Spring 2017

Psychopathy and the Effect of Imitation on Empathetic Pain

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PSYCHOPATHY AND THE EFFECT OF IMITATION ON EMPATHETIC PAIN

by

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(Under the Direction of Amy Hackney)

ABSTRACT

Psychopathy is a disorder largely characterized by a marked deficit in empathy, however, the specificity and extent of the deficit is currently unclear. While it has been well-established in the literature that individuals higher in psychopathy tend to have intact Theory of Mind abilities and exhibit a deficient ability for affective empathy (Blair, 2005), the contribution of motor empathy to these abilities, particularly in regard to empathy for pain, has yet to be experimentally examined. Additionally, the possibility of imitation increasing motor empathic abilities has not been tested in this capacity. The goal of the current study was to further explore the role of motor empathy and imitation in empathetic pain within individuals higher in psychopathy by employing a physiological measure in conjunction with self-report measures.

Participants (N = 120) completed three measures of psychopathy (PPI-R: SF, SRP-SF, and Tri-PM) and a measure of motor empathy (Berg Motor Empathy questionnaire). Skin conductance was measured as all participants viewed 15 static images of faces expressing pain, fear, and a neutral expression while either imitating or observing the expressions and subsequently rated the images using the Self-Assessment Manikin (SAM). Results showed that, while participants showed greater SCRs to the aversive images and greater SCRs during imitation, they did not differ in self-report ratings between imitate and observe groups. Further,

there were no differential effects of imitation on overall experience of empathetic pain in people higher in psychopathy. Implications and future directions are discussed.

INDEX WORDS: Psychopathy, Empathy, Empathetic Pain, Imitation, Motor empathy

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B.A., University of North Carolina Wilmington, 2014

A Thesis Submitted to the Graduate Faculty of Georgia Southern University in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

STATESBORO, GEORGIA

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Electronic Version Approved:

May 2017

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CHAPTER 1

INTRODUCTION

Psychopathy is a pervasive disorder characterized by interpersonal difficulties and affective deficits, such as guiltlessness and shallow affect, as well as a pattern of antisocial behavior and impulsive lifestyle, including recklessness and deceitfulness (Cleckley, 1982; Hare, 2003). These distinct characteristics of psychopathy have been categorized into Factor 1 and Factor 2 traits, respectively, to distinguish between the traits that are more emotional in nature, referring to interpersonal behavior, and those that are more lifestyle-related, referring to typical patterns of behavior (Hare, 2003). The factors delineated by Hare also coincide with the constructs of primary and secondary psychopathy, which exemplify the affective/interpersonal features versus the behavioral/lifestyle features, respectively, as well as allude to a biological basis versus a more environmentally-influenced pathology (Lykken, 1995).

Central to the disorder, and largely underlying the interpersonal and affective (Factor 1) traits, is a marked lack of empathy and a callous disregard for the well-being of others (Decety, Skelly, & Kiehl, 2013; Hare, 2003; Meffert et al., 2013). This specific deficit has been extensively studied in individuals diagnosed with psychopathy as well as the general population. However, the empathy impairment unique to those higher in psychopathy, mainly involving the affective component, has yet to be experimentally examined in the context of empathetic pain, i.e., the subjective experience of observed pain. Further, the role of motor empathy—the vicarious experience of another's actions—in understanding and sharing another's emotional experience of pain has yet to be experimentally examined in individuals higher in psychopathy. The purpose of the current experiment is to fill this gap in the literature by exploring the effects

of imitating emotionally distressful pictures of faces on autonomic responses, specifically in people higher in psychopathic traits.

Empathy

Empathy, in a general sense, is the ability to comprehend the emotional experiences of another person and reciprocate those feelings and experiences (Lamm, Batson, & Decety, 2007); however, several definitions of empathy exist to delineate the different aspects of the empathic experience. The overall construct of empathy has been shown to be comprised of three distinct components each uniquely contributing to an individual's subjective experience (Neumann & Westbury, 2001). Cognitive empathy refers to perspective taking of the observer. This is also known as Theory of Mind (Lamm, Batson, & Decety, 2007) or imaging oneself in another's situation. Affective empathy, in contrast, refers to the shared emotional state between subject and observer, which can mean imagining the feelings of another person or feeling another person's distress or suffering. Affective empathy can be further deconstructed into empathic concern, similar to compassion, and personal distress. The difference between the two aspects is that personal distress implies that the personal emotional experience is shared by both parties whereas empathic concern involves only the experience of the subject (Davis, Luce, & Kraus, 1994). Finally, there is also evidence of motor empathy, defined by Blair (2005) as the innate tendency to simultaneously imitate the facial expressions, intonations, and body language of another person.

To further explicate the differences and relationships between the empathy components, the third component, also known as emotion contagion, provides the basis for what is known as the Perception Action Model (Preston & de Waal, 2002) of empathy. This model proposes that empathy is a function, present in both humans and multiple species of non-humans, that evolved

from automatic processes such as mimicry. This function allows for development of certain cognitive skills such as the learning of appropriate behaviors, interactions, and consequences of those actions early in life as well as learning potential dangers (Goubert et al., 2005). Further, the model proposes that when we perceive an emotion, certain areas of the brain are activated eliciting the corresponding emotion in ourselves (Lamm, Batson, & Decety, 2007). The Perception Action Model in turn led to the embodied simulation view of empathy which proposes an essential role of a specialized group of neurons known as the mirror neuron system (MNS). Mirror neurons are suggested to share common pathways in the brain that are activated both when an individual observes an action or experience as well as when they execute or experience that same situation (Fecteau, Pascual-Leone, & Theoret, 2008). Evidence suggests that the MNS, responsible for simulating observed facial expressions, forms a network with the limbic system and insula, areas associated with emotion. The limbic areas receive feedback from the MNS thus becoming activated and eliciting a corresponding emotion or action (i.e., the empathic response) (Iacoboni, 2009).

Some studies have suggested that motor empathy can be viewed as a component of or a precursor to cognitive empathy, but both seem to be essential in eliciting the affective empathic response (Decety, Chen, Harenski, & Kiehl, 2013). Although the research to date has been inconsistent regarding the precise relationships among the three types of empathy, motor empathy appears to be a common factor in modulating both cognitive and affective empathy via imitation. In one instance, it was reported that motor imitation (i.e., imitation of bodily postures/movement) was positively associated with cognitive empathy but not with emotional empathy (Chartrand & Bargh, 1999). Conversely, a later study using electromyography (EMG) to measure facial motor imitation found that emotional empathy was positively associated with

imitation of facial expressions (Sonnby-Borgstrom, 2002). Similarly, neuroimaging studies using different experimental paradigms have indicated differential MNS involvement in empathy—that is, three of the studies found an association with emotional empathy while another study identified an association with cognitive empathy. The differences in the findings are presumably due to the inconsistent methodologies (Baird, Scheffer, & Wilson, 2011). Later transcranial magnetic stimulation (TMS) studies support the importance of the MNS in empathy, and particularly empathetic pain, by demonstrating a positive association between sensorimotor resonance for pain and MNS function (Baird, Scheffer, & Wilson, 2011).

Additional research has shown that the MNS response occurring during the execution of an action and during the observation of that action is also involved in our understanding of another's pain due to the overlapping activation of these areas in conjunction with activation of emotion-related areas (Blair, 2005; Singer et al., 2004). Evidence indicates that we unconsciously imitate facial expressions we see and, through a primitive biofeedback process, provides us with more information about the emotional state of the subject (Blairy, Herrere, & Hess, 1999; McIntosh, 1996). In effect, when we see another person in pain, specific parts of our brains composed of mirror neurons become activated, areas commonly collectively referred to as the pain matrix, as if we were experiencing it first-hand allowing us to understand, at both cognitive and emotional levels, the pain of others (Derbyshire, 2000; Lamm, Batson, & Decety, 2007; Singer et al., 2004). It has been suggested that this mirror neuron activation is the mechanism through which we vicariously experience the pain of a suffering individual or victim and thus are able to empathize—a function partially facilitated by automatic facial mimicry due to the associations among the brain regions involved in emotion, action observation, and action execution. Normally, such a reaction serves to elicit an aversive reaction in the observer

prompting certain behaviors, typically an attempt to help the person in pain or inhibiting any aggressive impulses. However, if this ability is impaired or abnormal, the aversive reaction in the observer may not be elicited (Lee et al., 2013; Lamm, Batson, & Decety, 2007).

Imitation

Lipps (1903) is identified as the first to clearly define empathy and the first to allude to its relationship to imitative ability, defining empathy as understanding the mental states of others unconsciously via "inner imitation" (Baird, Scheffer, & Wilson, 2011). Some of the first empirical evidence suggesting a connection between facial expressions of emotion and experiencing that emotion was provided by Laird (1974) and which was soon followed and supported by the work of Lanzetta, Cartwright-Smith, & Kleck (1976). Their pioneering work found that people pretending not to experience pain while undergoing electric shocks showed fewer physiological and subjective responses to pain compared to those pretending to exhibit unbearable pain or those expressing natural pain reactions. These results led to the coining of the term *facial feedback hypothesis* (McIntosh, 1996).

More recent research focused on this automatic mimicry process that has been proposed to initiate the response to observed facial expressions (Davis, Senghas, & Ochsner, 2009). In an investigation of the effect of facial emotion inhibition on the strength of emotional experience. Participants viewed video clips that were of positive, negative, and neutral valence while their facial muscle movements were assessed. The results indicated that those participants who were instructed to keep their face motionless during the videos (i.e. inhibiting their emotional expression) experienced significantly less emotion, measured using a Likert-type emotions questionnaire, than participants who were not given any instructions. These results provide

evidence in support of the facial feedback hypothesis, suggesting that by changing one's facial expression, the emotional experience of the person can in fact be altered (Davis et al., 2009).

Later studies incorporating physiological indicators of empathy lend further support to the role of imitation. In a study testing the effects of voluntary imitation on autonomic responsiveness, Lee et al. (2013) instructed undergraduate student participants to either imitate neutral and angry facial expressions, selected from a set of static face images displayed on a computer screen, or to simply observe them while their EMG responses and SC responses were recorded. Findings revealed that the SC responses were significantly higher in those who imitated compared to those who observed. Autonomic responsivity was significantly higher specifically in those who imitated the angry facial expressions compared to the neutral ones. EMG responses were significantly higher for both types of expressions. The results suggest that the stronger feedback the facial muscles were producing from the imitation resulted in enhanced sympathetic activation in response to negative emotions (Lee et al., 2013).

Advances in technology since the first associations between facial expression and emotional experience were observed have allowed for the assessment of empathy within participants using physiological correlates. Such measures include, but are not limited to electroencephalography (EEG), functional and structural MRI, electromyography (EMG), and galvanic skin response (GSR). These novel methods have been used in conjunction with traditional measures of behaviors leading to new insights and providing methodological tools that were unavailable with early research approaches. Such methods provide objective physical evidence to support that derived from self-report measures. Research can now focus more on the higher order cognitive and affective processes related to autonomic functioning and empathy (Neumann & Westbury, 2001). Additionally, physiological measures offer a level of objectivity

that is unattainable with self-report measures and allow a better operationalization of empathy through the assessment of central nervous system, autonomic nervous system, and motor system activity (Neumann & Westbury, 2001). The majority of studies regarding the complex relationships among the forms of empathy and imitation, however, have been conducted in community or college populations with participants whose empathy is intact or with patients who have suffered brain damage. The research to date is quite limited regarding these relationships within individuals higher in psychopathy, who are characterized by an empathy deficit.

Psychopathy and Empathy for Pain

A growing body of literature has used brain imaging technology to demonstrate the associations between activities in specific brain regions with the ability of individuals higher in psychopathy to empathize, specifically to empathize with those in pain (Fecteau, Pascual-Leone, & Theoret, 2008; Meffert, Gazzola, den Boer, Bartels, & Keysers, 2013). In one instance, a study using TMS of the motor cortex demonstrated that the MNS in this region is responsive to implied actions (in this case a needle penetrating either a hand or inanimate object) even without the presence of an actual body part (Fecteau, Pascual-Leone, & Theoret, 2008). Further, individuals high in psychopathic traits, specifically the cold-heartedness subscale of the Psychopathic Personality Inventory-Revised (PPI-R), exhibited significantly greater cortical excitability during the presentation of the pain stimulus which is suggestive of greater sensorimotor responsivity (or motor empathy) to pain in these individuals (Fecteau, Pascual-Leone, & Theoret, 2008). Additional EEG and fMRI studies lend support to the findings of increased sensorimotor responsivity to pain experienced by others in psychopathy (Decety, Chen, Harenski, & Kiehl, 2013).

Interestingly, previous research has shown that although individuals higher in psychopathy understand the emotional states of others on an intellectual level (i.e., they possess intact cognitive empathy), they are unable to share the emotional state of others (Blair, 2005; Patrick, Bradley, & Lang, 1993; Wai & Tiliopoulos, 2012), illustrating a deficit in affective empathy. Individuals higher in psychopathy seem to be unable to appreciate or vicariously feel the same emotion another person is feeling and provide an appropriate emotional response (Blair, 2005). One theory that has been proposed for this specific deficit in affective empathy is that individuals higher in psychopathy have a reduced capacity to vicariously experience the emotions of others (Meffert et al., 2013). In the context of empathetic pain experiences, therefore, it is possible that the typical neural and autonomic response one would expect when observing pain is less robust in the brains of those higher in psychopathy. This theory was tested by Decety, Skelly, and Kiehl (2013) with a population of incarcerated males who had been diagnosed with psychopathy using the Psychopathy Checklist-Revised (PCL-R).

Participants with a score of 30 or higher were included in the high psychopathy group. Results from the study showed that, when looking at images of painful interactions, the healthy control participants exhibited appropriate activation in the amygdala and hippocampus (areas involved in emotion regulation) while the men diagnosed with psychopathy showed less activation in areas of the brain associated with emotion; however, they showed greater activation in areas associated with cognitive empathy, or Theory of Mind (Decety, Skelly, and Kiehl, 2013). Those high in psychopathic traits showed greater activation in the brain region that is most consistently activated in empathy for pain compared to controls who showed more activation in regions involved in both cognition and emotion. When participants were looking at only the facial expressions of pain no differences emerged in activation of the fusiform gyrus,

responsible for face recognition, indicating that the deficit was specific to emotional aspects of the observed pain experience. The findings showed that affective empathy tended to decrease significantly during both the observation of painful interactions and painful facial expressions in individuals higher in Factor 1 psychopathy traits, who are characterized mainly by the emotional and interpersonal features of the disorder. The deficit in affective empathy seems to be a consistent finding as evidenced by the hypo-activation of brain areas associated with emotion and involved in the pain matrix (Decety, Skelly, & Kiehl, 2013).

Complementary to the findings regarding affective empathy's role in empathetic pain, Avenanti, Bueti, Galati, and Aglioti (2005) conducted a study using TMS to investigate the roles of motor empathy as well as affective empathy in the observation of pain. The motor evoked potentials (MEPs) elicited in the participants' hands were recorded and TMS pulses were delivered to the motor regions of their brains as they observed videos of a needle penetrating a hand, a Q-tip grazing the same hand, and a needle penetrating a tomato. Participants also gave subjective ratings, using Visual Analogue Scales, of their perception of the "painfulness" of the stimuli to the target and the intensity of the model's pain. Results demonstrated reduced MEPs, indicative of sensorimotor resonance (or contagion), only when participants observed a needle penetrating a hand compared to the non-painful stimuli. Further, the reduced excitability was significantly correlated with the participants' self-reported sensory empathy scores (Avenanti et al., 2005). The authors suggest that, because empathy for pain seems to rely on both motor and affective empathy, it is plausible that the ability to vicariously the pain experience of another person may be integral to learning socially appropriate reactions to painful stimuli. These findings may possibly elucidate, to a certain degree, mechanisms of the empathy deficit in psychopathy and the inappropriate responses to distress associated with the disorder. However, a

similar study has yet to be conducted with individuals higher in psychopathy so it is largely unknown the degree to which they can vicariously experience pain. However, there is robust evidence of diminished autonomic response to distress cues and fear in psychopathy, lending support to the neuroimaging findings and self-report findings.

Psychopathy and Autonomic Responsivity

Brain imaging is not alone in the investigation of association between emotion and facial expression. Recent studies have also examined this interaction using EMG, or facial muscle movement, and electrodermal activity (EDA). EDA is the general term that encompasses both the electrical changes occurring in the skin as well as the resting potential, or resting electrical activity (Raine, 2013). EDA is more commonly referred to in the emotion and empathy literature as galvanic skin response (GSR) or skin conductance (SC)—hereafter referred to as SC to maintain consistency.

Although these measures are nonspecific assessments of sympathetic activation, rather than methods of detecting responses to a particular emotion, they demonstrate fairly consistent effects of emotion on autonomic responsivity (Neumann & Westbury, 2011). For instance, a study assessed SC responses and heart rate responses to neutral and aversive tones in a group of three-year old children and then assessed them at age 28 for psychopathic traits using the Self-Report Psychopathy (SRP-II; Hare, 2003) scale. They found that the adults who scored higher on the SRP were less inhibited and less fearful at age 3, as exhibited by their autonomic responses. In addition, the higher scorers took longer to recover from the tones, the longer recovery time significantly predicting psychopathy and supporting the results of similar studies conducted with adults (Glenn, Raine, Venables, & Mednick, 2009). These results are suggestive of a diminished

avoidance response to aversive stimuli stemming from early childhood that could possibly be predictive of psychopathic traits later in life.

In recent years, numerous studies have continued to add to the literature on using physiological measures to explore the deficiencies in emotional reactivity specifically in psychopathic individuals, showing generally consistent results. These studies show that individuals higher in psychopathy tend to exhibit deficient SC responses to conditioned aversive stimuli (including startle probes and noise blasts), shock anticipation, as well as responses to adrenaline infusions (Benning, Patrick, & Iacono, 2005). Dindo and Fowles (2011) assessed SC responses during two different types of tasks, a countdown stressor task and a stressful speech task, in individuals assessed for psychopathy. Results showed that individuals scoring high on Factor 1 traits, particularly fearlessness, were negatively related to SC responses during the countdown stressor task, in which the individual waits in anticipation of a loud noise blast. Factor 2 traits were unrelated in this task but were associated with significantly increased SC during the speech task, consistent with theories suggesting relatively intact anxiety and negative emotion in individuals higher in Factor 2 psychopathy traits (Dindo & Fowles, 2011). In addition, other studies have shown consistent negative associations between the startle reflex and psychopathy, particularly related to fearlessness, as well as negative associations with anticipation of noise blasts and amygdala activation during fear processing (Lilienfeld et al., 2012). Together these findings lend support to the fearlessness theory of psychopathy as well as the theory that Factor 1 and Factor 2 traits might describe two distinct forms of the disorder.

Further, a study conducted by Benning, Patrick, and Iacono (2005) assessed startle blink response to an unexpected startle probe (in this case an aversive noise) while participants, who were previously assessed for psychopathic traits, viewed pleasant, neutral, or negative pictures.

Findings revealed that the participants who scored high in Fearless Dominance (FD), a subscale of the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Widows, 2005), exhibited significantly lower SC responses to negative pictures, showed a smaller SC response overall, and failed to exhibit a startle reflex compared to the low scorers. The latter result was specific to FD, whereas the SC findings applied to both those with FD and Impulsive/Antisocial traits. FD traits also significantly predicted the difference between the degree of startle response for negative pictures whereas Impulsive/Antisocial traits did not (Benning, Patrick, and Iacono, 2005).

The collective findings indicate that the possible biological mechanisms that underlie psychopathy seem to be relatively similar across sample populations, particularly regarding the Factor 1 traits. The reliability of the associations between autonomic activity and psychopathy suggests that this population is relatively fearless, demonstrating deficient autonomic responsivity to threat. This pattern of associations indicates that they may possess a biological tendency to approach otherwise aversive situations rather than avoid them, providing support to the fearlessness theory of psychopathy (Benning, Patrick, & Iacono, 2005; Lilienfeld et al., 2012; Raine, 2013).

The Current Study

The current study aimed to investigate the gap in the literature regarding the roles of affective and motor empathy in how individuals higher in psychopathy vicariously experience the pain of others. Previous studies have shown that facial mimicry partially facilitates motor empathy in the general population, in turn allowing the observer to share the emotional state of the subject (i.e., produce a vicarious experience) (Davis, Senghas, & Ochsner, 2009; McIntosh,

1996). Given these findings, it is possible that the same process can potentially be a mechanism through which the empathic capacity may be accessed in people higher in psychopathy.

Studies have repeatedly shown that imitation of facial expressions can modulate the emotional or empathic experience of individuals in community or college populations (Lee et al., 2013). Although the extent to which psychopathic individuals possess the same ability has yet to be tested with a similar methodology, a recent study used an extreme groups procedure within the general population to test emotional congruency of facial expressions in individuals high in psychopathic traits compared to those low in these traits (Khvatskaya & Lenzenweger, 2015). Undergraduate participants completed the PPI-R to assess psychopathic traits and then viewed a set of static images displaying positive and negative emotional faces while their facial muscle movements (i.e. EMG activity) were recorded to compare the extent to which their facial expression matched that of the face in the image. The degree of emotional congruency achieved by individuals high in psychopathic traits was compared to that of those low in psychopathic traits. The comparison analysis ultimately showed that, although there were no differences in the positive expressions, those scoring high on the PPI-R showed significantly less congruency with negative emotional expressions based on the activity of the facial muscles known to be associated with the target emotion. The findings suggest that high levels of psychopathic traits may be associated with motor empathy deficits. Moreover, these individuals may experience different autonomic arousal in response to negative emotions of others (Khvatskaya & Lenzenweger, 2015).

Recent evidence further indicates that individuals higher in psychopathy may possess the capacity for empathy, neurologically speaking, if given explicit instructions to empathize. Meffert et al. (2013) tested this possibility with a sample of male offenders who were recruited

from a forensic psychiatric facility and assessed as highly psychopathic based on their scores on the PPI-R. The offenders and a group of male control participants underwent fMRI experiments wherein they viewed videos depicting love, pain, social exclusion and a neutral situation and then participated in similar interactions. They found that, in the offender group, the brain regions normally involved when observing an action (or vicarious action) were significantly less active during the observation phase of viewing the videos. The reduced vicarious activity was consistent regardless of the emotion condition or observed activity. This difference in brain activity between the offenders and controls was significantly reduced, becoming negligible, when the psychopathic individuals were explicitly instructed to empathize with the subject (Meffert et al., 2013). The underlying mechanism, however, remains ambiguous in that it is unknown whether the instructions to empathize are simply activating the cognitive empathy that may be intact in those higher in psychopathy or if these individuals in fact have the capacity for affective empathy that needs to be accessed more consciously. Research investigating the affective response of individuals higher in psychopathy to those in pain is quite limited. Further, methods of increasing the capacity for empathetic pain in these individuals, as well as enhancing their physiological response to such situations, have yet to be explored.

The present study tested the potential capacity for empathetic pain in individuals high in psychopathic traits by using an imitation manipulation. Participants first completed the Psychopathic Personality Inventory-Revised Short Form (PPI-R SF), a validated measure of psychopathic traits used in forensic and community populations (Lilienfeld & Widows, 2005), the Triarchic Psychopathy Measure (TriPM; Patrick, 2010), the Self-Report Psychopathy Scale-Short Form (SRP-SF; Neumann & Pardini, 2014) and a measure of motor empathy (Berg & Lilienfeld, unpublished manuscript). Participants then received an instruction to imitate or

observe facial expressions from a set of static images consisting of fearful, painful, and neutral expressions adapted from a set of dynamic facial expressions developed and validated by Simon et al. (2008). During this task, their skin conductance response (SCR) and heart rate were recorded in order to assess their autonomic responsivity to the images. Research shows that SC is highly associated with emotional arousal and empathy (McIntosh, 1996). Therefore, in the present context it was expected that there would be an increase in SC if the participant was empathizing with the subject in pain because that image should cause emotional arousal. Heart rate has previously been found to be related to higher levels of antisocial behavior, aggressiveness, and low empathy (Raine, 2013); however, the collective findings are inconsistent regarding these associations. Therefore, it was expected that an association would be found but the direction of the predicted association was not specified. Use of these measures in conjunction with the Self-Assessment Manikin (SAM), a self-report measure of emotional responses, was intended to provide a level of objectivity that is typically lacking with self-report measures alone, thus participants' trait empathy can be more fully assessed.

The main hypothesized findings were:

1.) Individuals who imitate the facial expressions, compared to those who observe, would exhibit higher empathetic pain, evidenced by autonomic responses and self-report, in response to the pain images but not the fear or neutral images.

2.) Individuals scoring lower in psychopathy would exhibit consistently higher state empathy compared to those higher in psychopathy (regardless of task condition) during both the pain and fearful images.

3.) Individuals scoring higher in psychopathy would exhibit higher empathetic pain when instructed to imitate painful facial expressions compared to individuals scoring higher in psychopathy instructed to observe painful facial expressions (i.e., there would be a moderating effect of psychopathy on the effect of imitating painful expressions).

CHAPTER 2

METHOD

Design

The current study is a 2 × 3 mixed design (see Figure 1) wherein the between-subjects factor is the Imitate condition versus the Control condition and the within-subjects factor is the Image Type observed (pain, neutral, and fear). The dependent variables of interest are sympathetic response to the stimuli (SC) and subjective responses (SAM). Psychopathy is used as a covariate to examine the relationship(s) between psychopathic traits and the effects of imitating facial expressions of pain.

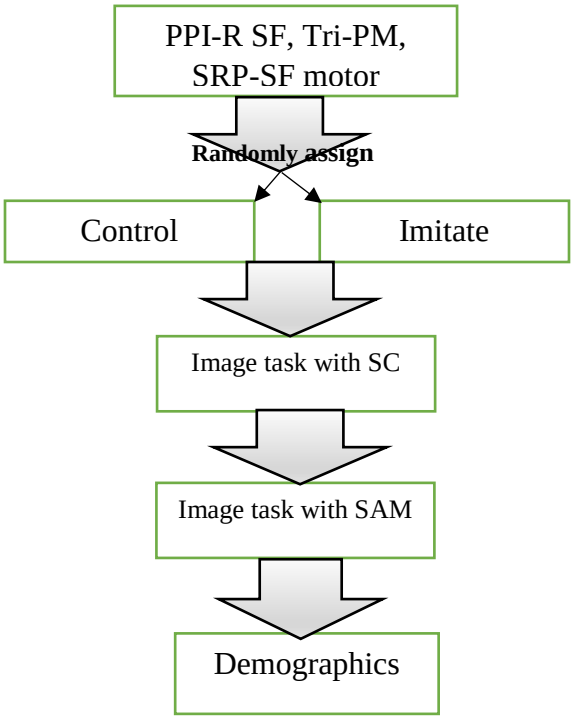

Figure 1. Graphic representation of study design.

Participants

Participants were 135 undergraduate students recruited from Georgia Southern University via the online SONA system. Participants were excluded from data analysis if the manipulation check revealed that they failed to follow the imitate instructions (n = 8). Participants were also excluded from analyses if random responding to the questionnaires was detected (n = 1). An additional six participants were excluded from analyses due to loss of SC data caused by a technological malfunction. The final sample of participants included 120 (77 females) undergraduate students between the ages of 17 and 41 (M = 19.43, SD = 2.43).

Measures

Psychopathic Personality Traits. Trait levels of psychopathy were measured using the Psychopathic Personality Inventory-Revised Short Form (PPI-R SF; Lilienfeld & Widows, 2005; Tonnaer, Cima, Sijtsma, Uzieblo, & Lilienfeld, 2013), the Triarchic Psychopathy Measure (Tri-PM; Patrick, 2010), and the Self-Report Psychopathy Scale Short Form (SRP-SF; Paulhus, Neumann, & Hare, 2009; Williams, Nathanson, & Paulhus, 2003).

The PPI-R SF is a shortened version of the original PPI-R, a standardized and well-validated measure of psychopathic traits developed for use in non-forensic populations, also frequently used with incarcerated individuals. Internal consistency and test-retest reliability data for the measure are reassuring with alphas of .90-.93 and .95, respectively (Lilienfeld & Andrews, 1996; Tonnaer, Cima, Sijtsma, Uzieblo, & Lilienfeld, 2013). The 55-item self-report measure assesses the full continuum of psychopathic traits, falling under two distinct factors: *Fearless Dominance* (FD) and *Impulsive/Antisocial* (IA). A third scale, *Cold-heartedness*, has been identified which contains items that do not load onto the other two factors. Cold-

heartedness has been defined as a tendency to act with callous disregard for others and without guilt; this factor has previously been inversely associated with affective empathy (Lilienfeld & Andrews, 1996). FD has been found to be highly associated with Factor 1 traits on the Self-Report Psychopathy scale, one of the most widely used psychopathy measures within community samples, and with the Boldness scale of the Tri-PM (Lilienfeld et al., 2012). Further studies have identified this factor of the PPI-R as a potential marker of primary psychopathy, a subtype originally described by Cleckley (1982) as able to function for the most part without significant dysfunction and relative immunity to distressful situations, as reflected by findings that show consistent blunted autonomic reactivity to threatening or aversive situations (Lilienfeld et al., 2012).

The Tri-PM is a well-validated measure of psychopathy (Hall, Drislane, Patrick, Morano, Lilienfeld, & Poythress, 2014) that specifically delineates three constructs central to the socially dysfunctional aspects of the disorder: boldness (e.g., "I would enjoy skydiving"), meanness (e.g. "I don't mind if someone I dislike gets hurt"), and disinhibition (e.g., "I often act on immediate needs"). The 58-item measure uses a Likert-type scale ranging from 1 (Mostly False) to 4 (Mostly True).

The Self-Report Psychopathy Scale Short Form (SRP-SF; Neumann & Pardini, 2014 Williams, Nathanson, & Paulhus, 2003) is a condensed version of the SRP-III, a measure of psychopathy that has been widely used to assess psychopathic tendencies within community populations. The scale is rated on a 5-point Likert scale (1 = *disagree strongly* to 5 = *agree strongly*). Each statement belongs to one of four subscales to assess different aspects of psychopathy including interpersonal manipulation (IPM), callous affect (CA), erratic lifestyle

(ELS), and criminal tendencies (CT). For the purposes of the present study, only the mean score across subscales was used in the final analyses to calculate the indexed psychopathy score.

Empathy. Trait motor empathy was assessed using a shortened adaptation of a recently developed preliminary measure of emotional contagion (Berg & Lilienfeld, unpublished manuscript). Eight items are rated on a Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree") measuring the degree to which the participant "mirrors" others. Additionally, state empathy and emotional responses to images were assessed during the task using the Self-Assessment Manikin (SAM; Bradley & Lang, 1994), a widely used pictorial assessment tool that has been used in previous studies to assess affective state empathy in response to stimuli (Ali, Amorim, & Chamorro-Premuzic, 2009; Bradley & Lang, 1994; Wai & Tiliopoulos, 2012). This is the measure used in the development of the International Affective Picture System (IAPS) by Lang & Bradley (1997), a widely-used set of images in emotion and empathy research. The SAM measures the participant's perception of the stimuli's valence and intensity on the three dimensions of "pleasure", "arousal", and "dominance" (i.e., the degree of control the participant perceives the target to have).

Physiological responses. The autonomic responsivity of participants was measured using their skin conductance response (SCR) during the image task, recorded with Neulog GSR logger sensor NUL-217. Two silver/silver chloride electrodes were placed on the distal phalanges of the index and ring fingers on the participant's non-dominant hand. Skin conductance was measured using the amplitude of the response denoted in microSiemens (μS). A response was identified as occurring above .01 μS (Roth, Dawson, & Filion, 2012). SCR has previously been associated with empathic responses in similar studies (Lee et al., 2013; McIntosh, 1996).

Stimuli

The stimuli consist of 15 static images adapted from the set of dynamic facial expressions developed and validated by Simon et al. (2008). The images display faces expressing pain, fear, and a neutral expression. The stimuli were presented via a PowerPoint presentation on a computer screen. Pain is the main expression of interest, fear and neutral are included as controls. A robust finding in the literature is an impairment in the processing and recognition of fear in individuals higher in psychopathy (Blair, 2005; Lykken, 1995). Inclusion of fear is intended to test for specific responses to pain, rather than generalized responses to unpleasant stimuli.

Procedure

After reading and signing a detailed consent form, each participant was individually seated in front of a computer and complete the three measures of psychopathy, and the measure of trait motor empathy. Then participants completed the image task. The specific instructions differed depending on the group to which the participant was randomly assigned. Those in the "imitate" group were given the following instructions:

> "Please focus on the pictures on the screen, imagine what the person is likely feeling and try to the best of your ability to replicate the person's facial expression."

Those in the "observe" group were instructed to simply focus on the images and remain as still as possible. All research assistants were given a script with the instructions to avoid potential differential experimenter effects. Electrodes were placed on the non-dominant hands of the participants at the beginning of the session after signing the informed consent to measure SCR throughout the task. Participants then viewed the stimuli, each image remaining on the screen for 4 seconds. Using an adaptation of Lykken's procedure, a loud noise blast was delivered after the

last image to assess participants' maximum SCR. Minimum SC (baseline) was defined as the participants' lowest skin conductance level (SCL) throughout the session. These values were used to calculate the range corrected values for each participant to control for individual differences in skin conductance (See Data Analysis section; Braithwaite, Watson, Jones, & Rowe, 2015; Lykken & Venables, 1971).

The task was first completed without interruption. Afterward, the participant viewed the images again, completing the questions on the SAM for each image and reporting their perception of the valence and intensity of that image on the three dimensions of "pleasure", "arousal", and "dominance" (Benning, Patrick, & Iacono, 2005). Following the completion of all tasks, participants completed a demographics form, and were conditionally debriefed. Participants will receive a full debriefing via email after data collection is completed to try to prevent participants from informing others of the study purposes.

Manipulation Check. To verify that participants followed the imitate instructions, a research assistant was seated in a room adjacent to the experimental room with a clear view of the participant behind a one-way mirror. The participant was naïve to the researcher's presence throughout the experiment. The research assistant monitored the participant's progress and coded for imitation engagement recording a "1" if an attempt at imitation was made by the participant and a "0" if no effort was clearly made.

Data Analysis

Data from the personality measures and Self-Assessment Manikin were collected through the online Qualtrics survey system. The PPI-R: SF, Tri-PM, and SRP-SF exhibited good reliability (Cronbach's alphas 0.85, 0.85, and 0.82, respectively). The measure of motor empathy

also displayed adequate reliability ($\alpha = 0.73$). The Arousal dimension of the SAM exhibited good reliability for fear, neutral, and pain images (see Table 1d for alphas). The remaining participant responses to the SAM exhibited adequate reliability, with three exceptions (see Table 1d). The SAM responses that showed poor reliability are not discussed as the results cannot be appropriately interpreted.

All data sets were downloaded into SPSS to be analyzed. Initially, two 2 (Participant Expression) × 2 (Image Type) mixed measures ANOVAs were conducted with skin conductance as the outcome measure. Follow-up individual ANCOVAs were then conducted using psychopathy as the covariate to test the study's main hypothesis that there would be a significant condition by image type by psychopathy interaction. Two additional 2 (Participant Expression) × 2 (Image Type) mixed measures MANCOVAs were conducted with SAM scores (Pleasure, Arousal, and Dominance) as the outcome measures. Follow-up MANCOVAs using psychopathy as the covariate were again conducted.

To control for individual differences in skin conductance, range restriction of the data was performed. Skin conductance scores for each stimulus condition (pain, neutral, and fear) were obtained by calculating a proportion of each participant's maximal skin conductance response (Braithwaite, Watson, Jones, & Rowe, 2015; Lykken & Venables, 1971). The individual's difference score was divided by the maximal response elicited throughout the session. The difference score was derived by subtracting the baseline SCL from the peak response following the stimulus, defined as the average response occurring between .9 and 4 s after stimulus onset (Patrick, Bradley, & Lang, 1993). The stimulus designed to elicit the participant's maximal SCR was a white noise blast which has been used in previous similar studies (Lykken et al., 1966; Patrick, Bradley, & Lang, 1993).

CHAPTER 3

RESULTS

Data Transformations. Prior to analysis, the mean values for the SRP-SF, PPI-R: SF, and Tri-PM were converted to z-scores and then averaged together to create a single indexed psychopathy score which was used for the remaining analyses. Pearson's zero-order partial correlations were computed to examine the associations between personality measures. Bivariate correlations were also conducted to examine associations among the DVs, total psychopathy, and motor empathy. Gender was controlled for due to the significant difference in psychopathy scores between men and women (see Gender and Ethnic Differences section). The three measures of psychopathy showed strong positive associations with one another but not with motor empathy (see Table 1a). However, the correlational analyses for the Imitate and Observe groups conducted separately revealed a significant negative association between motor empathy and total psychopathy for the Imitate group (r = -0.290, $p < 0.01$) but not the Observe group (r = -0.004, p = 0.122). Further examination of the group means showed that participants in the Imitate group scored higher in total psychopathy (M = 0.024, SD = 0.818) compared to those in the Observe group (M = -0.025, SD = 1.007), although the difference was not significant, F (1, 119) = 0.083, p = 0.773. Correlations for all DVs, psychopathy and motor empathy are displayed in Tables 1b and 1c. The descriptive statistics for all personality measures are displayed in Table 1d.

Table 1a.

Pearson zero-order partial correlations personality measures.

	SRP	PPI	Tri-PM	Motor Empathy	Psychopathy
SRP	—				
PPI	**0.713****	—			
Tri-PM	**0.708****	**0.782****	—		
Motor Empathy	-0.053	-0.103	-0.121	—	
Psychopathy	**0.891****	**0.916****	**0.914****	-0.101	—

**Significant at <0.001

Table 1b.

Bivariate correlations between DVs and personality measures for 'Observe'.

	Motor Empathy	**Psychopathy**
Motor Empathy	—	—
Psychopathy	-0.004	—
SCR—Neutral	0.008	-0.031
SCR—Pain	0.013	0.048
SCR—Fear	-0.083	**-0.330***
SAM-Pleasure (neutral)	0.093	0.034
SAM-Arousal (neutral)	-0.050	**-0.223****
SAM-Dominance (neutral)	0.038	0.067
SAM-Pleasure (pain)	-0.037	-0.139
SAM-Arousal (pain)	-0.076	0.190
SAM-Dominance (pain)	0.047	-0.181
SAM-Pleasure (fear)	-0.039	-0.039
SAM-Arousal (fear)	0.015	**0.275***
SAM-Dominance (fear)	-0.035	**-0.318***

*Significant at $p<0.05$

**Significant at $p<0.01$

Table 1c.

Bivariate correlations between DVs and personality measures for 'Imitate'.

	Motor Empathy	**Psychopathy**
Motor Empathy	—	—
Psychopathy	**-0.290***	—
SCR—Neutral	0.008	-0.031
SCR—Pain	-0.099	-0.076
SCR—Fear	**-0.323***	-0.027
SAM-Pleasure (neutral)	0.093	0.034
SAM-Arousal (neutral)	-0.050	**-0.223****
SAM-Dominance (neutral)	0.038	0.067
SAM-Pleasure (pain)	0.203	-0.066
SAM-Arousal (pain)	-0.188	-0.086
SAM-Dominance (pain)	0.177	-0.001
SAM-Pleasure (fear)	0.091	0.031
SAM-Arousal (fear)	-0.109	-0.031
SAM-Dominance (fear)	-0.040	-0.033

*Significant at $p<0.05$

**Significant at $p<0.01$

Table 1d.

Descriptive statistics.

Measure	α	M	SD	Range	
				Actual	Potential
Psychopathy		0.000	0.912	-1.590-4.350	-1.590-4.350
PPI-R:SF	0.851	2.074	0.325	1.450-3.730	1-5
SRP-SF	0.823	1.941	0.429	1.030-3.480	1-5
Tri-PM	0.848	2.061	0.420	1.330-3.890	1-5
Motor Empathy	0.727	3.329	0.471	2.220-4.220	1-5
SAM					
Pleasure-Fear	0.575	2.078	0.035	1.881-2.254	1-5
Pleasure-Neutral	0.546	2.858	0.050	2.433-3.183	1-5
Pleasure-Pain	0.822	1.598	0.029	1.328-1.862	1-5
Arousal-Fear	0.749	3.358	0.051	3.051-3.847	1-5
Imitate	0.822	3.407	0.063	3.200-3.833	1-5
Observe	0.867	3.242	0.037	3.065-3.548	1-5
Arousal-Neutral	0.749	2.200	0.015	2.017-2.407	1-5
Imitate	0.857	2.254	0.014	2.102-2.407	1-5
Observe	0.851	2.143	0.010	2.016-2.270	1-5
Arousal-Pain	0.837	3.817	0.109	3.220-4.254	1-5
Imitate	0.912	3.957	0.097	3.550-4.217	1-5
Observe	0.931	3.597	0.073	3.161-3.839	1-5
Dominance-Fear	0.697	2.418	0.071	2.167-2.917	1-5
Dominance-Neutral	0.455	3.158	0.162	2.533-3.750	1-5
Imitate	0.715	3.153	0.238	2.533-3.750	1-5
Observe	0.658	3.156	0.121	2.698-3.571	1-5
Dominance-Pain	0.750	2.200	0.168	1.700-3.00	1-5

Note. There were no differences in reliability between Imitate and Observe conditions unless otherwise indicated.

Analyses for skewness and kurtosis were conducted for psychopathy scores, Self-Assessment Manikin scores, and skin conductance (SC) data. Distributions for all SAM data were normally distributed. Distributions for the three individual, transformed measures of psychopathy and the total psychopathy scores were normally distributed.

Prior to range correction of SC data, an analysis for skewness of the raw data revealed a significant negative skew. The range restriction procedure was subsequently performed. The distributions remained slightly negatively skewed, so the data were logarithmically transformed resulting in a normalized distribution (Braithwaite, Watson, Jones, & Rowe, 2015; Lykken & Venables, 1971; Roth, Dawson, & Filion, 2012).

Gender and Ethnic Differences. A series of analyses was performed to determine the presence of differences in psychopathy and SC related to demographic variables. A robust finding in the psychopathy literature has shown that women generally tend to score lower on measures of psychopathy than men, therefore this difference was initially analyzed in the present sample. An independent samples *t*-test revealed that there was a significant difference in overall psychopathy scores between men (M = 0.306, SD = 1.012) and women (M = -0.184, SD = 0.801), t (118) = 2.936, $p < 0.01$, which was consistent with previous research.

Studies have also demonstrated that women may show greater SC response to unpleasant pictures as well as differences in resting SC level (Montagu & Coles, 1966; Roth, Dawson, & Filion, 2012), however these findings have been inconsistent (Kring & Gordon, 1998; Roth, Dawson, & Filion, 2012). Independent samples *t*-tests did not reflect gender differences in SCR to fear, t (118) = -1.298, p = 0.197, or pain, t (118) = 0.310, p = 0.757, images within the present sample. Further, no significant gender differences were found for baseline SCL, t (118) = -0.528, p = 0.599.

Analyses were then conducted to test for differences in baseline SC between Black and White participants because previous research has shown that Black individuals tend to have lower resting skin conductance level than White participants (Roth, Dawson, & Filion, 2012). An independent samples *t*-test revealed that there was a significant difference in SCL between Black and White participants, $t\ (112) = 4.095$, $p < 0.001$, which was consistent with previous research (see Table 2). However, the difference in skin conductance response (SCR), the outcome measure of interest, between Black and White participants was not significant for any of the Image Type conditions (see Table 2).

Table 2.

t-test results for race-based differences in skin conductance.

Variable	**Race**	**N**	**M**	**SD**	***t***	***df***	***p***
SCL	White	70	2.054	1.281	4.095	112	**<0.001***
	Black	44	1.222	1.034			
SCR	White	70	0.068	0.053	0.915	112	0.362
Pain	Black	44	0.077	0.052			
Fear	White	70	0.052	0.037	1.306	112	0.194
	Black	44	0.063	0.057			
Neutral	White	70	0.060	0.049	0.136	112	0.892
	Black	44	0.061	0.050			

Skin Conductance.

Hypothesis 1. To test for differential responses to pain images compared to neutral images between imitate and observe conditions, a 2 (Participant Expression: imitate, observe) × 2 (Image Type: pain, neutral) mixed measures analysis of variance (ANOVA) was conducted

where Participant Expression served as the between-subjects variable and Image Type as the within-subjects variable. There was a significant main effect of Image Type such that participants showed significantly higher SCRs when viewing pain images (M = 0.071, SE = 0.005) compared to neutral images (M = 0.059, SE = 0.004), F (1, 118) = 4.214, $p < 0.05$. A significant main effect was also found for Participant Expression such that participants who imitated facial expressions showed a significantly greater response (M = 0.075, SE = 0.005) than participants who observed (M = 0.056, SE = 0.005), F (1, 118) = 7.071, $p < 0.01$. The Participant Expression × Image Type interaction was not significant (see Table 3a).

Similarly, a second Participant Expression × Image Type (Fear, Neutral) ANOVA revealed a significant effect of Participant Expression such that participants who imitated the facial expressions exhibited higher SCRs (M = 0.075, SE = 0.004) compared to those who observed (M = 0.046, SE = 0.005), F (1, 118) = 21.505, $p <.001$. There was not a significant main effect of Image Type and no significant Image Type × Participant Expression interaction (see Table 3b).

Table 3a.

Image Type (Pain, Neutral) × Participant Expression ANOVA results for SCR.

Effect	***df***	**Error *df***	***F***	***p***	**Means**	**Standard Errors**
Image Type	1	118	4.214	**<.05***	Pain:0.071 Neutral:0.059	0.005 0.004
Participant Expression	1	118	7.071	**<.01***	Imitate:0.075 Observe:0.056	0.005 0.005
ImageType*ParticipantExpression	1	118	1.925	0.168		

Table 3b.

Image Type (Fear, Neutral) × Participant Expression ANOVA results for SCR.

Effect	***df***	**Error *df***	***F***	***p***	**Means**	**Standard Errors**
Image Type	1	118	0.236	0.628	Fear:0.062 Neutral:0.059	0.004 0.004
Participant Expression	1	118	21.505	**<0.001***	Imitate:0.075 Observe:0.046	0.004 0.005
ImageType*ParticipantExpression	1	118	0.121	0.728		

Hypothesis 2. Bivariate Pearson correlations were conducted to test for relationships between psychopathy and SCRs to fearful images and between psychopathy and SCRs to pain images. (See Table 4). The association between SCRs to pain images and Psychopathy was not significant (r = -0.012, p = 0.898). The association between SCRs to fearful images and psychopathy was trending in the predicted direction (r = -0.167, p = 0.068) (See Figure 2).

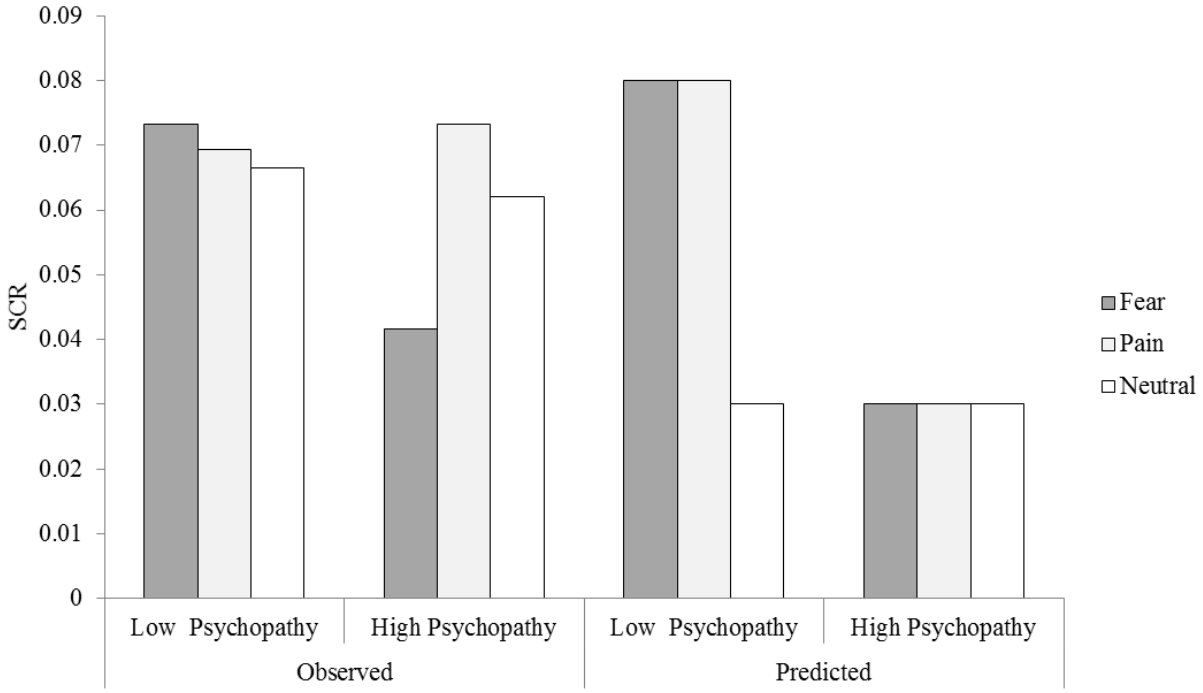

Figure 2. SCR means for low and high in psychopathy during fear and pain images. High and low psychopathy scores were determined by using one standard deviation above and one standard deviation below the mean psychopathy score.

Hypothesis 3. To test the hypothesis that there would be differential reactivity to pain images, compared to neutral, during imitation between individuals higher and lower in psychopathy, a follow-up 2 (Participant Expression: Imitate, Observe) × 2 (Image Type: Pain,

Neutral) × Psychopathy ANCOVA was conducted. The Image Type × psychopathy interaction was not significant, F (1, 116) = 0.063, p = 0.802. The Image Type × Participant Expression by psychopathy interaction was also not significant, F (1, 116) = 0.138, p = 0.711. A second ANCOVA was conducted to test for the same effect for fear versus neutral images (i.e., Image Type (Fear, Neutral) × Participant Expression × Psychopathy interaction). Neither the two-way interaction, between Image Type and psychopathy [F (1, 116) = 0.099, p = 0.754], nor the three-way interaction, among Image Type, Participant Expression, and psychopathy [F (1, 116) = 0.520, p = 0.472], were significant.

Self-Assessment Manikin

Hypothesis 1. Considering the multiple outcome measures included in the SAM, a doubly multivariate design—wherein multiple DVs are measured within each level of the within-subjects factor—was used to test for differential self-report responses to the images between imitate and observe conditions. Initially, a 2 (Participant Expression: Imitate, Observe) × 2 (Image Type: Pain, Neutral) mixed measures MANOVA was conducted using the three SAM dimensions (pleasure, arousal, and dominance) as the outcome measures of interest. The multivariate test revealed a significant main effect of Image Type, F (1, 116) = 104.283, p < 0.001. Given the significance of the omnibus test, the univariate tests were then examined. Results showed a significant main effect of viewing pain facial expressions, versus neutral, on feelings of Pleasure, F (1, 118) = 239.372, p <0.001, Arousal, F (1, 118) = 158.561, p < 0.001, and Dominance, F (1, 118) = 54.749, p < 0.001 in the predicted direction (See Table 3a for means and standard errors). The multivariate test did not reveal a significant main effect of Participant Expression, F (1, 116) = 1.742, p = 0.162 (see Table 3c for means and standard

errors), or a significant Image Type × Participant Expression interaction effect, F (1, 116) = 0.498, p = 0.685.

A second 2-way mixed measures MANOVA was conducted to test for effects within the Image Type condition (Fear vs. Neutral), again using the three SAM dimensions (pleasure, arousal, and dominance) as the outcome measures of interest. The multivariate test again revealed a significant main effect of Image Type, F (1, 116) = 67.157, p < 0.001. Given the significance of the omnibus test, the univariate tests were then examined. Results showed a significant main effect of viewing fearful facial expressions, versus neutral, on feelings of Pleasure, F (1, 118) = 110.117, p <0.001, Arousal, F (1, 118) = 141.985, p < 0.001, and Dominance, F (1, 118) = 63.767, p < 0.001 in the predicted direction (See Table 3d for means and standard errors). The multivariate test did not reveal a significant main effect of Participant Expression (See Table 3d), or a significant Image Type × Participant Expression interaction effect, F (1, 116) = 0.162, p = 0.922.

Table 3c.

Image Type (Pain, Neutral) × Participant Expression ANOVA results for SAM.

Dependent Variable	**Effect**	***df***	**Error *df***	***F***	***P***	**Means**	**Standard Error**
SAM (Omnibus)	Image Type	1	116	104.283	**<0.001***		
	Participant Expression	1	116	1.742	0.162		
	ImageType*ParticipantExpression	1	116	0.498	0.685		
SAM-Arousal	Image Type	1	118	158.561	**<0.001***	Pain: 3.746 Neutral: 2.193	0.103 0.076
	Participant Expression	1	118	3.373	0.069	Imitate:2.848 Observe:3.092	0.093 0.095
	ImageType*ParticipantExpression	1	118	0.851	0.358		
SAM-Dominance	Image Type	1	118	83.676	**<0.001***	Pain:2.210 Neutral:3.165	0.071 0.064
	Participant Expression	1	118	0.997	0.320	Imitate:2.644 Observe:2.731	0.061 0.062
	ImageType*ParticipantExpression	1	118	0.549	0.460		
SAM-Pleasure	Image Type	1	118	239.372	**<0.001***	Pain:1.601 Neutral:2.849	0.064 0.048
	Participant Expression	1	118	2.820	0.096	Imitate:2.292 Observe:2.158	0.056 0.057
	ImageType*ParticipantExpression	1	118	0.003	0.954		

Table 3d.

Image Type (Fear, Neutral) × Participant Expression ANOVA results for SAM.

Dependent Variable	**Effect**	***df***	**Error *df***	***F***	***P***	**Mean**	**Standard Error**
SAM (Omnibus)	Image Type	1	116	67.157	**<0.001***		
	Participant Expression	1	116	1.293	0.280		
	ImageType*ParticipantExpression	1	116	0.162	0.922		
SAM-Arousal	Image Type	1	118	141.985	**<0.001***	Fear: 3.338 Neutral: 2.193	0.079 0.076
	Participant Expression	1	118	1.414	0.237	Imitate:2.694 Observe:2.838	0.085 0.086
	ImageType*ParticipantExpression	1	118	0.019	0.891		
SAM-Dominance	Image Type	1	118	63.767	**<0.001***	Fear:2.419 Neutral:3.165	0.071 0.061
	Participant Expression	1	118	0.560	0.456	Imitate:2.761 Observe:2.824	0.059 0.060
	ImageType*ParticipantExpression	1	118	0.337	0.563		
SAM-Pleasure	Image Type	1	118	110.117	**<0.001***	Fear:2.131 Neutral:2.849	0.048 0.047
	Participant Expression	1	118	2.701	0.103	Imitate:2.544 Observe:2.436	0.046 0.047
	ImageType*ParticipantExpression	1	118	0.194	0.660		

Hypothesis 2. Bivariate Pearson correlations were conducted to test for relationships between psychopathy and SAM scores to fearful images and between psychopathy and SAM scores to pain images. Results revealed a significant negative association between Psychopathy and the Dominance dimension of the SAM for fearful images (r = -0.200, $p < 0.05$). The remaining SAM dimensions did not show significant associations with Psychopathy for pain or fearful images (See Table 3c).

Table 4.

Bivariate correlations between psychopathy and DVs.

	Psychopathy
Psychopathy	—
SCR—Pain	0.048
SCR—Fear	-0.167
SAM-Pleasure (pain)	-0.097
SAM-Arousal (pain)	0.049
SAM-Dominance (pain)	-0.099
SAM-Pleasure (fear)	-0.001
SAM-Arousal (fear)	0.120
SAM-Dominance (fear)	**-0.200***

*Significant at $p < 0.05$

Note. Correlations are collapsed across Participant Expression.

Hypothesis 3. A follow-up MANCOVA was then conducted using psychopathy as the covariate to test the hypothesis that there would be differential subjective empathy responses (pleasure, arousal, and dominance) to pain images, versus neutral, during the Participant Expression between individuals higher and lower in psychopathy. The Image Type (Pain,

Neutral) × psychopathy interaction was not significant for Pleasure, Arousal, or Dominance, F (1, 114) = 1.181, p = 0.320. The Participant Expression × Image Type × psychopathy interaction was also not significant for Pleasure, Arousal, or Dominance (See Table 5).

Table 5.

Image Type, Participant Expression, and Psychopathy interactions.

Dependent Variable	**Effect**	***df***	**Error *df***	***F***	***p***	**Simple Effect**	***df***	***Error df***	***F***	***p***
SAM (Omnibus)	ImageType*Psychopathy	6	111	2.073	0.062	Fear*Imitation*Psychopathy	1	114	1.681	0.175
	ImageType*ParticipantExpression*Psychopathy	6	111	0.868	0.521	Pain*Imitation*Psychopathy	1	114	1.286	0.283
Arousal	ImageType*Psychopathy	2	116	3.442	**0.034***	Fear*Imitation*Psychopathy	1	116	4.821	**0.030***
	ImageType*ParticipantExpression*Psychopathy	2	116	3.302	**0.039***	Pain*Imitation*Psychopathy	1	116	3.760	0.055
Dominance	ImageType*Psychopathy	2	116	1.798	0.168	Fear*Imitation*Psychopathy	1	116	0.435	0.511
	ImageType*ParticipantExpression*Psychopathy	2	116	0.235	0.791	Pain*Imitation*Psychopathy	1	116	0.091	0.764
Pleasure	ImageType*Psychopathy	2	116	0.642	0.527	Fear*Imitation*Psychopathy	1	116	1.353	0.247
	ImageType*ParticipantExpression*Psychopathy	2	116	0.790	0.455	Pain*Imitation*Psychopathy	1	116	0.833	0.363
SCR	ImageType*Psychopathy	2	115	0.438	0.647	Fear*Imitation*Psychopathy	1	116	0.138	0.711
	ImageType*ParticipantExpression*Psychopathy	2	115	2.108	0.126	Pain*Imitation*Psychopathy	1	116	0.520	0.472

A second MANCOVA was then conducted using psychopathy as the covariate to test the hypothesis that there would be differential subjective empathy responses (pleasure, arousal, and dominance) to fearful images, compared to neutral, during the Participant Expression between individuals higher and lower in psychopathy. The omnibus test revealed a marginally significant Image Type (Fear, Neutral) × psychopathy interaction, F (1, 114) = 3.652, p = 0.015. Examination of the univariate tests showed a significant Image Type × psychopathy interaction for the Arousal dimension, F (1, 116) = 7.148, $p < 0.01$. The two-way interaction was not significant for Pleasure (F = 0.001, p = 0.979) or Dominance (F = 3.170, p = 0.078). Although the omnibus test did not show a significant Participant Expression by Image Type by Psychopathy interaction effect, F (1, 114) = 1.681, p = 0.175, examination of the univariate tests revealed a marginally significant three-way interaction effect for the Arousal dimension, F (1, 116) = 4.821, p = 0.030 (See Figure 3). The three-way interaction for Pleasure and Dominance did not reach significance (See Table 3d).

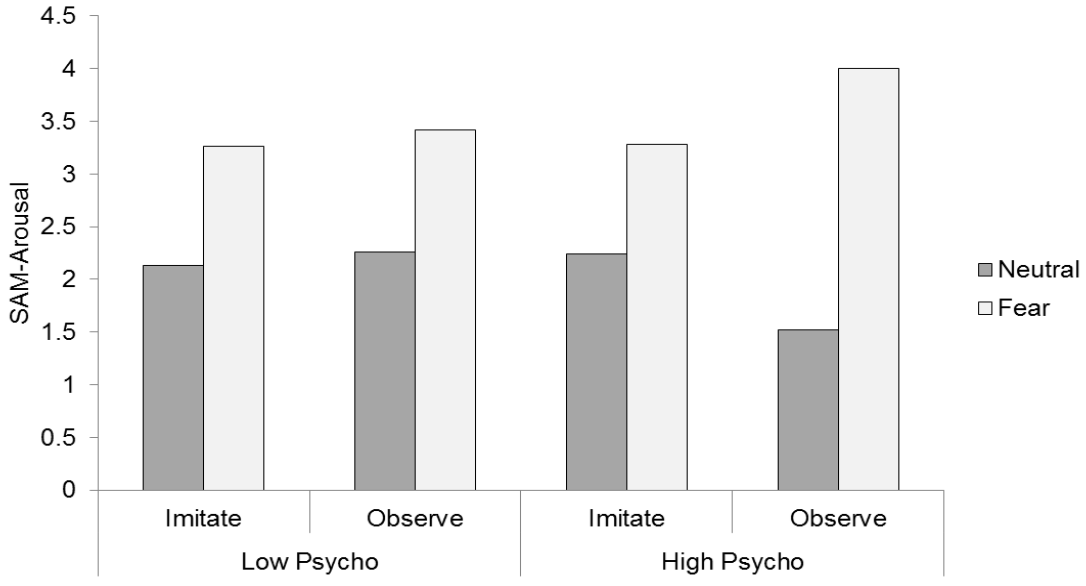

Figure 3. Participant Expression by Image Type by Psychopathy interaction.

CHAPTER 4
DISCUSSION

The present study sought to explore the possibility of transiently increasing the capacity for empathetic pain in individuals higher in psychopathy via imitation. Participants completed measures of psychopathy and motor empathy and then were instructed to either observe or imitate faces expressing pain, fear, or a neutral expression while their skin conductance response (SCR) was recorded. Participants also subsequently rated their subjective perceptions of the images on the dimensions of pleasure, arousal, and dominance using the Self-Assessment Manikin (SAM). The study's main hypothesis predicted that participants higher in psychopathy who imitated the facial expressions would experience greater pain empathy (as indicated by both SCR and subjective ratings) compared to those higher in psychopathy who observed.

Preliminary analyses examined associations between psychopathy measures, motor empathy, and the DVs. The correlational analyses did not reveal significant associations between psychopathic traits (SRP, PPI, or Tri-PM) and trait motor empathy. This is not necessarily a surprising finding given the inconsistencies in the limited literature regarding the capacity for motor empathy or emotion contagion in individuals higher in psychopathy (Blair, 2005; Khvatskaya & Lenzenweger, 2015; Fecteau, Pascual-Leone, & Theoret, 2008; Decety, Chen, Harenski, & Kiehl, 2013). However, examination of the association in the Imitate and Observe groups separately revealed a change from a slightly and non-significantly negative association to a significant negative association between total psychopathy and motor empathy only for those who imitated facial expressions. A possible explanation for the stronger association in the Imitate group is the difference in mean psychopathy scores between the groups, although the difference in scores between groups was statistically non-significant; this would lend some support to

previous research showing a motor empathy deficit in psychopathy if these results replicate in samples with greater range in psychopathy scores (Khvatskaya & Lenzenweger, 2015).

Hypothesis 1

It was predicted that participants who imitate the facial expression of pain, but not fear or neutral, will exhibit higher empathetic pain (indicated by SCR and SAM scores) compared to participants who observe. Results showed partial support for the hypothesis in that there was a significant main effect of Image Type on SCR and SAM scores as well as a significant main effect of Participant Expression on SCR (but not SAM). As expected, participants showed differential autonomic reactivity to each type of image (i.e. fear, pain, and neutral) which was corroborated by differential subjective ratings of each image type. That is, participants rated pain and fear images as less pleasurable, more arousing, and less dominant compared to neutral images, indicating each image elicited the desired effect. Participants who imitated facial expressions also showed greater SCRs, compared to those who observed, but not differential SAM scores. This indicates that the imitation manipulation was effective in modulating autonomic responsivity to affective stimuli, although imitation did not have a similar effect on self-report responses. Further, the predicted interaction effect was not significant.

The lack of an interaction effect may be a function of the measure of state empathy used due to its vague nature; that is, the dimensions of emotional reactivity measured by the SAM, particularly arousal and dominance, could have been misinterpreted or misunderstood by the participants in the given context. As an alternative measure, a simple Visual Analogue Scale might be implemented asking participants to rate the degree of unpleasantness they believe the target is feeling or asking what emotion they believe the target is feeling and rate the perceived degree of that emotion (Lamm, Nusbaum, Meltzoff, & Decety, 2007; Lamm, Porges, Cacioppo,

& Decety, 2008). This type of measure would more directly assess state emotional empathy in response to pain and fearful expressions. There was also considerable variability in skin conductance across participants, which may have been a contributing factor. Further research is needed to explore potential interaction effects in different populations and using different measures.

Hypothesis 2

It was predicted that participants scoring lower in psychopathy would exhibit consistently higher state empathy (according to SCR and SAM scores) compared to those higher in psychopathic traits when viewing the pain and fearful images, independent of Participant Expression. The hypothesis was generally not supported in that, without consideration given to Participant Expression, there was not a significant association between psychopathy and response to fearful or pain images. The exception is the significant negative correlation found between psychopathy and the Dominance dimension of the SAM, such that higher psychopathy scores were related to lower dominance ratings, collapsing across Participant Expression.

However, when the imitate versus observe conditions are considered separately, a significant negative association between SCR to fearful images and psychopathy emerges for only the observe group. This is consistent with previous research showing blunted autonomic responses to aversive stimuli in individuals higher in psychopathy, and lending further support to the fearlessness hypothesis (Benning, Patrick, & Iacono, 2005; Dindo & Fowles, 2011). The association was not significant for SCRs to pain images in either group, suggesting an appropriate response to others' pain at a physiological level. The mean SAM scores were slightly higher on the Arousal dimension for both fearful and pain images but slightly lower on the Pleasure and Dominance dimensions, but the associations were again not significant. This

finding may potentially be accounted for by the intact cognitive empathy possessed by individuals higher in psychopathy, a well-established finding in the literature *(*Ali, Amorim, & Chamorro-Premuzic, 2009; Blair, 2005; Blair, 2007; Wai, & Tiliopoulos, 2012).

Hypothesis 3

Finally, it was predicted that participants scoring higher in psychopathic traits would exhibit higher empathetic pain (indicated by SCR and SAM scores) when instructed to imitate compared to participants high in psychopathic traits who observe. The moderating effect of psychopathy on the relationship between imitation and the dependent measures (SCR and SAM scores) was not supported for pain nor for fearful images. It is possible that the restricted range of psychopathy scores partially accounts for the lack of a three-way interaction. A second potential explanation is that the use of a total indexed psychopathy score obscured nuances in the effect. That is, by collapsing across the various facets subsumed within the construct of psychopathy, it is possible that a three-way interaction effect associated with a specific component of the psychopathic personality, such as fearlessness, meanness, or cold-heartedness, was overlooked (Benning, Patrick, & Iacono, 2005; Brislin et al, 2016; Dindo & Fowles, 2011; Fecteau, Pascual-Leone, & Theoret, 2008). However, further research is needed to completely rule out the presence of any interaction.

Although the three-way interaction was not significant for skin conductance, SAM scores showed a marginally significant Image Type (Fear) by Participant Expression by Psychopathy interaction on the Arousal dimension. Interestingly, the mean scores revealed that individuals higher in psychopathy who observed rated the fearful images as more arousing than those who imitated and higher than individuals lower in psychopathy. Moreover, the significant Image Type (Fear) by Psychopathy interaction suggests that individuals higher in psychopathy consistently

rated the fearful images more arousing than those lower in psychopathy, regardless of condition. This result may potentially be a function of the intact cognitive empathy (i.e. Theory of Mind) ability present in psychopathy. That is, perhaps these individuals rely on their cognitively-based ability to "read" others and thereby are able to complete self-report empathy measures similarly to lower psychopathy individuals—or possibility in an overcompensating manner, as it appears in the present sample. This explanation might also account for the imitate group scoring lower than the observe group because the act of imitation tends to be distracting, recruiting the cognitive resources typically used for Theory of Mind abilities (Brass & Heyes; 2005; Meltzoff & Decety, 2003).

Limitations and Future Directions

A limitation of the present study is the participant sample, comprised solely of undergraduate students, because this resulted in a limited range of psychopathy scores. Undergraduate populations generally score in the mid-range or lower end of the psychopathy spectrum thereby limiting inferences that can be made regarding individuals on the high end of the spectrum. Future studies might attempt to obtain a sample of participants from a population on the higher end of the spectrum, such as a forensic population. Obtaining an all-male population might be fruitful as well since women generally score lower on measures of psychopathy compared to men. A male sample of criminal offenders would be more likely to generate psychopathy scores on the higher end of the spectrum.

A second limitation of the present study is the use of skin conductance (SC) as the physiological indicator of pain empathy. SC measures are useful and informative in many ways— they are inexpensive, quick to respond to physiological changes from various stimuli, and have a fairly rapid return to baseline. However, SC tends to measure non-specific autonomic

activity rather than emotion-specific responses to a designated stimulus. Given that the present study was concerned with pain empathy specifically, future research might explore the use of measures that are better able to target the particular brain regions or physiologic activity associated with the experience and perception of pain. fMRI and TMS methods, for instance, would be exemplary ways to extend the present research.

A final potential limitation of the present study lies in the use of imitation as the empathy manipulation. The concepts of facial feedback and mirror neuron-mediated empathy have been contentious issues in the literature in recent decades, resulting in studies supporting the theories as well as contradicting them (Blairy, Herrere, & Hess, 1999; Cook, Johnston, & Heyes, 2013; Lee et al, 2013; Lewis, 2012; Mcintosh, 1996). Although there has been strong evidence showing the effects of imitation on subjective and physiologic emotion congruence (Cook, Johnston, & Heyes, 2013; Davis, Senghas, & Ochsner, 2009) and the associations between the MNS and pain empathy (Decety, Skelly, & Kiehl, 2013; Fecteau, Pascual-Leone, & Theoret, 2008; Iacoboni, 2009), additional research is unquestionably needed to clarify the mechanisms and any causal relationships. Further, the current study required the participants to imitate facial expressions without a source of feedback to judge congruence. Previous research has shown that giving participants visual feedback on the accuracy of imitation significantly increases emotional congruence between the model and participant (Cook, Johnston, & Heyes, 2013). Follow-up studies are needed to assess how the present results might vary if the manipulation was adapted in such a way and how it might differ if implemented within forensic or clinical populations.

As it stands currently, the results discussed in this study suggest that, although an imitation manipulation may be effective in modulating autonomic responsivity to facial expressions of pain and fear, the manipulation does not appear to affect the overall experience of

empathetic pain in individuals higher in psychopathy. If further research replicates these findings with individuals higher on the psychopathy spectrum than was obtained in the present sample (e.g. forensic populations), the conclusions presented in this study would be supported—namely, the ineffectiveness of an imitation manipulation for increasing empathetic pain in psychopaths. Different methods of empathy induction that do not rely on emotion contagion or motor empathy might then be employed to further explore the possibility of empathic plasticity. An alternative, bleaker, implication is that individuals higher in psychopathy, or certain subsets of psychopathic traits, cannot learn to empathize with another's pain. If the latter is true, future studies might investigate how such a deficit might be adaptive (e.g. in the medical field, certain military jobs) and the best methods by which to identify these individuals early in life.

Despite the limitations discussed above, this was the first study to explore the possibility of facial feedback modulating the experience of empathetic pain in individuals higher in psychopathy using both physiological and self-report measures as converging evidence for state empathetic pain. The results raise interesting and important questions regarding methods of empathy induction, operationalization and measurement of pain empathy, and psychopathic tendencies for future research to further explore.

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APPENDIX A

INFORMED CONSENT

This study is being conducted by Emily Lasko and Dr. Amy Hackney. Emily is a Master's Experimental Psychology student at Georgia Southern University and Dr. Hackney is a faculty member in the Psychology Department at Georgia Southern University.

The purpose of this research is to investigate emotional responses to pictures. The study will include the completion of two personality assessments, a questionnaire, viewing a series of images, answering questions about emotional responses, and the measurement of skin conductance and heart rate responses.

Participation in this research includes minimal risk, no more than would be encountered in daily life events. Possible risks include slight discomfort due to the content of some of the images.

Participating in this study will not have direct benefits to you personally. It will, however, have potential benefits to society as a whole by contributing to the body of knowledge about emotional responses to pictures.

The study will take less than 50 minutes to complete.

Your participation in this study will remain completely anonymous. No identifying information will be collected or distributed. De-identified or coded data from this study may be placed in a publicly available repository for study validation and further research. You will not be identified by name in the data set or any reports using information obtained from this study, and your confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

Participants have the right to ask questions and have those questions answered. If you have questions about this study, please contact Emily Lasko (the Principal Investigator) or Dr. Hackney, whose contact information is located at the end of the informed consent. For questions concerning your rights as a research participant, contact Georgia Southern University Office of Research Services and Sponsored Programs at 912-478-5465.

You will receive 1.5 course credits toward your Introductory Psychology requirements for your participation in the study. Participation is voluntary and you may end your participation at any time before or during the study by letting the attending Research Assistant know that you would like to stop. You will not be penalized in any way if you choose to cease participation.

You must be 18 years of age or older to consent to participate in this research study. If you consent to participate in this research study and to the terms above, please sign your name and indicate the date below. By signing this informed consent, you are acknowledging that you have

read and understood the instructions and costs and benefits to participating in this research. Moreover, you are indicating that you would like to participate in this study as a volunteer. If you do not wish to take this survey or are hesitant about participating, let the research assistant know and please email the primary investigator to discuss any concerns you may have.

You will be given a copy of this consent form to keep for your records. This project has been reviewed and approved by the GSU Institutional Review Board under tracking number **_____H16422_____**.

Title of Project: The relationship between emotional responses and skin conductance

Principal Investigator: Emily Lasko

el01781@georgiasouthern.edu

Faculty Advisor: Amy Hackney

ahackney@georgiasouthern.edu

_____ _____

Participant Signature Date

I, the undersigned, verify that the above informed consent procedure has been followed.

_____ _____

Investigator Signature Date

APPENDIX B

PARTICIPANT DEMOGRAPHICS QUESTIONNAIRE

INSTRUCTIONS: Complete the following demographic information. Please note that all personal information will be kept completely confidential and none of the responses you provide will be connected to your name, email address, or other identifying information.

1. Age (in years): _____

2. Gender (Select one):
   ☐ Female ☐ Male ☐ Transgender (specify) _____ ☐ Other (specify) _____

3. Which of the following best describes your racial/ethnic identity? (Select all that apply)
   ☐ African American or Black
   ☐ American Indian or Alaskan Native
   ☐ Asian or Pacific Islander
   ☐ Hispanic or Latino
   ☐ White or Caucasian
   ☐ Other (specify) _____

4. Which of the following best describes your level in school? (Select one)
   ☐ 1st year ☐ 2nd year ☐ 3rd year ☐ 4th year ☐ Other (specify) _____

5. What is your major in school? _____

6. What is your minor in school? _____

7. Is English your primary language?
   ☐ Yes ☐ No

8. Would you consider yourself fluent in English?
   ☐ Yes ☐ No

9. Have you ever been accused of academic misconduct?
   ☐ Yes (specify how many times _____) ☐ No

10. Have you ever been arrested?
    ☐ Yes (specify how many times _____) ☐ No

11. Have you ever been detained in jail?
    ☐ Yes (specify how many times _____) ☐ No

12. Are you currently on any medications?
    ☐ Yes (specify _____) ☐ No

13. Have you had any caffeine recently?

☐ Yes (specify amount and how long ago _____) ☐ No

APPENDIX C

Stimuli