2008

Psychopathic Personality Traits and Cortisol Response to Stress: The Role of Sex and Type of Stressor

Megan M. O’Leary
FLORIDA STATE UNIVERSITY
COLLEGE OF ARTS AND SCIENCES

PSYCHOPATHIC PERSONALITY TRAITS AND CORTISOL RESPONSE TO STRESS: THE ROLE OF SEX AND TYPE OF STRESSOR

By

Megan M. O’Leary

A Thesis submitted to the Department of Psychology in partial fulfillment of the requirements for the degree of Master of Science

Degree Awarded:
Fall Semester, 2008
The members of the Committee approve the Thesis of Megan M. O’Leary
defended on September 29, 2008.

______________________________________
Jeanette Taylor
Professor Directing Thesis

______________________________________
Lisa Eckel
Committee Member

______________________________________
Joyce Carbonell
Committee Member

The Office of Graduate Studies has verified and approved the above named committee
members.
ACKNOWLEDGEMENTS

The author would like to acknowledge her former major professor, Bryan Loney, and her current major professor, Jeanette Taylor, for their helpful comments and guidance during the preparation of this manuscript. Thanks also go to thesis committee members Lisa Eckel and Joyce Carbonell for their helpful comments.
# TABLE OF CONTENTS

List of Tables ............................................................................................................. v
List of Figures ........................................................................................................... vi
Abstract .................................................................................................................... vii

PSYCHOPATHIC PERSONALITY TRAITS AND CORTISOL RESPONSE TO STRESS: THE ROLE OF SEX AND TYPE OF STRESSOR ........................................ 1

METHOD ............................................................................................................... 7

RESULTS ............................................................................................................. 12

DISCUSSION .......................................................................................................... 15

APPENDICES ........................................................................................................ 27

REFERENCES ....................................................................................................... 31

BIOGRAPHICAL SKETCH .................................................................................... 40
# LIST OF TABLES

Table 1: Sample Descriptive Statistics and Preliminary Group Comparisons ........20

Table 2: Mean Perceived Stress Values (and Standard Deviations) by Group for the Social Rejection .......................................................................................................21

Table 3: Mean Perceived Stress Values (and Standard Deviations) by Group for the Trier Social Stress Test ............................................................................................22
LIST OF FIGURES

Figure 1: Mean salivary cortisol in response to the social rejection stressor...........23

Figure 2: Mean salivary cortisol in response to the TSST.................................24

Figure 3: Perceived stress ratings in response to the TSST...............................25
ABSTRACT

Previous research has indicated that blunted cortisol production is associated with the existence of psychopathic personality traits in men but not women. The current study explored whether prior null results for women were related to the latency of the cortisol stress response. In addition, the current study tested whether psychopathic personality traits were related to inhibited cortisol production differentially among men and women depending on the nature of the stressor. A mixed-sex sample of 145 participants characterized by high (36 men, 37 women) and low (34 men, 38 women) scores on a screening measure of psychopathic personality traits were randomly assigned to either a performance-based stressor task or a social rejection stressor task. Salivary hormone samples were taken just prior to task onset (baseline) and at 0, 20, 40, and 60 min post-stressor. Results indicated that both men and women characterized by psychopathic personality traits exhibited blunted stress-induced cortisol to the performance-based task in comparison with controls at 20 min post-stressor. The social rejection task induced an immediate cortisol response post-stressor in the male controls only. Results suggest that deficient cortisol production in response to stress might be another important neurobiological feature associated with psychopathic traits.
Psychopathic personality traits generally refer to the affective (e.g., lack of remorse and superficial emotions), interpersonal (e.g., misuse of others for personal gain), and behavioral (e.g., impulsive and antisocial lifestyle) features that have historically differentiated the most severe and stable displays of antisocial behavior (Hare, 1994; Lykken, 1995; Lilienfeld & Widows, 2005). In recent years, there has been increasing interest in the affective and interpersonal features that often occur in isolation from the behavioral features and can be assessed reliably across clinical, forensic, and non-referred samples (Lilienfeld & Widows, 2005). There is accumulating research suggesting that these personality features are associated with similar emotional impairments regardless of the presence of antisocial or criminal behavior (Frick, Bodin, & Barry, 2000; Levenson, Kiehl, & Fitzpatrick, 1995; Lilienfeld & Andrews, 1996). However, these affective and interpersonal features have been identified as the hallmark psychopathic personality traits that seem to be the underlying cause of such persistent and severe forms of aggression (Hare, Hart, & Harpur, 1991; Frick et al., 2003; Walters, 2003). The current study will further investigate the emotional stress response associated with affective and interpersonal psychopathic personality traits.

A large body of evidence has shown psychopathy to be associated with blunted autonomic nervous system (ANS) activity. For example, Hare and colleagues (Hare & Craigen, 1974; Hare, Frazelle, & Cox, 1978) found that individuals elevated in the affective and interpersonal psychopathic traits display smaller electrodermal responses to anticipated loud noise blasts. Similarly, other related indices of ANS activation have been explored in relation to psychopathic personality traits, such as eye blink startle response. For instance, Patrick and colleagues (Patrick, 1994; Benning et al., 2005) found that the affective and interpersonal psychopathic traits are associated with blunted startle response to distressing picture stimuli accompanied by loud noise bursts. Research linking the affective/interpersonal dimension of psychopathy to under-activity of the ANS is consistent with broader theoretical models linking emotional under-reactivity to impaired socialization of conscience and behavioral control (Blair, 1999, Frick & Morris, 2004;
Kochanska, 1993, 1997). Individuals deficient in the processing of distressing emotional material are suspected to be less sensitive to social feedback and punishment cues. Consequently, fear conditioning is disrupted, which leads these individuals to be less sensitive to emotional exchanges and less likely to regulate their behavior accordingly (Lykken, 1995; Kochanska, 1997; Blair, 1999).

A potentially informative index of ANS activity that has been relatively overlooked in the study of psychopathic personality traits is cortisol production, particularly cortisol response to perceived stress. Cortisol is a peripheral marker of hypothalamic-pituitary-adrenal (HPA) axis functioning that has been specifically linked to the processing of negative emotional material (e.g. King, Blair, Mitchell, Dolan, & Burgess, 2006). The HPA axis is part of a larger network involved in fear and distress perception activated by the amygdala. The amygdala has been widely implicated in the processing of fear stimuli, and has been directly implicated in the development of psychopathic traits (Blair, Mitchell, & Blair, 2005). Loney and colleagues (Loney, Butler, Lima, Counts, & Eckel, 2006) were first to suggest that cortisol production may be an important avenue for further research on psychopathic personality traits and stress reactivity. Other indices of ANS activity such as electrodermal activity and heart rate lack specificity and can respond similarly to extreme positive and negative emotional content (Bradley, 2000; Vrana & Rollock, 2002). Furthermore, cortisol indexes a cumulative stress response rather than discrete and transient psychophysiological responding characteristic of electrodermal, electromyographic, and heart rate activity.

Historically, the majority of psychopathic trait investigations have focused almost exclusively on men (Hare, 1994, 2003; Lykken, 1995). While research now indicates that women characterized by psychopathic traits are similar to their male counterparts in terms of the psychometric structure of psychopathic personality traits and their associations with severe aggressive behavior (e.g., Hare, 2003; Forth, Kosson, & Hare, 2003; Lilienfeld & Widows, 2005), women have demonstrated equivocal associations of psychopathic traits to measures of emotional reactivity leading to questions about the robustness of causal models generally found for men (e.g., Sutton, Vitale, & Newman, 2002; Vitale & Newman 2001). Thus, although psychopathic traits are likely the same phenotypic construct in men and women, it is possible that biological markers might vary
in their ability to signal such traits across sex. Loney and colleagues (Loney et al., 2006; O’Leary, Loney & Eckel, 2007) have now conducted two preliminary studies investigating potential sex differences in the association between cortisol production and psychopathic personality traits.

Loney et al. (2006) recruited a mixed-sex adolescent sample (ages 12 to 18 years) with various combinations of psychopathic personality traits and conduct problems to explore for sex differences in the association between psychopathic personality traits and cortisol production. That study focused exclusively on resting salivary cortisol and found that boys characterized by elevated psychopathic traits were associated with low cortisol production regardless of level of conduct problems. Girls characterized by psychopathic traits could not be distinguished from control girls via resting cortisol. Loney et al. (2006) outlined two methodological limitations that needed to be addressed prior to concluding that low cortisol production is not associated with psychopathic traits in girls. First, their study focused exclusively on resting cortisol, but change in cortisol production in response to an experimental stressor is arguably a more precise and direct measure of stress reactivity. Loney et al. (2006) indicated that using provocation to measure the stress response might exacerbate group differences and/or suggest important contextual variables related to underlying emotional impairments. Second, Loney et al. (2006) failed to control for phase of menstrual cycle in girls (most of whom were likely post-menarchal). This is important given that women in the luteal phase (i.e., 12-14 days prior to onset of menstruation) are most comparable to males in terms of cortisol production, whereas women in the ovulatory and follicular phases have been shown to have attenuated cortisol production in comparison with men (Kirschbaum, Kudielka, Gaab, Schommer, & Hellhammer, 1999).

O’Leary et al. (2007) attended to these limitations in a follow-up study conducted on a mixed-sex college sample characterized by high or low scores on a screening measure of psychopathic personality traits, the Levenson Self-Report Psychopathy Scale (SRPS). Unlike the Loney et al. (2006) study that only involved measurement of resting cortisol, participants in the O’Leary et al. study provided saliva samples prior to and immediately following participation in the Trier Social Stress Test (TSST). The TSST is a psychosocial stressor that involves a mock job interview with confederate feedback.
followed by a counting task (Kirschbaum, Pirke, & Hellhammer, 1993). This task has generally produced reliable and large cortisol responses in prior adult research according to a recent meta-analysis (Dickerson & Kemeny, 2004). In addition to assessing cortisol response to an experimental stressor rather than resting cortisol level, O’Leary et al. scheduled women to participate during the luteal phase of their menstrual cycle. Consistent with prediction, men with elevated affective/interpersonal psychopathic personality traits lacked stress-induced increases in salivary cortisol that were apparent in men low in those traits. Interestingly, this was a large effect ($d = 1.08$) which demonstrated for the first time that blunted cortisol response to stress was associated with affective/interpersonal psychopathic traits for men. Women, however, failed to display increases in cortisol following the stress induction regardless of the level of psychopathic personality traits. Some could take this as yet more evidence that affective/interpersonal psychopathic personality traits are not associated with impaired cortisol production in women. However, the null findings for women across psychopathy groups suggested that there may have been methodological issues thwarting the ability to either induce stress in control women or correctly measure the cortisol response, as this finding contradicts literature indicating that women typically mirror the cortisol response of men when in the correct menstrual phase (e.g., Kirshbaum et al., 1999). Therefore, the current study will more carefully attend to these two factors in order to elucidate the hypothesized impairment in women marked by affective/interpersonal psychopathic personality traits.

**Current Study**

The current study further explored for sex differences in the association between affective and interpersonal psychopathic personality traits and cortisol response to stress. It could be that there are genuine sex differences in the association between these two variables. However, theoretical justification for these differences is lacking and there remain some prominent methodological issues that could have influenced the prior results. First, as argued by O’Leary et al. (2007), sociocultural influences may have also operated against the detection of cortisol effects for women. There is evidence that young women are generally socialized for a relational orientation by authority figures and peers, and this is contrasted with a sociocultural emphasis on instrumentality and physical dominance for young men (Crick & Zahn-Waxler, 2003). Along these same lines, one
recent study (Stroud et al., 2002) found that a stressor sensitive to a relational orientation (i.e., social rejection) was more potent for women, and elicited a stronger cortisol response in women than performing in front of an audience. The current study explored whether prior null effects for women were influenced by the gender specificity of the stress test by randomly assigning participants to either a performance-based (i.e., the TSST) or social rejection experimental stressor. In order to verify the potency of each stressor, cognitive appraisal of the experimental stress inductions was assessed. It was hypothesized that men would appraise the TSST as more stressful, and women would appraise the social rejection as more stressful. In addition, it was hypothesized that there would be a significant sex*psychopathic personality traits*cortisol interaction for each stress paradigm, such that men and women controls would demonstrate a stronger response to their gender-salient stress tests, but participants characterized by elevated affective/interpersonal psychopathic personality traits would display lower cortisol responses to the gender-salient stress tests. Control men and women were not expected to display as strong of a cortisol response to the opposite sex’s stress test (i.e., men to the social rejection, women to the TSST).

Second, O’Leary et al. (2007) sampled cortisol at baseline and immediately after the TSST, which indexed the participants’ anticipation of the TSST. This is a viable sampling method that has been used in multiple prior investigations (e.g., Martel et al., 1999; Wolf, Schommer, Hellhammer, McEwen & Kirschbaum, 2001). Anticipation of the TSST is generally associated with a modest increase of cortisol levels; however, a further rise of cortisol is evident in response to the challenge when indexed 15 to 20 min post-stressor (Kirschbaum et al., 1993; Uhart et al., 2006). Interestingly, some previous research shows that men’s cortisol response is more sensitive to the anticipation of stress, whereas, women’s cortisol generally remains unchanged until the onset of the stressor, thus causing their peak in cortisol to be delayed (e.g., Kirschbaum, Wust, & Hellhammer, 1992). Research has attributed the difference in anticipation of stress between sexes to different stress response systems. Men are postulated to use a “fight-or-flight” response in anticipation of stress, whereas, women have evolved a “tend-and-befriend” response to stressors, most likely to emphasize the protection and nurturing of offspring by socializing with other groups to keep risks to a minimum (Taylor et al., 2000; Ennis,
Kelly, & Lambert, 2001). This orientation would cause women to be more cooperative rather than competitive, thus causing the down-regulation of the HPA-axis in anticipation of stress (Ennis et al., 2001).

Therefore, in order to find psychopathic group differences in females, it might be necessary to sample cortisol 20 minutes after the termination of the stressor, which would allow for the assessment of changes from baseline to peak cortisol response. The integration of this cortisol methodology could allow for detection of possible latency effects for women (e.g., delayed rather than absent cortisol response to a stressor). The current study assessed cortisol at five time points: 10 min prior to the start of the stressor task (baseline), and 0, 20, 40, and 60 min post-stressor. Based on the results of the O’Leary et al. (2007) study, it was expected that men with elevated affective/interpersonal psychopathic personality traits would fail to show stress-induced increases in salivary cortisol as compared to control men when indexed from baseline to immediately post-stressor, and women would fail to display increases in cortisol following the stress induction regardless of the level of affective/interpersonal psychopathic personality traits across this same time period. Next, it was predicted that when indexed from baseline to 20 min post-stressor, control participants across sex would display a significant increase in cortisol, and both men and women characterized by affective/interpersonal psychopathic personality traits would lack the stress-induced increases in salivary cortisol found in their control counterparts. The fourth (40 min) and fifth (60 min) saliva assessments were included as a verification of previous research indicating cortisol peaks 20 min post-stressor. Incidentally, elevated cortisol has been implicated in the development of trait anxiety (see Brown et al., 1996; Dabbs, Jurkovic, & Frady, 1991; Scerbo & Kolko, 1994). Therefore, trait anxiety was assessed for use as a covariate in analyses, in the case that groups differed significantly on this variable.

Finally, as previously mentioned, females respond variably to psychosocial stressors based on their phase of the menstrual cycle. Females in the luteal phase are most comparable to males in terms of cortisol production (Kirschbaum, Kudielka, Gaab, Schommer, & Hellhammer, 1999). O’Leary et al. (2007) controlled for menstrual phase through self-report, which is defensible given their detailed questions about cycle regularity, use of birth control, and current phase of menstrual cycle. The proposed study
followed the same methodology; however, a follow-up analysis was conducted after removing women who evidenced very low progesterone in order to explore whether low progesterone levels mask group differences between women high in psychopathic personality traits and control women.

**Method**

**Participants**
A total of 145 participants (70 men, 75 women; mean age = 18.89, SD = 1.74) were recruited based on preliminary responses to a brief measure of affective/interpersonal psychopathic personality traits administered during an IRB-approved mass screening of undergraduate psychology students enrolled at a large university in the southeastern United States (see Procedures section for details). Participants were recruited across three academic semesters. A total of 3,236 students participated in the screening and, therefore, the 145 participants selected for this study were a random sample of those who were eligible. See Procedures section for details regarding groups selected for this study.

**Measures**

**Psychopathic Personality Traits.** These were assessed with the Levenson Self-Report Psychopathy Scale (SRPS; Levenson et al., 1995). This 26-item measure was designed specifically for the assessment of psychopathic personality traits in non-referred samples. The SRPS contains a 16-item Primary Psychopathy subscale assessing the affective and interpersonal features of the psychopathy construct (Cleckley, 1976; Harpur, Hare, & Hakstian, 1989; Lee & Ashton, 2005). The SRPS items are rated on a 4-point Likert scale, ranging from 1 (“Disagree strongly”) to 4 (“Agree strongly”). The Primary Psychopathy subscale was used as the screener for level of psychopathic personality traits during the mass screening of college students, and scores ranged from 16-64. This measure has demonstrated strong reliability and validity in prior non-referred and college research investigations (e.g., Levenson et al., 1995; Lynam, Whiteside, & Jones, 1999); Chronbach’s alpha = .93 in the current sample.

**Trait Anxiety.** This was assessed using the 20-item trait anxiety subscale from this State-Trait Anxiety Inventory (STAI; Spielberger, 1983). Items are rated on a 4-point Likert scale ranging from “almost never” to “almost always.” The items on this measure
assess topics such as worrying too much over things that do not matter, and feeling unable to overcome difficulties. This is a well-established anxiety measure with strong psychometric properties (e.g., Barnes, Harp, & Jung, 2002; Kabacoff, Segal, Hersen, & Van Hasselt, 1997); Chronbach’s alpha = .88 in the current sample.

**Stress Inductions.** Two experimental stress inductions were used. The first was the Trier Social Stress Test (TSST; Kirschbaum et al., 1993). The TSST begins with a 10 min relaxation period followed by a 5 min mock job interview/public speaking task in front of 2 to 3 same-sex confederates who are described as being trained in behavioral observation. A video camera is present and participants are told that they are being filmed and that the film will be reviewed by an expert behavioral analyst. This is part of the stress manipulation and no filming actually occurs. After the mock job interview, a 5 min calculation task is completed (counting backwards from 2,083 in increments of 13) with confederate feedback. The TSST was selected because it has been associated with prominent cortisol responses in prior research (Gaab et al., 2003; Kirschbaum et al., 1993; Kudielka & Kirschbaum, 2005).

The second stress induction was a social rejection paradigm popularized by Twenge and colleagues (Twenge et al., 2001; Twenge & Campbell, 2003; Twenge, Catanese, & Baumeister, 2003). In this task, groups of 4-6 same-sex participants are introduced and asked to interact for 15 min. Participants are given name tags and topics of discussion (Sedikides, Campbell, Reeder, & Elliot, 1999). Following the group discussion, participants are separated and informed that they will be paired up in dyads to complete an additional lab task. They are then asked to provide the names of two people that they would most like to work with on the task. The experimenter indicates that he/she will gather similar feedback from the other participants to create the groups. After a brief interval (~2-3 min), the experimenter returns to tell each participant that they will have to complete the task alone because nobody chose to work with them. This task was selected because it has successfully elicited self-reported increases in stress and cortisol responses in a number of prior investigations (e.g., Baumeister, DeWall, Ciarocco, & Twenge, 2005; Leary, Tambor, Terdal, & Downs, 1995; Stroud et al., 2002; Blackhart et al., 2007).
Salivary Hormone Assessment and Radioimmunoassay (RIA) Procedure.

Repeated hormone sampling was conducted during the TSST and social rejection stress inductions. Salivary hormone assessments have the benefit of preventing the stress-inducing effects of blood sampling via venipuncture. To assess cortisol concentration, participants were asked to deposit 4 ml of saliva into collection vials at each of five assessment points: 10 min prior to the commencement of the stress induction (baseline), and 0, 20, 40, and 60 min post-stressor. The 40 and 60 min. post-stressor times were included both to verify prior literature suggesting that cortisol response peaks at 15-20 min post-stressor, and also to account for various possibilities in cortisol response pattern, including one in which the stress response system is dysregulated and the negative feedback loop malfunctions resulting in a cortisol response that peaks at 15-20 min post-stressor and remains elevated.

Saliva samples were frozen at −20 °C until assayed. Commercially available solid-phase RIA kits from Diagnostics Products Corporation (Coat-A-Count® Cortisol kit) were used to measure cortisol (µg/dL) and progesterone (pg/ml) in the saliva samples. Samples were assayed in duplicate and the average of was used in analyses. The lower limit of sensitivity was < .003 µg/dL, and the intra-assay coefficients of variations for the pre-stress and post-stress cortisol assays ranged from 1.50-1.70 and were all comparable with previous cortisol research (e.g. Hansen, Garde, Christensen, Eller, & Netterstrom, 2003). Salivary progesterone levels were used to verify that female participants were tested during the luteal phase of their menstrual cycle. During the luteal phase, mean serum progesterone concentration is ~300 pg/ml (range = 100 – 500 pg/ml; White, Justice, & de Wit, 2002). Saliva dilutes cortisol by a factor of 20, so conversion of this value to salivary progesterone indicates that 5 pg/ml of progesterone or greater is consistent with being in the luteal phase. All samples were processed using a high throughput, automated gamma counter (Apex 41600, Titertek Instruments, Huntsville, AL) and related software.

Perceived Stress. This was assessed each time a saliva sample was taken by asking participants to rate their perceived stress level (“Please rate your current level of stress using the following scale”) on a 7-point Likert rating scale ranging from 1 (No Stress) to 7 (Maximum Stress). This is a common procedure in the greater stress
induction literature to track cognitive appraisal of stress stimuli (e.g., Nater et al., 2005; Nejtek, 2002).

**Self-Affirmation Task.** All participants completed this measure immediately before debriefing. This measure asks participants to rank order 12 personality characteristics (e.g., humor and social skills) as most important to least important in relation to defining their own personality. They are then asked to write about why their most important characteristic was top ranked and a time when it has played a role in their life. The experimental stress manipulations used in the current study have not been associated with any adverse effects in the greater literature such as durable impact on mood ratings. However, this self-affirmation task has been used in similar research investigations as a precautionary measure to decrease any residual negative mood (e.g., Koole, Smeets, van Knippenberg, & Dijksterhuis, 1999).

**Procedure**

Within-sex univariate data were examined during the first semester of data collection to establish upper- and lower-quartile cut-scores for the Primary Psychopathy subscale for both men (upper quartile > 39, lower quartile < 29) and women (upper quartile > 33, lower quartile < 26). These cut-scores were then used to recruit a similar number of male and female participants from the upper quartile (high psychopathic personality traits: 36 men, 37 women) and lower quartile (low psychopathic personality traits: 34 men, 38 women) across the three semesters of data collection. Recruited participants were predominately Caucasian (70% Caucasian, 14% African American, 16% other).

Eligible participants (i.e., upper or lower quartile on screening measure of psychopathic personality traits) were contacted by phone and invited to participate. They were excluded from the experiment if they self-reported current use of hormone contraceptives or steroid hormones, as these medications can significantly influence cortisol production and are often treated as exclusionary criteria in the greater literature (e.g., Kirschbaum et al., 1993; Takai et al., 2004). The full protocol was administered across two testing sessions. During the first 45-min testing session, participants completed consent paperwork and the STAI. Women were asked the length of their last menstrual cycle, the date of the start of their last menstrual cycle, and whether they
typically experienced regular (i.e., 26 – 34 day) menstrual cycles. Women with regular menstrual cycles were scheduled for their second testing session during the 12-14 days preceding their next anticipated menstruation (i.e., luteal phase) and those with irregular cycles were excluded.

The second testing session was always conducted between 1200 and 1800 since afternoon assessment appears optimal for comparisons of stress induced changes in cortisol production (Yehuda et al., 2003; Kudielka, Schommer, Hellhammer, & Kirschbaum, 2004). Participants were asked to abstain from exercise, smoking, eating, and consuming caffeinated beverages or alcohol for 2 h prior to the second testing session as these variables can impact cortisol production (Stroud et al., 2002; Takai et al., 2004). All participants were administered a very brief adherence questionnaire at the beginning of the testing session to ensure that they had not engaged in any of these activities, and were rescheduled for another day if they had. Written informed consent was obtained from participants prior to beginning any study measures. Next, they completed the stress induction task to which they had been randomly assigned: TSST (n = 73; 38 men, 35 women) or social rejection (n = 72; 32 men, 40 women). Screening status (i.e., high versus low psychopathic personality traits) was unknown to the experimenter and confederates. Of note, filler tasks presumed not to interfere with cortisol (e.g., word-find puzzles) were provided when participants were not completing actual study measures (i.e., between providing saliva samples). At the end of the testing session, participants completed the self-affirmation task and were debriefed. During debriefing, participants in the social rejection condition were asked whether or not they were aware of the use of deception in the study (i.e., that they had not actually been rejected by their peers). Participants who reported that they were aware of the goals of the study were removed from analyses (n = 15; 7 men, 8 women).

**Analyses**

First, descriptive statistics were run for all of the main study variables for the full sample, by sex, and by level of psychopathic personality traits. These preliminary analyses provided a means to evaluate the integrity of the grouping strategy and to assess the possibility of group differences on trait anxiety. Next, sex differences in the association between psychopathic traits and cortisol stress response was assessed using
two separate 2*2*2 mixed-design analyses of variance (ANOVA) procedures per stressor condition (TSST and social rejection). Sex and psychopathic traits (high vs. low) each served as between-subjects factors in all ANOVAs, and cortisol assessment was a within-subjects factor with two levels. In each stressor condition, one 2*2*2 ANOVA included cortisol from baseline to 0 min post-stressor as the within-subjects factor levels and the other 2*2*2 ANOVA included cortisol from baseline to 20 min post-stressor as the within-subjects factor levels.

An a priori power analysis indicated that 20 participants were needed per cell (total sample = 160 participants) to detect moderate-to-large ($f = .35$) main and interaction effects with a power level of .80 and an alpha level of .05 (Cohen, 1988). Recruitment ended at the end of the third semester as planned; however, the recruitment of participants fell short. Therefore, post-hoc power analyses were conducted to determine power to detect main and interaction effects based on the total sample collected. These power analyses were conducted for each stressor, as the total number of participants differed due to the removal of participants from the social rejection stressor. For the social rejection stressor, the post-hoc power analysis indicated that with an average of 15 participants per cell (total sample = 58 participants), the current study had a statistical power of 71% to detect a moderate-to-large ($f = .35$) main or interaction effect with alpha set to .05. For the TSST, the post-hoc power analysis indicated that with an average of 18 participants per cell (total sample = 73), the current study had a statistical power of 83% to detect a moderate-to-large main or interaction effect with alpha set to .05.

**Results**

Table 1 provides descriptive statistics and group comparisons for the psychopathic personality trait, anxiety, and demographic variables. In terms of recruitment integrity, the groups differed significantly in level of psychopathic personality traits, with high psychopathic trait group’s Primary Psychopathy subscale scores on the SRPS higher than the low psychopathic trait group’s scores (female range = 16 – 48, male range = 16 - 61) . However, the men in the high psychopathic trait group also had significantly higher scores than women in the high psychopathic traits group. Pairwise comparisons indicated there were no significant differences in either age or
anxiety levels across groups. As such, anxiety score was not included as a covariate in analyses. Finally, there was a significant group difference for race variable such that women in the high psychopathic trait group had a higher percentage of minority participants than all other groups.¹

The observed range of pre-stress ($M = .17 \, \mu g/dL, SD = .12; \text{range} = .01-.60$) and post-stress cortisol levels ($M = .21 \, \mu g/dL, SD = .18; \text{range} = .00-.97$) were within normal parameters for the demographic characteristics of the sample (e.g., Habra et al., 2003; Kudielka et al., 2004). However, a Kolmogorov–Smirnov one-sample test of normality indicated that four of the five cortisol values were strongly and significantly positively skewed, violating the assumption of normality (ranges: $d = 1.23-2.33$, $p<.05$). Prior research indicates that a positive skew is typical of cortisol; therefore, following the lead of prior investigations, cortisol values were logarithmically transformed to reduce skewness and to be more consistent with the assumptions of the test statistics (e.g., Loney et al., 2006; Kivlighan, Granger, & Booth, 2005; McBurnett, Lahey, Rathouz, & Loeber, 2000; Pajer, Gardner, Rubin, Perel, & Neal, 2001).

Figure 1 depicts mean log-transformed cortisol values for the social rejection condition across the four recruitment groups. First, cortisol was examined from baseline to immediately post stress. Interestingly, there were was a significant interaction effect for sex*group*cortisol, $F(1, 53) = 7.85, p<.05$. Second, cortisol was examined from baseline to 20 min post-stress. Contrary to prediction, there was not a significant interaction when indexing this time interval, $F(1, 53) = 2.747, p = .105$. Men characterized by low psychopathic personality traits were the only group to increase in cortisol in response to this stressor, but this increase was found only immediately post-stress.

Interestingly, for the TSST, there was a trend toward a sex*cortisol interaction effect, such that men across group responded to the anticipation of the TSST, $F(1, 69) = 2.93, p = .09$. However, consistent with prediction (though not statistically significant), paired samples t-tests conducted on men characterized by psychopathic personality traits and those without psychopathic personality traits indicated that only men with low psychopathic personality traits showed a trend toward statistically significant increases in cortisol from baseline to immediately post-stressor, $t = -1.92, p = .07$, compared to males.
with elevated psychopathic personality traits, $t = .07, p = .95$. Next, cortisol was tested from baseline to 20 minutes post-stress. Consistent with prediction, results of this analysis indicate a statistically significant group*cortisol interaction effect, $F(1, 69) = 3.85, p = .05$. This was found to be a medium effect ($d = .48$). Figure 2 depicts the mean log-transformed cortisol values for this interaction effect. The control participants’ cortisol reached its peak 20 minutes post-stressor, whereas participants marked by elevated psychopathic personality traits evidenced inhibited cortisol response in comparison.

Means for perceived stress in response to the social rejection are reported in Table 2. Contrary to expectations, there was not an interaction effect for sex*group*perceived stress, $F(4, 45) = .47, p = .76$, for this stressor. That is, none of the groups demonstrated a statistically significant increase in perceived stress in response to the social rejection. This finding brings into question the integrity of the stress induction and explains the null effects for cortisol 20 min post-stressor. The TSST analyses showed a significant interaction effect for sex*perceived stress, $F(4,61) = 2.61, p<.05$. Means for the perceived stress in response to the TSST are reported in Table 3. Pairwise comparisons between time 1 and time 2 showed both males ($t = -7.25, p<.001$) and females ($t = -4.66, p<.001$) reported statistically significant increases in stress to the TSST. Overall, however, females demonstrated higher levels of perceived stress across all time points, as depicted in Figure 3.

In order to investigate whether low progesterone levels masked potential group differences between women who were high versus low in psychopathic personality traits, follow up analyses were conducted on the main study hypotheses after removal of women who evidenced progesterone values less than 5 pg/ml. A 2*5 mixed design ANOVA was conducted for each stress condition (TSST and social rejection) with psychopathic personality traits as the between subjects factor with two levels and cortisol as the within subjects factor with five levels. For the social rejection manipulation, a total of 6 women were removed and there was no significant group*cortisol interaction, $F(4, 21) = .87, p = .50$. For the TSST, a total of 4 women were removed and again the group*cortisol interaction was non-significant, $F(4, 26) = 2.00, p = .12$. 
Discussion

Previous research investigating the association between psychopathic personality traits and cortisol production has found that men with elevated affective/interpersonal psychopathic personality traits appear to have blunted cortisol production at baseline (Loney et al., 2006) and in response to stress (O’Leary et al., 2007). These results have failed to extend to women, raising questions about the association between affective/interpersonal psychopathic personality traits and HPA functioning in that population. The current study aimed to replicate and extend the O’Leary et al. (2007) findings by attending to methodological issues that could have contributed to their null results for women. It was hypothesized that gender-salient stress manipulations would elucidate psychopathic trait group differences, such that males characterized by high affective/interpersonal psychopathic personality traits would display blunted cortisol production to the TSST in comparison with males low in these traits, and that the reciprocal would occur for females in response to social rejection. In addition, previous research indicates that cortisol peaks in response to stress after about 20 min. Thus, additional post-stressor cortisol measurements were taken to test the hypothesis that differences in cortisol response between women high and low in psychopathic traits would occur at the peak point of the response curve (i.e., 20 min post-stressor). Finally, progesterone was analyzed in order to explore how accurate females were with self report of menstrual cycle and whether low progesterone levels mask potential group differences between female groups high and low in affective/interpersonal psychopathic personality traits.

Consistent with previous research (e.g., Kirschbaum et al., 1993; Uhart et al., 2006), results for the TSST indicated that the cortisol response does reach its peak 20 min after this stress manipulation. By allowing the cortisol response to fully accumulate post-stressor, group differences between those high and low in psychopathic traits were evident when collapsing across sex, with a medium effect size. This suggests that both men and women characterized by elevations in affective/interpersonal psychopathic personality traits fail to display stress-induced increases in cortisol that are present for control participants. Despite this general effect for psychopathic traits group on cortisol response to stress, the results of the O’Leary et al. (2007) study were not replicated with
this sample. In the current study, there was only a trend towards statistical significance for a difference in cortisol response in men across psychopathic personality trait groups when indexing cortisol changes from baseline to immediately post-stressor. These conflicting results could be attributable to the fact that the current study used a two session experiment as opposed to the one session experiment used in the O’Leary et al. (2007) study. As mentioned previously, research has demonstrated that men’s cortisol response is more sensitive to the anticipation of stress than women, whereas, women’s peak in cortisol tends to be delayed (e.g., Kirschbaum et al., 1992). The O’Leary et al. (2007) study conducted a single session experiment that could have enhanced the anticipation effects among men, thereby contributing to the large difference in cortisol response that was found. In the current study, however, the male control group’s sensitivity to anticipation effects could have been blunted due to having been familiarized with the laboratory setting during the first session, thus reducing the anxiety associated with anticipation of a new experiment.

In addition, self-reported stress was measured in response to the TSST. Results indicated that both males and females reported a statistically significant increase in stress in response to the TSST although, overall, females demonstrated higher levels of perceived stress across all time points. Participants across sex gave their highest rating of perceived stress immediately after the TSST, which corroborates the timeline indicated in past research suggesting that it takes 20 min post-stressor for peak cortisol effects to be detected (e.g., Kirschbaum et al., 1992). This is an important finding as results from O’Leary et al. (2007) could lead researchers to assume that females did not find the TSST stressful due to lack of recorded cortisol response. This finding speaks to the importance of using multi-method assessments when tapping the stress response with a biological measure, as an added measurement of self-report lends itself as a manipulation check and can help explain null results.

Another interesting finding was that there were no differences in self-reported perceived stress across psychopathic personality trait groups. This finding is in line with the typical description of psychopathy such that there is discordance between what is expressed semantically and what is experienced emotionally (Cleckley, 1976). Research continues to document that individuals marked by high psychopathic personality traits
understand and apply the lexical meaning of emotional words, but do not affectively experience the emotion (e.g. Hare & Jutai, 1988; Blair et al., 2006).

Contrary to prediction, neither men nor women evidenced increases in self-reported stress in response to the social rejection. This finding questions the integrity of the stress induction and explains the null results of the cortisol analyses. Though males characterized by low psychopathic personality traits demonstrated a different overall trend in cortisol in response to this stressor, they did not evidence a statistically significant increase in cortisol across the predicted time points. These results are contradictory to another cortisol investigation that has found support for the integrity of this manipulation among college-aged participants (Blackhart, Eckel, & Tice, 2007).

There are a few possible explanations for the null effects associated with the social rejection manipulation. First, although the current study followed the instructions for conducting the social rejection manipulation outlined in past investigations (Twenge et al., 2001; Twenge & Campbell, 2003; Twenge et al., 2003) perhaps this manipulation was unbelievable, as approximately 21% of participants stated that they did not believe they were rejected. Second, the students who participated in the social rejection manipulation came from a large pool of undergraduates who opt to participate in many different studies to meet the research requirement for their introductory psychology course and, therefore, participants may have experienced similar types of social rejection manipulations in other experiments (a distinct possibility given that many other deception studies were ongoing during the same semesters as the current study).

An interesting alternative explanation for the null results in the social rejection task could be that, in general, being rejected does not activate the HPA axis to the extent of other social stress paradigms, such as the TSST. A recent meta-analysis of stress inductions indicated that tasks containing both uncontrollable and social-evaluative elements have been associated with the largest cortisol changes and the longest times to recovery (Dickerson & Kemeny, 2004). It could be argued that the social rejection task is somewhat controllable, as participants are able to say and do whatever they like when they interact with the other people in the group. In addition, they are able to rank others in the group, giving them a sense of control over the situation. Moreover, there is a minimal social-evaluative element to this manipulation, as this component does not
become focal until after the participants are split up and asked to rank each other, which lasts a total of 2-3 minutes.

The validity of self-reported menstrual cycle phase was explored in this study as well. After biological verification of menstrual phase via salivary progesterone levels, it appears that approximately 8% of women did not evince progesterone levels characteristic of the luteal phase. This study is one of the first to provide a biological check of self-reported menstrual cycle. An exploratory analysis was conducted within females to investigate whether psychopathic personality group*cortisol differences were significant with the removal of females who did evidence progesterone levels not characteristic of the luteal phase. These results were not significant indicating that, overall, self-report of menstrual phase is reasonably accurate.

The current findings must be interpreted in the context of the following limitations. First, the study was conducted on a college sample. Though numerous studies have shown affective/interpersonal psychopathic personality traits can be reliably found in non-referred and college samples (e.g. Levenson et al., 1995; Lilienfeld & Andrews, 1996; Frick et al., 2003), future research should attempt to replicate these findings in forensic settings where psychopathic personality traits would likely be more prevalent and/or extreme. In addition, a deception manipulation such as the social rejection paradigm may elicit predicted cortisol increases outside of a college sample, as these participants would be less likely to have endured a similar experiment previously and less likely to try and guess the hypothesis of the study. Second, the current study employed an extreme groups approach to recruitment, which is reasonable for new research areas in order to guide future research and detect trends (Preacher et al., 2005). In addition, previous research has indicated that psychopathic traits are non-normally distributed and potentially taxonomic, and thus this sampling strategy is commonly used in non-referred psychopathy studies (Harris et al., 1994; Vasey et al., 2005). However, it may be informative for future studies to recruit across the entire distribution of psychopathic traits to explore whether there is a linear or non-linear association to cortisol production. Finally, the current study only assessed for one measure of stress reactivity. It would be beneficial to integrate other ANS indices to gain a full picture of the stress response impairment associated with psychopathic personality traits.
The present study adds to a small but growing body of work that suggests that impaired functioning of the HPA axis might serve as another marker of neurobiological deficits associated with psychopathic personality. The present results also add to research supporting the link between the affective/interpersonal dimension of psychopathy to under-reactivity of the ANS, further delineating the specific neurobiological processes involved in psychopathic personality trait expression (Blair, Mitchell, & Blair, 2005). Specifically, measuring cortisol may give a more complete picture of the temporal sequence of the stress response that occurs within an individual. Biological markers used in prior research tap the anticipation of stress (anticipated noise blasts; Hare, 1978; Hare, Frazelle, & Cox, 1978) and the immediate response to a stressor (eye blink startle response; Patrick, 1994; Benning et al., 2005), implicating the involvement of the amygdala. Integrating all of these aspects of the stress response into one study could assist in pulling the pieces of impaired ANS response associated with psychopathy together to see the bigger picture of biological deficits associated with these individuals, and aid in outlining the etiology associated with these traits.
Table 1
Sample Descriptive Statistics and Preliminary Group Comparisons

<table>
<thead>
<tr>
<th></th>
<th>Male Participants</th>
<th>Female Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Psychopathic Personality Traits</td>
<td>High Psychopathic Personality Traits</td>
</tr>
<tr>
<td>Age $(SD)$</td>
<td>19.31 (1.00)</td>
<td>19.12 (1.45)</td>
</tr>
<tr>
<td>Psychopathic Traits $(SD)$</td>
<td>22.71_a (3.77)</td>
<td>42.12_c (6.36)</td>
</tr>
<tr>
<td>Anxiety $(SD)$</td>
<td>33.90 (9.02)</td>
<td>36.20 (9.80)</td>
</tr>
<tr>
<td>Ethnicity (% Minority)</td>
<td>27.6%_a</td>
<td>26.5%_a</td>
</tr>
</tbody>
</table>

Note. Means with different subscripts denote significantly significant differences ($p < .05$) in pairwise comparisons using chi-square test for the ethnicity variable and the Tukey’s HSD test for all other variables.

* $p < .05$, ** $p < .001$
Table 2

*Mean Perceived Stress Values (and Standard Deviations) by Group for the Social Rejection*

<table>
<thead>
<tr>
<th>Perceived Stress Level</th>
<th>Baseline (SD)</th>
<th>Immediate Post-Stress (SD)</th>
<th>20 min Post-Stress (SD)</th>
<th>40 min Post-Stress (SD)</th>
<th>60 min Post-Stress (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Psychopathic Personality Traits (<em>n</em> =10)</td>
<td>2.30 (1.16)</td>
<td>2.40 (1.26)</td>
<td>2.30 (1.34)</td>
<td>2.50 (1.27)</td>
<td>2.20 (1.40)</td>
</tr>
<tr>
<td>High Psychopathic Personality Traits (<em>n</em> =15)</td>
<td>2.50 (.80)</td>
<td>2.43 (1.02)</td>
<td>2.79 (1.25)</td>
<td>2.71 (1.54)</td>
<td>2.21 (.97)</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Psychopathic Personality Traits (<em>n</em> =15)</td>
<td>3.20 (1.37)</td>
<td>3.00 (1.25)</td>
<td>2.73 (1.39)</td>
<td>2.64 (1.39)</td>
<td>2.60 (1.35)</td>
</tr>
<tr>
<td>High Psychopathic Personality Traits (<em>n</em> =17)</td>
<td>2.94 (1.30)</td>
<td>2.93 (1.29)</td>
<td>3.50 (1.20)</td>
<td>3.12 (1.32)</td>
<td>2.94 (1.39)</td>
</tr>
</tbody>
</table>

*Note:* Perceived stress levels ranged from 0 (not at all) to 7 (extremely stressed).
Table 3

*Mean Perceived Stress Values (and Standard Deviations) by Group for the Trier Social Stress Test*

<table>
<thead>
<tr>
<th>Perceived Stress Level</th>
<th>Baseline (SD)</th>
<th>Immediate Post-Stress (SD)</th>
<th>20 min Post-Stress (SD)</th>
<th>40 min Post-Stress (SD)</th>
<th>60 min Post-Stress (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Psychopathic Personality Traits (n =19)</td>
<td>3.35 (1.32)</td>
<td>4.63 (.50)</td>
<td>3.33 (1.50)</td>
<td>2.84 (1.43)</td>
<td>2.84 (1.80)</td>
</tr>
<tr>
<td>High Psychopathic Personality Traits (n =19)</td>
<td>3.20 (1.32)</td>
<td>4.53 (1.41)</td>
<td>3.33 (1.59)</td>
<td>2.87 (1.45)</td>
<td>2.33 (1.40)</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Psychopathic Personality Traits (n =19)</td>
<td>2.50 (1.27)</td>
<td>3.74 (1.33)</td>
<td>2.63 (1.46)</td>
<td>2.57 (1.43)</td>
<td>2.32 (1.34)</td>
</tr>
<tr>
<td>High Psychopathic Personality Traits (n =16)</td>
<td>1.67 (1.34)</td>
<td>3.89 (1.32)</td>
<td>2.56 (1.15)</td>
<td>2.44 (1.38)</td>
<td>2.72 (1.49)</td>
</tr>
</tbody>
</table>

*Note: Perceived stress levels ranged from 0 (not at all) to 7 (extremely stressed).*
Figure 1: Mean salivary cortisol in response to the social rejection stressor. Vertical line with cross bars represent +/- 1 standard error. Cortisol values were log-transformed. * Indicates significant ($p<.05$) sex*group*cortisol interaction effect when indexed from baseline to immediately post-stress.
Figure 2: Mean salivary cortisol in response to the TSST. Vertical line with cross bars represent +/- 1 standard error. Cortisol values were log-transformed.
* Indicates significant ($p<.05$) group*cortisol interaction effect from when indexed from baseline to 20 min post-stress.
Trier Social Stress Test

Perceived Stress Samples

Perceived Stress Rating

- Females
- Males

Baseline Immediately post-stress 20 min post-stress 40 min post-stress 60 min post-stress

Figure 3: Perceived stress ratings in response to the TSST. Vertical line with cross bars represent +/- 1 standard error.
* Indicates significant ($p<.05$) increases in perceived stress ratings for both males and females.
Footnote

1 Information regarding race/ethnicity was presented for descriptive purposes only. No a priori hypotheses were made concerning race/ethnicity. Introducing minority status (i.e. Caucasian vs. other) as a covariate in the main group analyses did not alter the pattern or magnitude of findings.
APPENDIX A

COPY OF HUMAN SUBJECTS APPROVAL FORM

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8633 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 1/31/2007

To: Megan O'Leary
3369 Argonaut Drive
Tallahassee, FL 32312

Dept.: PSYCHOLOGY DEPARTMENT

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
Personality Styles and Cortisol Response to Stress

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Human Subjects Committee at its meeting on 1/10/2007. Your project was approved by the Committee.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals which may be required.

If the project has not been completed by 1/30/2008 you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. The principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

cc: Bryan Loney
HSC No. 2006.1073
APPENDIX B

COPY OF INFORMED CONSENT FORMS

Informed Consent Form

I freely and voluntarily consent to participate in the research project entitled “The Relationship between Personality Styles and Emotional Functioning” and understand that there is no penalty for non-participation. I understand that my consent may be withdrawn at any time without prejudice or loss of credit. I also understand that I will receive 1 hour of course credit for my participation. This project is being conducted under the direction of Dr. Bryan Loney, who is a professor in the Department of Psychology here at FSU, and by Megan O’Leary, a graduate student in the Department of Psychology. There is an established research literature linking various personality features (e.g., extraversion) to emotional functioning (e.g., happiness). Today, I will be asked to spend approximately 45 minutes completing some forms assessing my typical thoughts, feelings, and behavior. Based on my responses to these measures, I may be asked to participate in a follow-up study. The obtained information will be kept in a locked file cabinet in a research laboratory located on the Florida State University campus. A sheet of names with corresponding identification numbers will be kept in a locked file cabinet in a separate office suite. My responses to the research measures that I complete will be grouped together with scores of other participants making it impossible for anyone outside of the research team to determine how I responded. By signing and dating this form, I agree to participate in this study. The experimenter appreciates the time I have spent reviewing these materials whether or not I decide that I would like to participate. I can feel free to direct any questions, comments, and/or concerns to Megan O’Leary or Dr. Loney by phone (644-2300) or email (oleary@psy.fsu.edu). If I have questions about my rights as a participant in this research, or if I feel that I have been placed at risk, I can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Office of the Vice President for Research, at (850) 644-8633.

Participant Signature __________________________ Date __________________________
Informed Consent Form

I freely and voluntarily consent to be a participant in the research project entitled “The Relationship between Personality Styles, Hormone Functioning, and Social Performance” and understand that there is no penalty for non-participation. I understand that my consent may be withdrawn at any time during the experimental session without prejudice or loss of credit. I also understand that I will receive 2 course credits for participating in this 2 hour experiment. This project is being conducted under the direction of Dr. Bryan Loney, who is a professor in the Department of Psychology here at FSU, and by Megan O’Leary, a graduate student in the Department of Psychology. There is an established research literature linking various personality features (i.e., extraversion) to social performance, and there is a newer literature studying how hormones may be related to emotional and behavioral functioning. As part of my participation, I will be asked to provide five saliva samples (i.e., deposit a small amount of saliva into a plastic container) that will be examined for 2 naturally occurring hormones (i.e., cortisol and progesterone) that research studies have shown are important in the processing of challenging tasks. The saliva will only be examined for these two hormones and will be disposed of immediately following examination (i.e., mixed with water and flushed down lab sink). The saliva sampling has been used by a number of other clinicians and researchers interested in hormone functioning and is not associated with any pain or discomfort on the part of participants. Analysis of the saliva samples will be supervised by Lisa A. Eckel, Ph.D. (Professor of Neuroscience and member of the Department of Psychology at The Florida State University). Dr. Eckel has the necessary experience and credentials to conduct this type of research and can be contacted with any questions concerning this portion of the study at 850-644-2300. In addition to providing five saliva samples, I will be asked to discuss various questions with a small group of peers and will then complete some paper and pencil measures of emotion. In order to protect my confidentiality to the extent allowed by law, I will be assigned a participant number that will serve as the only piece of identification for research measures. The obtained information will be kept in a locked file cabinet in a research laboratory located on the Florida State University campus. A separate sheet of names with corresponding identification numbers will be kept in a locked file cabinet in Dr. Loney’s office. Additionally, my responses to research measures will be grouped together with scores of other participants making it impossible for anyone outside of the research team to determine how I responded. If I agree to participate in the study, I will sign and date below. The experimenter appreciates the time that I have spent reviewing these materials whether or not I decide that I would like to participate. I can feel free to direct any questions, comments, and/or concerns to Megan O’Leary or Dr. Loney 850-644-2300, or by email at oleary@psy.fsu.edu. If I have questions about my rights as a participant in this research, or if I feel that I have been placed at risk, I can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Office of the Vice President for Research, at (850) 644-8633.

Participant Signature ______________________________ Date ______________

It is helpful for our research if we can use SAT or ACT scores as a separate variable in our analyses. However, we need your permission to access these scores that the university keeps on file. Of course, this data will be coded with your subject numbers rather than your name, and will be kept confidential to the extent allowed by law. Data will be kept in a locked file cabinet and will be destroyed by May of 2014. Please provide your signature below if you permit the use of your scores in our analyses.

Participant Signature ______________________________ Date ______________
Informed Consent Form

I freely and voluntarily consent to participate in the research project entitled “The Relationship between Personality Styles, Hormone Functioning, and Job Performance” and understand that there is no penalty for non-participation. I understand that my consent may be withdrawn at any time during the experimental session without prejudice or loss of credit. I also understand that I will receive 2 course credits for participating in this 2 hour experiment. This project is being conducted under the direction of Dr. Bryan Loney, who is a professor in the Department of Psychology at Florida State University, and by Megan O'Leary, a graduate student in the Department of Psychology. There is an established research literature linking various personality features (i.e. extraversion) to work performance, and there is a newer literature studying how hormones may be related to emotional and behavioral functioning. As part of my participation, I will be asked to provide five saliva samples (i.e., deposit a small amount of saliva into a plastic container) that will be examined for 2 naturally occurring hormones (i.e., cortisol and progesterone) that research studies have shown are important in the processing of challenging tasks. The saliva will only be examined for these two hormones and will be disposed of immediately following examination (i.e., mixed with water and flushed down lab sink). The saliva sampling has been used by a number of other clinicians and researchers interested in hormone function and is not associated with any pain or discomfort on the part of participants. Analysis of the saliva samples will be supervised by Lisa A. Eckel, Ph.D. (Professor of Neuroscience and member of the Department of Psychology at The Florida State University). Dr. Eckel has the necessary experience and credentials to conduct this type of research and can be contacted with any questions concerning this portion of the study at 850-644-2300. In addition to providing five saliva samples, I will be asked to provide a brief speech for a job application that will be observed by a job committee. I will also be asked to complete a calculation task that involves counting out loud. Finally, I will be asked to complete a few brief pencil-and-paper measures of emotion throughout my participation. In order to protect my confidentiality to the extent allowed by law, I will be assigned a participant number that will serve as the only piece of identification for research measures. The obtained information will be kept in a locked file cabinet in a research laboratory located on the Florida State University campus. A separate sheet of names with corresponding identification numbers will be kept in a locked file cabinet in Dr. Loney's office. Additionally, my responses to research measures will be grouped together with scores of other participants making it impossible for anyone outside of the research team to determine how I responded. If I agree to participate in the study, I will sign and date below. The experimenter appreciates the time that I have spent reviewing these materials whether or not I decide that you would like to participate. I can feel free to direct any questions, comments, and/or concerns to Megan O'Leary or Dr. Loney 850-644-2300, or by email at oleary@psy.fsu.edu. If I have questions about my rights as a participant in this research, or if I feel that you have been placed at risk, I can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Office of the Vice President for Research, at (850) 644-8633.

Participant Signature  
Date

It is helpful for our research if we can use SAT or ACT scores as a separate variable in our analyses. However, we need your permission to access these scores that the university keeps on file. Of course, this data will be coded with your subject numbers rather than your name, and will be kept confidential to the extent allowed by law. Data will be kept in a locked file cabinet and will be destroyed by May of 2014. Please provide your signature below if you permit the use of your scores in our analyses.

Participant Signature  
Date
REFERENCES


BIOGRAPHICAL SKETCH

PERSONAL INFORMATION

Name: Megan M. O’Leary
Date of Birth: November 16, 1983
Place of Birth: Indianapolis, IN

EDUCATIONAL INFORMATION

2006 – Present Florida State University, Tallahassee, FL
Clinical Psychology Doctoral Program (APA-Approved Program)
Major Professor: Jeanette Taylor, Ph. D.

2002 – 2006 Florida State University, Tallahassee, FL
Bachelor of Science, Summa Cum Laude, With Honors
Major: Psychology
Cumulative GPA: 3.9, Psychology GPA: 4.0

HONORS AND AWARDS

FSU Psychology Departmental Assistantship (2006-2007)
Summa Cum Laude (2006)
Honors in the Major (2006)
First Place Winner, Howard Baker Undergraduate Research Award (2006)
University Dean’s List: (2002- 2006)
University President’s List (2003-2006)
Bright Futures Scholarship (2002-2006)