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# Comorbidity Of Psychopathy In Schizotypy: Skin Conductance To Affective Pictures

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# COMORBIDITY OF PSYCHOPATHY IN SCHIZOTYPY: SKIN CONDUCTANCE TO AFFECTIVE PICTURES

by

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# ABSTRACT

Prior research substantiates a relationship between psychopathy and schizophrenia-spectrum disorders, which has begun to elucidate why some individuals with schizophrenia are violent. Unfortunately, this relationship has been limited to self-report. To objectively corroborate this finding, undergraduate students were recruited from an online screening administration of the Schizotypal Personality Questionnaire. This resulted in 56 participants (52% male) with a mean age of 20.37 (SD = 4.74) and a wide range of schizotypy scores who participated in the experiment. Following completion of self-report measures, participants viewed 15 pictures (five neutral, five threatening, and five of others in distress) from the International Affective Pictures System while electrodermal activity was recorded from one palm. As expected, all participants exhibited increased peak skin conductance (SC) to both threat and distress pictures compared to neutral pictures; however; no difference was found between threat and distress pictures. Although the self-report relationship was replicated, neither total psychopathy nor total schizotypy were related to any SC variable. Therefore, it does not appear that increased schizotypy was related to a differential SC response to emotional pictures in our sample, even after testing for the potential moderating influence of anxiety and the Self-Centered Impulsivity factor of psychopathy. Total schizotypy was, however, significantly and positively related to the Personality Assessment Inventory Aggression scale (including the subscales of Aggressive Attitude and Physical Aggression) and the total score on the Beck's Anxiety Inventory. Overall findings suggest that despite presence of the comorbidity in this subclinical population, subthreshold levels of both constructs do not relate to a reduced SC response to affective pictures as is seen in clinical psychopathy.

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| | |
|---|---|
| AGG | Personality Assessment Inventory Aggression Scale |
| AGG-A | Aggressive Attitude |
| AGG-P | Verbal Aggression |
| AGG-V | Physical Aggression |
| BAI | Beck Anxiety Inventory |
| EDA | Electrodermal Activity |
| IAPS | International Affective Picture System |
| MC | Abbreviated Marlowe-Crowne Social Desirability Scale |
| PPI-FD | Psychopathy Personality Inventory-Fearless Dominance |
| PPI-R | Psychopathy Personality Inventory-Revised |
| PPI-SCI | Psychopathy Personality Inventory-Self-Centered Impulsivity |
| SAM | Self-Assessment Manikin |
| SC | Skin Conductance |
| SCOR | Skin Conductance Orienting Response |
| SPQ | Schizotypal Personality Questionnaire |

# CHAPTER ONE: INTRODUCTION

There has been a general reluctance within scientific literature to critically examine the relationship between schizophrenia and violence, likely due to fear of perpetuating the associated stigma (Torrey, 2011). Despite this psychological zeitgeist, extant research has substantiated higher rates of violence for individuals with schizophrenia when compared to most other psychiatric disorders (Joyal, Dubreucq, Gendron, & Millaud, 2007; Hodgins, Mednick, Brennan, Schulsinger, & Engberg, 1996; Krakowski, Volavka, & Brizer, 1986), particularly when comorbid with substance abuse (Dumais, Potvin, Joyal, Allaire, Stip, Lesage…Côté, 2011; Erkiran, Özünalan, & Evren, 2006; Swanson, Holzer, Ganju, & Jono, 1990). Although some studies have found similar rates of violence in other serious disorders such as bipolar disorder, depression (Monahan et al., 2001; Swanson et al., 1990), and panic disorder (Swanson et al., 1990), these rates do not take into account multiple diagnoses. When comorbidity is considered, the highest rates of violence are found in individuals comorbid for schizophrenia and substance abuse (Erkiran et al., 2006; Swanson et al., 1990). The question is no longer "if" some individuals with schizophrenia are violent, but "why?"

Volavka and Citrome (2008) examined this very question and discussed three etiological subtypes of violent patients with schizophrenia; violence related to positive psychotic symptoms (e.g., hallucinations and delusions), impulsiveness, or comorbid psychopathy (e.g., characteristics of superficial charm, insincerity, lack of emotional reactions, and remorselessness; Cleckley, 1941). Bo and colleagues (2011) similarly identified two trajectories; violence corresponding to the emergence of positive symptoms and violence related to personality, particularly psychopathic traits. To date, the majority of the research has focused on

the role of positive psychotic symptoms (McGregor, Castle, & Dolan, 2012), despite additional research supporting an increased presence of psychopathy in violent patients with schizophrenia spectrum disorders (Fullam & Dolan, 2008; Warren et al., 2003; Nolan, Volavka, Mohr, & Czobor, 1999; Raine, 1992).

In addition to a general reluctance to examine the relationship between psychopathy and schizophrenia, this line of research has been further limited by a focus on violent criminals and the categorical classification of schizophrenia. A growing body of research has supported a fully dimensional model of schizophrenia, which suggests a continuum beginning with normality that then proceeds towards schizotypy, then moves towards schizotypal personality disorder (SPD), and finally toward the more severe disorder of schizophrenia (Claridge & Beech, 1995; Cochrane, Petch, & Pickering, 2010). At the lower end, schizotypy defines a latent personality construct genetically related to schizophrenia and includes traits such as suspiciousness, magical thinking, perceptual distortions, constricted affect, and odd or eccentric behavior and speech (Raine, 1991). Due to the familial aggregation of schizophrenia-spectrum disorders, schizotypy and SPD have served as valuable analog samples in the schizophrenia literature. Therefore, by exploring how the factors of psychopathy and schizotypy correlate in a subclinical community sample, we can increase our understanding of the specific underlying relationships that drive the comorbidity of the more severe categorical expressions, but without related confounds (e.g., incarceration, chronic neuroleptic use, and/or severe active symptomatology).

Recent unpublished data (Ragsdale & Bedwell, under review) has provided evidence for a relationship between self-reported schizotypy and psychopathy in a sample of undergraduate students. Specifically, the Schizotypal Personality Questionnaire (SPQ; Raine, 1991) total score

was positively related to the Self-Centered Impulsivity factor of psychopathy (PPI-SCI) and negatively related to the Fearless Dominance factor of psychopathy (PPI-FD), as measured by the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld and Widows, 2005). This preliminary finding indicates a specific psychopathy pattern that is related to schizotypy. However, because results were limited to self-report measures, examining an established objective correlate of psychopathy across individuals with various levels of schizotypy is the logical next step.

One such objective correlate of psychopathy, electrodermal activity (EDA), or skin conductance (SC), is an autonomic measure that has the advantage of being less subject to bias and measure-related error (Lorber, 2004). SC is primarily concerned with psychologically-induced sweat gland activity, which is activated in varying degrees depending on the degree of activation of the sympathetic nervous system (i.e., the "fight or flight" response). As sweat increases, conductivity increases and resistance decreases. SC is measured while a small electrical current is passed through a pair of two electrodes, typically placed on the palm of one hand (Cacioppo, Tassinary, & Bernstson, 2007; Fowles, 1981).

Psychopathy literature offers a long history of employing SC measures, which has resulted in successful differentiation of psychopaths and nonpsychopaths (Ogloff & Wong, 1990). A meta-analysis found that psychopaths evidence lower resting SC ($d$ = 0.30), lower SC response to experimental stimuli, primarily negatively-valenced; $d$ = 0.25), and lower SC reactivity to stimuli (i.e., change from prestimulus levels, $d$ = 0.31), when compared to nonpsychopaths (Lorber, 2004).

Earlier studies focused on the use of electric shock to understand the physiological nature of psychopathy which found that individuals higher in psychopathy experience reduced SC to the threat of punishment (i.e., anticipating a shock; Hare, 1965; Hare and Craigen, 1974), while administering punishment (i.e., delivering shock to others; Hare and Craigen, 1974; Dengerink and Bertilson 1975), and while passively observing others in distress (i.e., while observing others being shocked; Aniskiewicz, 1979; House and Milligan 1976). Research has found that anxiety moderates this relationship, as a higher level of anxiety appears to at least partially normalize the SC response in psychopaths (Aniskiewicz, 1979; House & Milligan, 1976).

Recent research in this area has begun to examine the role of psychopathy's two factors. Much of this literature has utilized versions of the Psychopathy Checklist (PCL) to assess the construct, which is a semi-structured interview that utilizes data typically derived from correctional files (Hare, 1991; 2003). Within the PCL, Factor 1 (F1) describes emotional-interpersonal features such as charm, egocentricity, shallow affect, and lack of empathy, while Factor 2 (F2) measures antisocial impulsivity features such as early behavior problems, delinquency, impulsiveness, and aggression (Harpur, Hakstian, & Hare, 1988). Individuals with psychopathy vary on the relative level of F1 and F2 factor scores.

A study that examined SC reactivity in male prisoners found that those high on F1, regardless of F2 scores, showed reduced SC response to both pleasant and unpleasant sounds. These findings suggest that psychopaths, particularly those high in F1 traits, exhibit broad suppression of emotional reactively (Verona, Patrick, Curtin, Bradley, & Lang, 2004). Another study showed that individuals higher in psychopathy exhibited significantly reduced SC reactivity when imagining fearful imagery, with deficits in physiological response predicted by

extreme F2 scores (Patrick, Cuthbert, & Lang, 1994). This finding suggests a relationship between F2 and autonomic hypoarousal in the presence of fear, and corroborates the reduced SC reactivity in psychopaths. One study using affective pictures found that, relative to controls, psychopaths exhibited reduced SC to distress cues (i.e., pictures of upset adults and children), but did not differ from controls for threatening or neutral stimuli (Blair, Jones, Clark, & Smith, 1997). Unfortunately this study did not report F1 and F2 relationships. Similarly, within a community sample of males, those high on F2 (compared to those low in F2) showed a smaller SC response to all categories of pictures (neutral, pleasant, and aversive), whereas only the highest scoring participants on F1 (compared to those low in F1) showed a smaller SC response for only the aversive pictures (Benning, Patrick, & Iacono, 2005). In general, results from studies examining SC reactivity in psychopaths when presented with various stimuli corroborate previous findings of general hypoarousal. However, discrepancies in the type of stimuli presented may explain why findings vary on implications of differential endorsements of the two factors of psychopathy.

Contrastingly, research on schizophrenia-spectrum disorders and SC has been relatively under-examined and limited to the SC orienting response (SCOR; for review, see Raine, Lencz, Benishay, & Mednick, 1995), which entails presentation of new or significant stimuli (e.g., loud tone) that results in a change in SC due to an attentional response. This type of SC response is conceptually different than the SC response typically examined in psychopathy research, as SCOR assess for attention allocation and SC responses to affective pictures assesses for emotional arousal. Therefore, the available research on schizotypy and SC does not directly inform this line of research. If some schizotypes do indeed do show an SC deficit similar to

individuals with psychopathy, it would more strongly implicate comorbid psychopathy in a subtype of this subclinical population, and may help elucidate underlying mechanisms related to the increased violence found in some individuals with schizophrenia. The specific aim of this study was to examine whether schizotypy is related to the relative pattern of reduced SC response to emotional pictures that has been observed in psychopathic individuals. The overarching goal is to better understand the etiology of violent behavior found in a subset of individuals with both schizophrenia and psychopathy in order to aid the development of effective treatment and prevention techniques.

We hypothesized that we would find a negative relationship between schizotypy and SC response to both distress and threat pictures, and that this relationship would be strongest for the distress pictures. We also hypothesized that the relationship between schizotypy and SC response to distress would be moderated (separately) by the PPI-SCI factor of psychopathy and anxiety, in that the relationship would be stronger in those with higher PPI-SCI and lower anxiety. We also hypothesized that individuals higher in schizotypy would self-report higher levels of trait aggression and reduced negative affective valence (i.e., more neutral), arousal, and dominance ratings to the negatively-valenced pictures.

# CHAPTER TWO: METHOD

## Participants

Participants were recruited from an online schizotypy screening questionnaire administered through a participant pool management system used to recruit students enrolled in classes in the University's Department of Psychology. All participants completed an online consent form, basic demographic questions, the Schizotypal Personality Questionnaire, and two validity scales (see Measures section below). Participants who met inclusion and exclusion criteria (described below) were contacted via email and invited to participate in the lab-based study. This resulted in a final sample size of 56 participants (52% male) who participated in all procedures, with a mean age of 20.37 (SD = 4.74; range = 17 to 48). The sample's race was reported as 66.1% Caucasian, 14.3% "Mixed/Other," 10.7% Hispanic, 5.4% African American, and 3.6% Asian.

## Measures

### Schizotypal Personality Questionnaire (SPQ)

The SPQ is a 74-item self-report measure of traits found in schizotypal personality disorder (Raine, 1991), consistent with DSM-IV diagnostic criteria (American Psychiatric Association, 2000). The SPQ provides an overall total score and nine subscales that load onto a three-factor model. The Cognitive-Perceptual factor consists of ideas of reference, odd beliefs or magical thinking, unusual perceptual experiences and suspiciousness; the Interpersonal factor is comprised of social anxiety, no close friends, constricted affect, and suspiciousness; and the Disorganized factor contains odd or eccentric behavior and odd speech. The SPQ has demonstrated sound reliability and validity (e.g., Yasuda, Hashimoto, Ohi, Fukumoto, Umeda-

Yano, Yamamoi, &…Takeda, 2011; Mechri, Gassab, Slama, Gaha, Saoud, & Krebs, 2010; Calkins, Curtis, Grove, & Lacono, 2004; Raine, 1991).

### Psychopathic Personality Inventory-Revised (PPI-R)

The PPI-R is a 154-item self-report measure designed to give an overall measure of the original concept of psychopathy (Cleckley, 1941), as well as eight content scales that create two orthogonal factors. The PPI-FD, or "Fearless Dominance," and PPI-SCI, or "Self-Centered Impulsivity," are respectively analogous to Hare's PCL Factors 1 and 2 (Lilienfeld & Widows, 2005). A high score on the PPI-FD indicates lack of anticipatory anxiety, low levels of tension and worry, low harm avoidance, and high levels of interpersonal dominance, whereas a high score on the PPI-SCI indicates high self-centeredness, ruthless use of others, disregard of tradition values, propensity to blame others, and reckless impulsivity (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003). The PPI and PPI-R have evidenced good internal reliability and test-retest reliability (Lilienfeld & Widows, 2005), as well as good convergent and discriminant validity with other self-report measures of psychopathy (Uzieblo, Verschuere, Van den Bussche, & Crombez, 2010), including the PCL-R (Poythress et al., 2010).

### Personality Assessment Inventory - Aggression Scale (AGG)

The AGG scale is comprised of the Aggressive Attitude (AGG-A), Verbal Aggression (AGG-V), and Physical Aggression (AGG-P) subscales, which respectively assess for general emotions and attitudes facilitative of aggressive behavior, a readiness to exhibit anger verbally, and past history and present attitudes regarding physically aggressive behavior. The AGG scale is positively correlated with other measures of anger control (Morey, 1996).

### Beck Anxiety Inventory (BAI)

The BAI is a 21-item self-report measure that assesses for symptoms of anxiety experienced over the past week. Each item is rated on a 0 (not at all) to 3 (severe) scale. Total scores (sums of ratings) range from 0 to 63, with higher scores reflecting higher endorsements of anxiety. The measure has evidenced high internal consistency and test-retest reliability over a one-week period (Beck, Epstein, Brown, & Steer, 1988).

### Infrequency Scale

The Infrequency Scale is an 8-item measure modeled after the Infrequency Scale of Personality Research (Jackson, 1984) to help identify/exclude participants that may be answering items randomly or without sufficient effort. The questions asked about highly improbable events (e.g., "There have been a number of occasions when people I know have said to hello to me."). Participants were excluded if they endorsed more than one of these items in the wrong direction.

### Abbreviated Marlowe-Crowne Social Desirability Scale (MC)

The MC scale is a short (i.e., 13-item) form of a 33-item Marlowe-Crowe Standard form, which has been found to have strong reliability with the standard measure ($r$ = .93) and is widely used to assess and control for response bias in self-report research (Reynolds, 1982). Participants were excluded if their MC score was more than two standard deviations above the mean for all participants who completed the online screening phase.

### Self-Assessment Manikin (SAM)

The SAM (see Figure 1) is a self-report affective rating system that utilizes graphic figures to assess for a dimensional scale of affective valence, ranging from unpleasant (1) to

pleasant (9); arousal, ranging from calm (1) to excited (9); and dominance, ranging from in control (1) to dominated (9) (Lang et al., 2008).

## Procedure

Following a detailed informed consent and completion of self-report measures, participants completed the affective picture skin conductance task. This paradigm utilized 15 pictures (5 neutral, 5 of others in distress, and 5 threatening) from the International Affective Picture System (IAPS: Lang, Bradley, & Cuthbert, 2008), which have published normative data using the SAM affective rating system (See Table 1; Lang, 1980). Neutral pictures were chosen by the investigator based on neutral valence and low arousal, along with face validity of a lack of emotional content. Threat and distress pictures were chosen by the investigator based on unpleasant valence and high arousal, along with face validity for the desired emotion depicted. Following a five minute baseline, the experimental software E-Prime 2.0 (Psychology Software Tools, Inc.; Sharpsburg, PA) presented the 15 pictures in a time-controlled random order. Similar to the procedures of Blair and colleagues (1997), a picture was presented for eight seconds, followed by a blank interstimulus interval (randomly jittered between 30 and 40 seconds), which was then followed by the next picture. Immediately prior to the interstimulus interval, the SAM figures for valence, arousal, and dominance were presented sequentially on the monitor (self-paced by the participant), and the preceding picture was rated on each of these three categories.

During baseline and the picture viewing task, SC was assessed via Mindware (Mindware Technologies LTD; Gahanna, Ohio). A BioNex 8 Slot Chassis collected SC via two electrodes placed on the palm of the participant's left hand. The MindWare system transferred the data to BioLab Acquisition Software (Model 60-3700-00) on a desktop computer. The dependent SC

variable of interest was the Peak SC response amplitude, which is measured in microseimens (note: this is not a frequency count of peaks). An SC change was considered a “peak” when and if a threshold change of 0.05 microseimens was reached within three seconds of the picture onset. The relative amplitude of these responses were calculated and recorded by the MindWare software.

# CHAPTER THREE: RESULTS

The normality of the distribution for each variable was examined by inspecting the skewness and kurtosis. SC variables and scores from all scales followed a relatively normal distribution (skewness and kurtosis < ± 2.00); therefore, parametric statistics were utilized for all analyses. To establish successful experimental manipulation of each individual picture, a paired-samples *t*-test was first conducted to compare each individual's Peak SC response of each neutral picture and the average of all four other neutral pictures across all participants (see Table 2 for descriptive statistics for each neutral picture). No significant differences were found for Peak SC response between each individual neutral picture and the average of the remaining neutral pictures (all *p*s > .09); therefore, the average neutral Peak SC variable utilized all 5 neutral pictures. Paired-samples *t*-tests were then conducted to compare each individual's Peak SC response of each threat and distress picture to that individual's average of all 5 neutral pictures, which was calculated across all participants (see Table 2). Participants exhibited significantly greater Peak SC response to each distress and threat picture (compared with neutral average), with the exception of Distress #2703, Threat #1114, and Threat #6830 (see Table 2). As these three pictures did not elicit the intended emotion or effect on SC, average distress and threat SC variables used in the subsequent analyses excluded these three pictures.

A one-way ANOVA was then conducted to compare the effect of stimulus type (neutral, distress, and threat; using the average of the final items for each category) on the average Peak SC response across all participants (N = 56), which revealed a significant main effect for stimulus type, $F(2, 55) = 12.03$, $p < .001$, $\eta^2 = .18$. Analysis of simple effects revealed significantly increased Peak SC response to both distress, $t(55) = 5.08$, $p < .001$, and threat

pictures, $t(55) = 4.47$, $p < .001$, compared to neutral pictures; however, no difference was found for Peak SC response between threat and distress pictures, $t(55) = 0.02$, $p = .99$.

Zero-order Pearson correlations (see Table 3) revealed that total schizotypy was not significantly related to total psychopathy, but was positively related to PPI-SCI (see Figure 2) and negatively related to PPI-FD (see Figure 3). Correlations further revealed that total schizotypy was not significantly related to Peak SC response to distress (see Figure 4), threat (see Figure 5), or neutral pictures, and, similarly, was not related to participants' average subjective valence, dominance, or arousal ratings for distress or threat pictures. Total schizotypy was, however, significantly and positively related to the aggression and anxiety scores. For the aggression correlation, total schizotypy was most strongly related to an aggressive attitude followed by physical aggression, but was not significantly related to verbal aggression. In addition, these relationships were only significant for the cognitive-perceptual factor of schizotypy, but not the interpersonal or disorganized factors.

Examination of the correlations between the three SPQ factor scores and SC variables revealed a significant positive correlation between the disorganized factor and the Peak SC response to threat pictures. Although total psychopathy was not related to any Peak SC response variables, PPI-SCI was positively related to Peak SC response to threat pictures. Correlations further revealed that, across all participants, Peak SC response to distress pictures was not significantly related to any of the three subjective ratings of distress pictures, whereas Peak SC response to threat pictures showed a significant negative relationship with self-reported valence (i.e., greater Peak SC was related to participants rating the picture as more negative) a significant positive relationship with self-reported arousal, but no relationship with self-reported dominance.

Two linear hierarchical regressions were then conducted to test for the hypothesized moderation of the SCI factor of psychopathy and anxiety (respectively) on the schizotypy-to-Peak SC to distress relationship. Any participant that had both a Studentized residual value greater than +/- 2.0 and a Cook's distance value > 0.071 (4/N) was considered a statistical outlier and removed from that regression. When the Peak SC response to distress was regressed onto the PPI-SCI total score, SPQ total score, and the interaction term (excluding one statistical outlier), there was no significant interaction, $B$ = <.001, $t(51) = 0.31$, $p = .98$. Similarly, when the Peak SC response to distress was regressed onto the BAI total score, SPQ total score, and the interaction term (excluding two statistical outliers), there was no significant interaction, $B$ < 0.001, $t(52) = 0.04$, $p = .97$.

# CHAPTER FOUR: DISCUSSION

Results from the current study replicate a previous finding with an additional sample (Ragsdale & Bedwell, under review), corroborating that schizotypy is related to a unique psychopathy profile (i.e., higher PPI-SCI and lower PPI-FD; see Figures 2 and 3). However, in contrast to our hypotheses, the degree of schizotypy was not related to peak SC response to any category of the pictures, failing to provide support for the hypothesis that individuals with a higher level of schizotypy would be autonomically hyporesponsive to pictures of threat and distress. Based on previous findings, we hypothesized that this relationship would be moderated by anxiety and/or the PPI-SCI factor score, which was also not supported by the analyses. Therefore, it does not appear that increased schizotypy was related to a differential SC response to emotional pictures in our sample, even after testing for the potential moderating influence of general anxiety and the SCI factor of psychopathy.

One potential explanation of the failure to find these expected relationships was that our hypotheses were implicitly contingent upon psychopathy evidencing the expected negative relationship with SC response to the emotion pictures. However, total psychopathy was not related to any SC variable within our sample. Comparison of our sample's total psychopathy scores with the original normative samples of 18-to 24-year-old community/college participants (Lilienfeld and Widows, 2005) revealed that our male participants had a total PPI-R score at the $50^{th}$ percentile, while our female participants had a total PPI-R score at the $43^{rd}$ percentile. This suggests that the lack of the expected negative correlation between overall psychopathy (and by extension schizotypy) and SC response to emotion pictures found in our sample may be accounted for by a subthreshold level of psychopathic traits. Consistent with this theory, we

found that these individuals with subthreshold psychopathy showed an increase (instead of expected decrease or lack of change) in SC to threat pictures as the PPI-SCI factor score increased. An additional perspective on this finding is that psychopaths may exhibit a deficit in autonomic response for actual threat (e.g., shock; Hare, 1965; Hare and Craigen, 1974) but not perceived threat (e.g., visual stimuli; Blair et al., 1997).

Despite the lack of expected findings with the SC variables, the zero-order correlations between schizotypy, psychopathy, anxiety, and aggression revealed a number of interesting relationships. For example, as expected from previous research, total schizotypy and all three schizotypy factors were positively correlated with general anxiety (i.e., BAI total score). The presence of a higher level of anxiety in individuals with schizotypy likely influences the observed negative relationship between PPI-FD (factor 1 psychopathy) and schizotypy, as PPI-FD often describes individuals with low levels of anticipatory anxiety (Benning et al., 2003). This notion is supported in our sample by a partial correlation which revealed that the negative relationship between schizotypy and PPI-FD was no longer significant when controlling for anxiety ($r$ = -.12, $p$ = .39). Specifically, individuals who endorse high levels of anxiety related to schizotypy, despite a high level of PPI-SCI, may actually be less likely to experience the callous and unemotional traits associated with psychopathy, and therefore fail to exhibit autonomic hyporesponsiveness.

Additionally, general anxiety and total schizotypy were positively correlated with the Physical Aggression subscale of the AGG, which is the subscale most similar to physical violence (e.g., “Sometimes I’m very violent” and “I’ve threatened to hurt people.”). Therefore, individuals with higher levels of schizotypy were more likely to report both increased anxiety

and increased physical aggression, which may both relate to a general agitation factor. The increased propensity for physical aggression in this subclinical analogue sample suggests that individuals comorbid for schizotypy and psychopathy, despite lack of physiological hypoarousal, may still exhibit behavioral outcomes similar to the more severe comorbidity (e.g., violence). Specifically, physiological hyporesponsiveness, thought to be responsible for the absence of empathy and the presence of callous unemotional traits in psychopaths (Osumi, Shimazaki, Imai, Sugiura, & Ohira, 2007), is not found within individuals with subthreshold levels of schizophrenia and psychopathy. This suggests, at least in this type of sample, that the associated aggression may be responsible for possible violent behavior; not psychopathy. This finding also extends the extant literature which reports a self-report relationship between schizophrenia and psychopathy, extending those findings to include an increased self-report of physical aggression related to schizotypy.

Finally, results did not support the hypotheses that schizotypy would be related to self-report ratings of the pictures, as no relationships were found between schizotypy and subjective valence, dominance, or arousal. This finding was inconsistent with prior research which found that the schizotypy was related to increased self-reported negative affective valence (Barenbaum et al., 2006) including in response to aversive images (Najolia, Cohen & Minor, 2011). When examining all participants, SC response to distress pictures additionally failed to show a relationship with any self-reported subjective ratings of distress pictures, including arousal. This finding suggests that individuals may fail to experience a strong link between their autonomic response and subjective emotional experience to these types of pictures, or, alternatively, that the SAM rating scales may not adequately capture the emotional response to these types of pictures.

Conversely, across all participants, SC response to threat pictures showed a negative relationship with valence and a positive relationship with threat arousal, suggesting a more consistent link between SC response and subjective report on the SAM for threat rather than distress pictures.

Taken together, these findings replicate a specific self-report relationship between psychopathy and schizotypy, in which schizotypy is positively related to PPI-SCI and negatively to PPI-FD, and extends these findings by showing that schizotypy is also positively related to self-reported physical aggression. However, results fail to support the presence of psychopathic autonomic hypoarousal within individuals endorsing higher levels of schizotypy, suggesting that the comorbidity of psychopathy and schizotypy presents with a different physiological pattern than what is expressed in pure psychopathy. The current study extends prior work on the overlap of schizophrenia and psychopathy by beginning to clarify the physiological response patterns of this comorbidity through a novel investigation of a nonforensic and nonpsychiatric analog sample. Admittedly, a limitation of this study is the use of undergraduate students, as it is unclear how well findings will generalize to more severe clinical and forensic samples. An additional limitation is the subjective differentiation of threat and distress pictures chosen for this study. Although images were chosen based on normed ratings of arousal and valence, categorical distinction between the aversive pictures was based on apparent face validity. Although peak SC responses to both categories of aversive pictures were larger than peak SC response to neutral pictures, without having participants rate subjective perception of aversive pictures beyond general arousal, dominance, and valence (i.e., perceived threat or distress), it cannot be affirmed with certainty that threat and distress pictures were cleanly isolated. Therefore, extant literature would benefit from future examination of larger samples of pictures where individuals could rate

how well images convey or represent threat, distress, and other emotions. Additionally, as each emotion category utilized five or less pictures, future research should utilize larger sample sizes of emotional stimuli to ensure an adequate number of trials, as this may explain why we did not find the expected relationship between schizotypy and increased negative valence ratings for the aversive pictures.

Despite these limitations, results contribute to the current literature aimed at understanding the link between violence and schizophrenia. This line of research is ultimately aimed at preventing violent behavior through identification of effective treatment techniques and appropriate assessment measures, which should in turn reduce the associated stigma (Torrey, 2011). Findings of the current study begin to elucidate physiological mechanisms (or lack of expected autonomic response) underlying the comorbidity found in schizotypy and psychopathy and suggest a specific pattern of association between psychopathy and schizotypy that may be related to violent behavior despite this absence of hyporesponsiveness. Future experimental research is needed to clarify whether those with comorbid schizophrenia and psychopathy exhibit the same absence of physiological hyporesponsiveness to distress and threat images found within the current schizotypy and psychopathy sample, as well as explore additional physiological measures (e.g., startle eye blink) and emotional stimuli (e.g., in vivo perception of threat).

# APPENDIX A: FIGURES

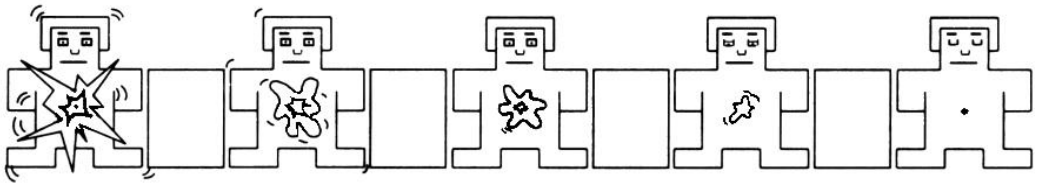

Figure 1: The SAM Figures for Arousal

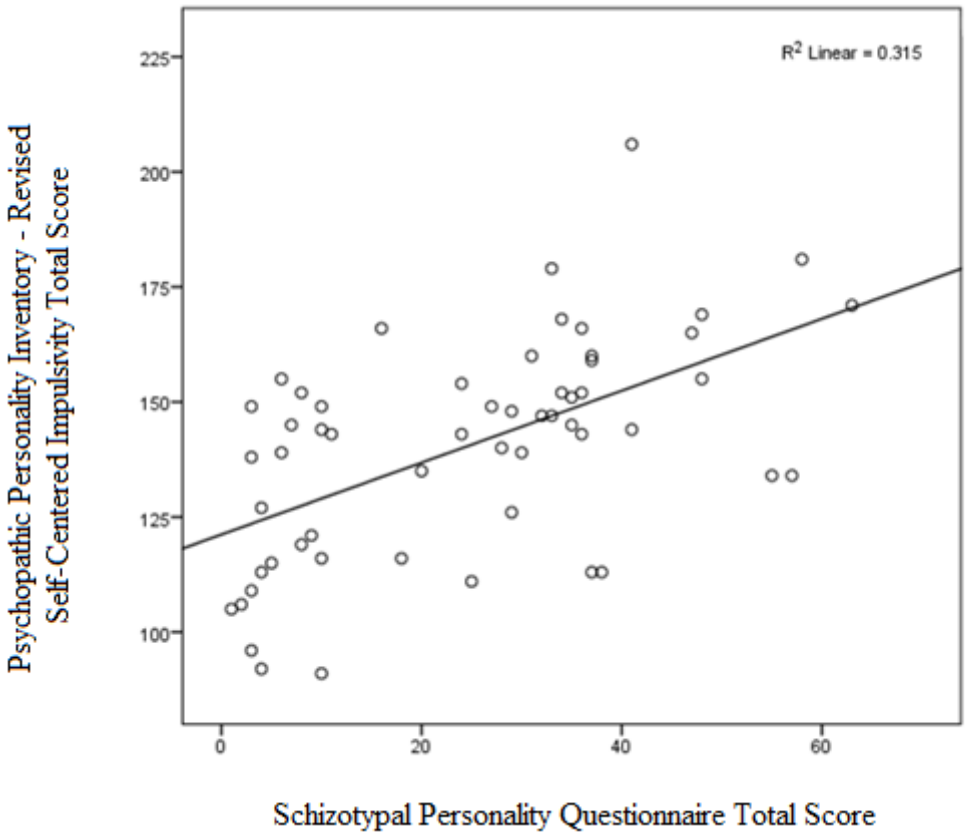


Figure 2: Scatterplot of Total Schizotypy and Self-Centered Impulsivity

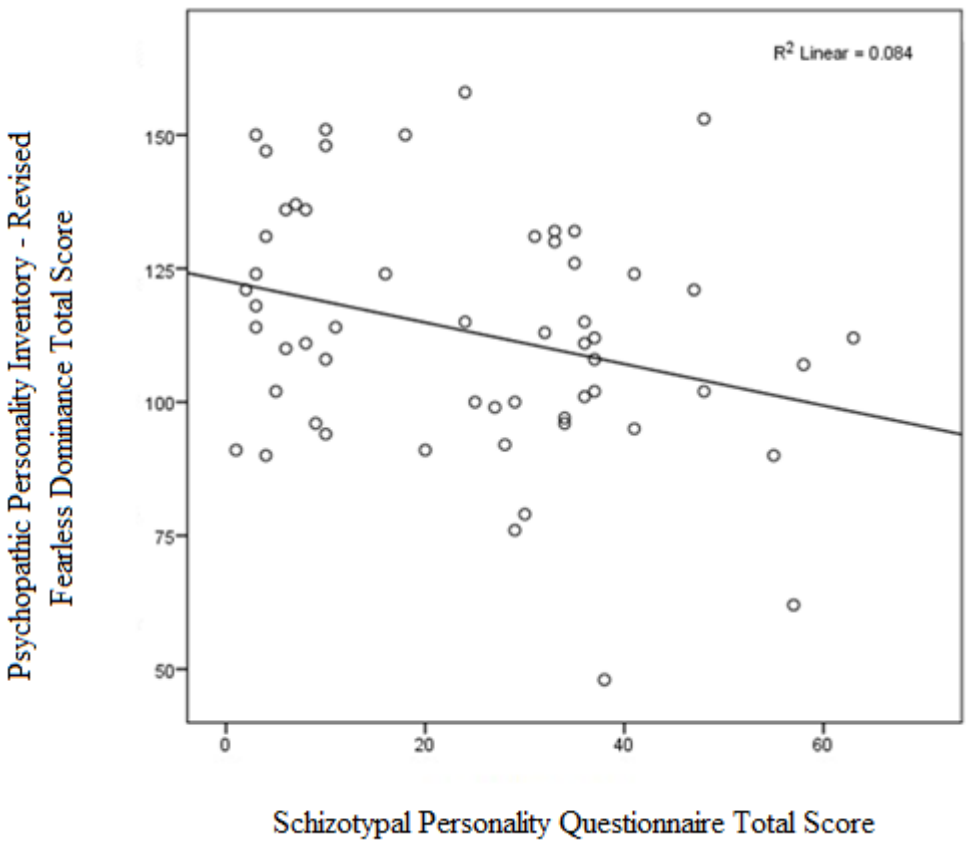


Figure 3: Scatterplot of Total Schizotypy and Fearless Dominance

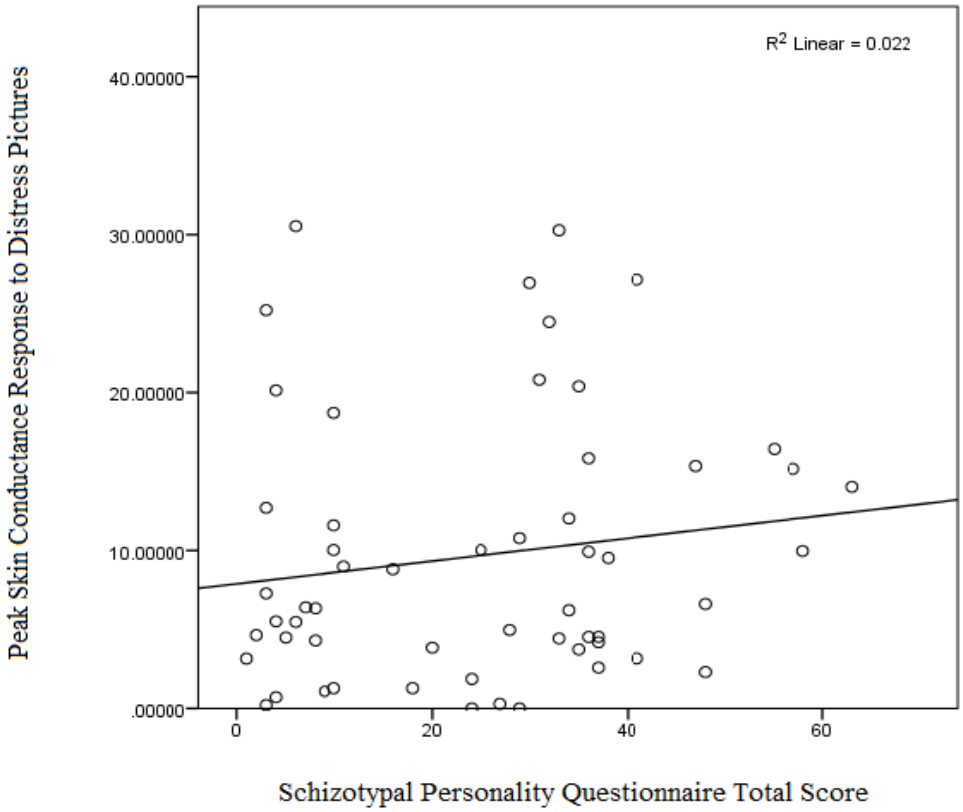


Figure 4: Scatterplot of Total Schizotypy and Peak Skin Conductance to Distress Pictures

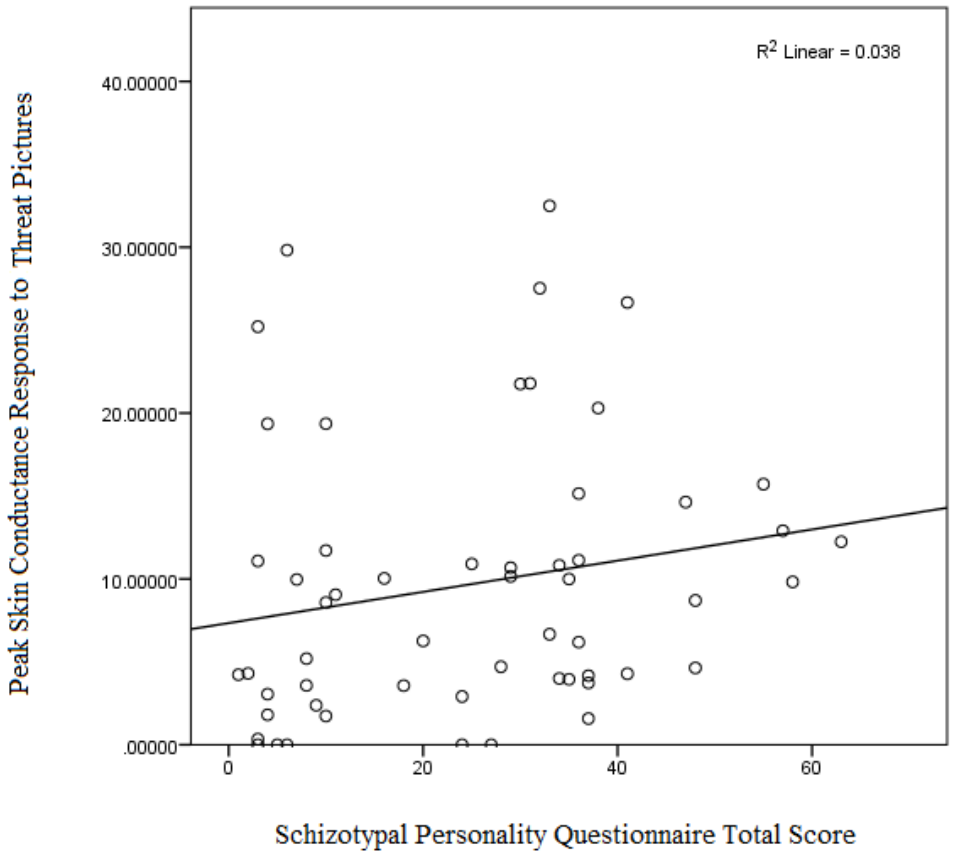


Figure 5: Scatterplot of Total Schizotypy and Peak Skin Conductance to Threat Pictures

# APPENDIX B: TABLES

Table 1: Normative Ratings of IAPS Pictures

| | IAPS Picture Number/ Description | Valence Rating[a] *M(*SD) | Arousal Rating[b] M(SD) |
|---|---|---|---|
| **Others in Distress** | 9413; men being hanged | 1.76(1.08) | 6.81(2.09) |
| | 2703; crying children | 1.91(1.26) | 5.78(2.25) |
| | 9040; starving child | 1.29(0.64) | 6.57(2.39) |
| | 6500; knife to throat | 2.73(2.38) | 7.09(1.98) |
| | 3168, mutilated face | 1.56(1.06) | 6.00(2.46) |
| **Threatening** | 1114, open mouthed snake | 4.03(2.16) | 6.33(2.17) |
| | 1525, attack dog | 3.09(1.72) | 6.51(2.25) |
| | 2120, close up of angry male face | 3.34(1.91) | 5.18(2.52) |
| | 6260, gun pointed at observer | 2.44(1.54) | 6.93(1.93) |
| | 6830, masked man with guns | 2.82(1.81) | 6.21(2.23) |
| **Neutral** | 7000, rolling pin | 5.00(0.84) | 2.42(1.79) |
| | 7010, wicker basket | 4.94(1.07) | 1.76(1.48) |
| | 7175, lamp | 4.87(1.00) | 1.72(1.26) |
| | 7090, book | 5.19(1.46) | 2.61(2.03) |
| | 7080, fork | 5.27(1.09) | 2.32(1.84) |

[a] Ranges from unpleasant (1) to pleasant (9)

[b] Ranges from calm (1) to excited (9)

Table 2: Descriptive Statistics of Peak Skin Conductance Response for Each Picture

| | Neutral | | Distress | | Threat | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Picture 1 | 7.68 | 8.82 | 8.22 | 8.68 | 7.89 | 8.78 |
| Picture 2 | 7.29 | 7.97 | 10.65*** | 9.00 | 10.07*** | 8.51 |
| Picture 3 | 7.31 | 9.15 | 9.86*** | 9.04 | 8.87* | 9.19 |
| Picture 4 | 7.92 | 8.74 | 8.96* | 9.24 | 10.03** | 8.89 |
| Picture 5 | 6.23 | 8.42 | 9.19** | 8.64 | 8.21 | 8.98 |

*Note. Significance denotes significant difference from average of all neutral pictures.*

*All values are microseimens.*

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 3: Zero-order Correlations

| Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. SPQ Total | — | | | | | | | | | | | | | | | | | | | | |
| 2. SPQ CogPer | .913*** | — | | | | | | | | | | | | | | | | | | | |
| 3. SPQ Int | .777*** | .512*** | — | | | | | | | | | | | | | | | | | | |
| 4. SPQ Dis | .888*** | .767*** | .562*** | — | | | | | | | | | | | | | | | | | |
| 5. PPI-R Total | .153 | .215 | -.042 | .199 | — | | | | | | | | | | | | | | | | |
| 6. PPI-R SCI | .561*** | .548*** | .399** | .490*** | .764*** | — | | | | | | | | | | | | | | | |
| 7. PPI-R FD | -.290* | -.148 | -.510*** | -.132 | .746*** | .175 | — | | | | | | | | | | | | | | |
| 8. Peak SC Distress | .148 | .094 | .109 | .201 | .232 | .250 | .119 | — | | | | | | | | | | | | | |
| 9. Peak SC Threat | .194 | .110 | .149 | .277* | .215 | .272* | .070 | .926*** | — | | | | | | | | | | | | |
| 10. Peak SC Neutral | .072 | .037 | .044 | .127 | .225 | .221 | .112 | .908*** | .878*** | — | | | | | | | | | | | |
| 11. Distress Valence | .050 | .191 | -.100 | -.041 | -.212 | -.140 | -.074 | -.206 | -.240 | -.199 | — | | | | | | | | | | |
| 12. Distress Dominance | -.120 | -.208 | .077 | -.139 | .156 | -.017 | .164 | .096 | .098 | .053 | -.539*** | — | | | | | | | | | |
| 13. Distress Arousal | -.072 | -.156 | .010 | .032 | .314* | .085 | .323* | .100 | .158 | .072 | -.561*** | .579*** | — | | | | | | | | |
| 14. Threat Valence | -.156 | -.014 | -.228 | -.228 | -.380** | -.345** | -.164 | -.230 | -.299* | -.254 | .695*** | -.453*** | -.560*** | — | | | | | | | |
| 15. Threat Dominance | -.061 | -.085 | -.052 | -.002 | .341** | .091 | .398** | -.009 | .053 | .056 | -.386** | .638*** | .446** | .494*** | — | | | | | | |
| 16. Threat Arousal | -.006 | -.113 | .086 | .057 | .248 | .112 | .259 | .225 | .299* | .192 | -.462*** | .458*** | .700*** | -.561*** | .517*** | — | | | | | |
| 17. PAI Agg Total | .267 | .357** | .147 | .129 | .345** | .373** | .098 | .058 | .064 | .005 | -.272* | .090 | .068 | -.190 | .190 | .013 | — | | | | |
| 18. PAI Agg Attitude | .341** | .414** | .225 | .186 | .219 | .311* | -.032 | .037 | .008 | .004 | -.215 | .060 | .023 | -.135 | .063 | -.093 | .902*** | — | | | |
| 19. PAI Physical Aggression | .270* | .352** | .127 | .163 | .329* | .387** | .094 | -.008 | .035 | -.080 | -.123 | -.028 | -.035 | -.086 | .127 | -.041 | .890*** | .756*** | — | | |
| 20. PAI Verbal Agg | .057 | .134 | .005 | -.036 | .351** | .246 | .224 | .135 | .148 | .089 | -.347** | .203 | .200 | -.266* | .313* | .194 | .790*** | .559*** | .536*** | — | |
| 21. BAI Total | .564*** | .555*** | .477*** | .407** | .001 | .409** | -.352** | .043 | .060 | .004 | .104 | -.107 | -.196 | -.036 | -.065 | -.066 | .393** | .443** | .383** | .129 | — |

*Note. Values are Pearson correlation coefficients; *p* < .05, ***p* <. 01, ****p* < .001.

SPQ = Schizotypal Personality Questionnaire; CogPer = Cognitive-Perceptual; Int = Interpersonal; Dis = Disorganized PPI-R = Psychopathic Personality Inventory – Revised; SCI = Self-Centered Impulsivity; FD = Fearless Dominance; SC = Skin Conductance; PAI = Personality Assessment Inventory; Agg = Aggression; BAI = Beck Anxiety Inventory

# APPENDIX C: IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

## Approval of Human Research

From: **UCF Institutional Review Board #1**
**FWA00000351, IRB00001138**

To: **Kathleen Ragsdale** and Co-PI: **Daniella Schlander, Jonathan Mitchell, Thomas A. Altro**

Date: **June 23, 2011**

Dear Researcher:

On 6/23/2011, the IRB approved the following human participant research until 6/22/2012 inclusive:

| | |
|---|---|
| Type of Review: | UCF Initial Review Submission Form |
| Project Title: | Personality traits related to skin conductance response to affective pictures |
| Investigator: | Kathleen Ragsdale |
| IRB Number: | SBE-11-07728 |
| Funding Agency: | |
| Grant Title: | |
| Research ID: | N/A |

The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 6/22/2012, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Kendra Dimond Campbell, MA, JD, UCF IRB Interim Chair, this letter is signed by:

Signature applied by Joanne Muratori on 06/23/2011 04:15:58 PM EDT

Joanne Muratori

IRB Coordinator

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