathic offenders. *Journal of Psychopathology and Behavioral Assessment, 28*, 9-18.

MacLeod, C., Mathews, A., & Tata, P. (1986) . Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95*, 15-20.

Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology*, 1, 167-195.

Mayer, A. R., Kosson, D. S., & Bedrick, E. J. (2006). Neuropsychological implications of selective attentional functioning in psychopathic offenders. *Neuropsychology, 20*(5), 614-624.

Miskovic, V. & Schmidt, L.A. (2010). Individual differences in psychoticism predict attention for emotional faces. *Personality and Individual Differences, 48*, 499-501.

Newman, J. P., Curtin, J. J., Bertsch, J. D., & Baskin-Sommers, A. R. (2010). Attention moderates the fearlessness of psychopathic offenders. *Biological Psychiatry, 67*(1), 66-70.

Patrick, C.J. (1994) Emotion and psychopathy: Startlinh new insights. *Psychophysiology, 31*, 319-330.

Price, R. B., Kuckertz, J. M., Siegle, G. J., Ladouceur, C. D., Silk, J. S., Ryan, N. D., et al. (in press). Empirical recommendations for improving the stability of the dot probe task in clinical research. *Psychological Assessment*.

Robins, L.N., Tipp, J., & Pryzbeck, T. (1991). Antisocial personality. In L.N. Robins, D.A. Regier (eds), *Psychiatric Disorders in North America*. New York: Free Press.

Sadeh, N., & Verona, E. (2008). Psychopathic personality traits associated with abnormal selective attention and impaired cognitive control. *Neuropsychology, 22*(5), 669-680.

Schofield, C.A. (2010). *Attentional biases in social phobia: Utilizing eye tracking data.* (unpublished doctoral dissertation. Binghamton University, Binghamton, NY.

Sekiguchi, T. (2011). Individual differences in face memory and eye fixation patterns during face learning. *ACTA Psychologica (Amsterdam), 137*(1), 1-9.

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Stacey, P.C., Walker, S., & Underwood, J.D. (2005). Face processing and familiarity: evidence from eye-movement data. *British Journal of Psychology, 96*(Pt 4), 407-422.

Sutton, S.K., Vitale, J.E., & Newman, J.P. (2002). Emotion among women with psychopathy during picture perception. Journal of Abnormal Psychology, 111 (4), 610-619.

Tottenham, N., Tanaka, J. W., Leon, A. C., McCarry, T., Nurse, M., Hare, T.A., Marcus, D.J., Westerlund, A., Casey, B. J. & Nelson, C. A. (in press). The NimStim set of facial expressions: Judgements from untrained research participants. *Psychiatry Research.*

Van der Stigchel, S., & Theeuwes, J. (2005). Relation between saccade trajectories and spatial distractor locations. *Cognitive Brain Research, 25*(2), 579-582.

Vaughn, M.G., Howard, M.O., & DeLisi, M. (2008). Psychopathic personality traits and delinqueny careers: An empirical examination. *International Journal of Law and Psychiatry, 31*, 407-416.

Vitale, J.E., Brinkley, C.A., Hiatt, K.D. & Newman, J.P. (2007). Abnormal selective attention in psychopathic female offenders. *Neuropsychology*, 21 (3), 301-312

Waechter, S., Nelson, A. L., Wright, C., & Hyatt, A. (2014). Measuring attentional bias to threat: Reliability of dot probe and eye movement indices. *Cognitive Therapy and Research, 38,* 313-333.

Walker-Smith, G.J., Gale, A.G., & Findlay, J.M. (1977). Eye movement strategies involved in face perception. *Perception, 6*(3), 313-326.