Psychopathy and the Incapacity to Love: Role of Physiological Arousal

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ABSTRACT

Psychopathy is a rare and unique disorder, primarily associated with an emotional deficiency and an inclination towards violent antisocial behavior. Among the various symptoms, the affective experience of the incapacity for love has received little empirical attention, despite having been established as one of Cleckley's 16 classic characteristics. Moreover, the role of physiological responding in their romantic experiences has yet to be examined. The proposed study examined physiological reactivity (i.e., heart rate, HR; skin conductance, SC) as a mediator and moderator in the relationship between psychopathic features and romantic experiences (i.e., passionate love, companionate love, Ludus love, relationship satisfaction, relationship history) in college men. As hypothesized, physiological reactivity mediated and moderated the relationship between psychopathic features and romantic experiences. Specifically, low physiological arousal for the partner partially mediated the relationship between psychopathic features and passionate love. Also, it was found that the interaction between low physiological arousal for the significant other and high physiological arousal for the opposite-sex friend moderates the relationship between psychopathic features and deficient romantic experiences. By gaining a better understanding of the impact on their romantic experiences, this study is intended to contribute to improved identification and assessment of psychopathic men.

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Introduction

Psychopathy is a rare and unique disorder, characterized by an emotional deficit in empathy and fear, an inclination toward antisocial behaviors, destructive interpersonal tendencies, and chaotic lifestyles. Despite their emotional poverty, some psychopathic individuals are adept at feigning emotions. They are able to deftly deceive and manipulate without compunction. Moreover, their diminished capacity for emotional arousal may result in the absence of self-doubt and anxiety thereby facilitating the creation of their charming façade. This discrepancy between expressing and experiencing emotion is captured by Johns and Quay's (1962) description of these individuals as people who "know the words, but not the music" (p.217).

Traditionally, the psychopathy literature has focused primarily on their antisocial behavior, despite assertions that the essence of the disorder lies in the psychopathic individual's difficulty with emotion processing (Mitchell & Blair, 2000). Currently there is no formal diagnosis for psychopathy in the Diagnostic and Statistical Manual of Mental Disorders. Instead, the term has been subsumed under the diagnostic category for Antisocial Personality Disorder (ASPD) (American Psychiatric Association, 2000) which emphasizes behavioral features while overlooking personality and affective components. The latter traits constitute the core elements of the classic psychopath as portrayed by Cleckley (Hare, Hart, & Harpur, 1991). Moreover, Cooke, Michie, Hart, and Clark (2004) suggest that antisocial behavior should be viewed as a secondary symptom or consequence of psychopathy.

This study will focus primarily on the psychopathic individual's incapacity for love – it is not intended as an all-encompassing model to account for the entire range of features associated with this disorder and does not address the multitude of other symptoms displayed by

psychopathic individuals (interested readers should refer to Cleckley, 1982; Hare, 1991a, 1993, 2003). In addition, consistent with the bulk of research indicating a predominance of psychopathy diagnoses among men, and the bulk of the research devoted to that gender, this study will primarily pertain to men. It is possible that the content of this discussion is similarly applicable to women, however further research is needed to determine gender differences.

Despite the ubiquitous nature of romantic love, it is a relatively young field of study in psychology (Reis & Aron, 2008). This is understandable as romantic love is difficult to manipulate experimentally. Studies frequently require individuals who claim they are "in love" to volunteer, which may result in a participation bias. Further, romantic love varies in operational definitions across studies. Additionally, the number of studies on the physiological correlates associated with romantic love is scarce. In terms of physiological recording, compared to sexual arousal, which can be measured reliably and validly by examining genital blood flow, no definitive test of romantic love exists. Part of this can be explained by the complexity of the construct of romantic love. Distinguishing between the various aspects (e.g., infatuation, jealousy, attachment, etc.) of love is challenging. For example, the emotions experienced during love can vary as an individual could be happy in the presence of his significant other but become sad upon separation. However, these specific emotions may be distinct from his overall feeling of love for her.

Also, current romantic love research tends to involve both genders. However, findings have indicated that romantic love experiences are more alike than different between men and women (e.g., Baumeister, Wotman, & Stillwell, 1993; Hatfield & Sprecher, 1986; Sprecher & Regan, 1998). For example, although men tend to "fall in love" more easily and quickly than women (Baumeister et al., 1993; Hill, Rubin, & Peplau, 1976), this gender difference is not

maintained as the romantic partners become more committed to each other (Rubin, Peplan, & Hill, 1981). Also, women have reported experiencing greater levels of companionate love than men, but the men who have strong feelings of companionate love experience more positive emotions and are more satisfied and committed in their relationships compared to women experiencing high levels of companionate love (Sprecher & Regan, 1998). Lastly, Sprecher and Regan (1998) have suggested that men do not differentiate between passionate and companionate love as much as women as their scores tend to be more highly correlated.

The advancement of romantic love research is more broadly integral to gaining a better understanding of the psychopathic man's inability to love by providing a basis for comparison. Such progress will contribute to the identification and detection of psychopathic men, who are more likely to be perpetrators of predation of female victims and partner abuse, causing significant pain to others (e.g., depression, PTSD; Brown & Leedom, 2008). Finally, and most pertinent to this paper it is important to study love in relation to psychopathy in order to better understand how the disorder impacts their romantic experiences. The premise is not necessarily that psychopathic men have relationship difficulties per se, but rather that they lack the fundamental capacity to experience romantic feelings for anyone or to possess the notion that another person could be precious to them. These men may be actually quite adept at seducing women, but as a result of their diminished capacity for love they pose an increased risk for exploiting and victimizing women. In effect, their diminished capacity for love prevents the formation of meaningful and enduring romantic relationships.

Relevant Types of Psychopathy

Individuals diagnosed with psychopathy comprise a heterogeneous group, prompting researchers to attempt to identify and classify the various subtypes (Hicks, Markon, Patrick,

Krueger, & Newman, 2004). Most popular is the distinction between primary and secondary psychopathy (Karpman, 1941; Lykken, 1957, 1995). Essentially, primary psychopathy refers to individuals who may exhibit antisocial behaviors motivated by an underdeveloped conscience and have a weak behavioral inhibition system resulting in a "fearless" temperament (Fowles, 1980), whereas secondary psychopathy refers to those who display antisocial behavior as expressions of neurotic conflict and have an overactive behavioral activation system resulting in impulsivity (Karpman, 1941). Moreover, despite aggressiveness and social improprieties among both subtypes, those with primary psychopathy tend to evidence confidence, dominance, low anxiety, and low guilt, whereas those with secondary psychopathy display relatively greater anxiety, withdrawal, emotionality, and low self-esteem (Blackburn, 1975, 1985, 1998). Secondary psychopathy is associated with a greater inclination to experience distress due to the consequences of one's actions and may place one at a higher risk for suicide-related behaviors (Poythress & Skeem, 2006). Thus, although both groups may commit antisocial acts, the underlying mechanisms are different. Also, the form of aggression exhibited may differ, as primary psychopathy is more associated with instrumental violence and secondary psychopathy is more associated with reactive violence (Poythress & Skeem, 2006). Since the focus of this paper will be on the incapacity for the emotional experience of romantic love, this paper will concentrate primarily on men who display characteristics of primary psychopathy.

Romantic Love

Despite being regarded as a universal human phenomenon (Aron et al., 2005; Doherty, Hatfield, Thompson, & Choo, 1994; Hatfield & Rapson, 1996; Hatfield & Sprecher, 1986; Jankowiak & Fischer, 1992; Tennov, 1979), the nature and complexity of romantic love still remains a mystery. In particular, although interest in relationship science has recently surged, few

rigorous empirical studies have examined the biological mechanisms associated with love (Reis, 2007). Also, the existing literature examining the biological factors in love tend to focus on the role of neurotransmitters and neural structures (e.g., Fisher, Aron, Mashek, Li, & Brown, 2002), rather than on psychophysiological responding (i.e., heart rate, HR; skin conductance, SC) per se. Romantic love is a broad concept that can be described in many ways. Laypeople seem to believe that infatuation is a mystical and sacred experience that cannot be explained by the laws of nature or science (Fisher, 1992). Literature reviews have indicated the difficulty of disentangling concepts of romantic love from love in general (Fisher, 1992). Moreover, the study of love is hindered by multiple interpretations of this concept.

According to Sternberg (1986), "romantic love" is characterized by feelings of intense passion and intimacy. He drew a distinction between these two terms however. He defined passion as "the drive that leads to romance, physical attraction, sexual consummation" and related phenomena in loving relationships, whereas intimacy is a "feeling of closeness, connectedness, and bondedness" in loving relationships. Passion and intimacy tend to be reciprocally and highly interactive with one another, but possess different characteristics. For example, the importance of passion is emphasized in short-term relationships and tends to decline over time, whereas intimacy is more valued in long-term, close relationships. Passion is considered to be relatively unstable and difficult to control and have immediate salient physiological concomitants (Sternberg, 1986). However, although one has some control over feelings of intimacy, these warm feelings may be experienced without being intensely felt. Moreover, intimacy is not restricted to romantic relationships but is also observed in various loving relationships (e.g., family members, close friendships) (Sternberg & Grajek, 1984), whereas passion is typically associated with romantic relationships. Finally, psychophysiological

responses are more pronounced in passion than in intimacy, especially with regard to autonomic arousal. Without intimacy, one experiences "infatuated love," and without passion, one experiences "liking" (Sternberg, 1986, 1997). In sum, romantic love describes the experience of couples who are physically and emotionally drawn to one another (Sternberg, 1986).

According to Crozier (2006, p.19), "emotions are experienced as internal states but they are produced in and through social interactions." Fisher (2004) claimed that basic (e.g., fear, anger, joy) as well as complex (e.g., admiration, loyalty, bashfulness) emotions contribute to our experiences of romantic feelings. In addition, "background feelings" (Damasio, 1994), which are low intensity emotional states such as calm, tension, mild pleasure, mild pain, and other general bodily states also contribute to this process (Fisher, 2004). However, some researchers have found that early-stage romantic love seems to reflect more of a motivation or goal-oriented state associated with reward representation regions in the brain, rather than a specific emotion (Aron et al., 2005). Purportedly, this drive subsequently leads to different specific emotions. Crozier (2006) described love as a secondary, or higher order, emotion, which is uniquely human, varies cross-culturally, is enduring, and involves cognitive processing and moral judgment. Still, Shaver and colleagues (1996) argue that love should be considered a basic emotion, emphasizing its significant role in everyday life. Furthermore, romantic love has been described as overwhelming, uncontrollable, involuntary, and transitory (Bartels & Zeki, 2000; Fisher, Aron, & Brown, 2006; Tennov, 1979). Individuals experiencing romantic attraction report feeling a powerful sense of empathy for their beloved (Fisher et al., 2002), providing a foundation for altruistic behavior. Finally, Diamond (2004) characterizes romantic love as "powerful feelings of emotional infatuation and attachment between intimate partners." Among western cultures, romantic love is regarded as a basis for mate selection (Fisher, 2004; Jankowiak & Fischer, 1992).

Due to disparate aspects of romantic love, Dorothy Tennov (1979) coined the term "limerence" to denote a temporary state which occurs in the earlier, more "passionate" stage of romantic love, involving intense feelings (e.g., excitement, euphoria), preoccupying interest and affection, a strong desire for contact (i.e., "intense longing for union with another"), and resistance upon separation with the loved one (Diamond, 2004; Tennov, 1979). This "hot" emotion is also referred to as lovesickness, infatuation, obsessive love, and being "head-over-heels" in love (Hatfield & Rapson, 1996). Limerence or passionate love has been suggested to possess a strong sexual component (Hatfield & Sprecher, 1986). Hatfield and Sprecher (1986) posits that the term "passionate love" is an appropriate designation for this experience, regardless of whether the sentiments are reciprocated (e.g., fulfillment, ecstacy) or uncertain or unreciprocated (e.g., emptiness, anxiety, despair). Physiological correlates of limerence include heart palpitations (e.g., pounding heart), accelerated breathing, trembling (e.g., trembling hands), shaking, flushing (e.g., flushed face), pallor, perspiration (e.g., sweaty palms), dizziness, and weakness in general (e.g., weak knees) (Hatfield & Sprecher, 1986; Tennov, 1979). The affective experience encompasses intense positive emotions (e.g., joy, ecstasy, excitement, and elation), as well as intense negative emotions (e.g., apprehension, anxiety, jealousy, despair, and fear), with rapid transitions between these feelings (e.g., from ecstasy to despair in a "matter of seconds") (Hatfield & Sprecher, 1986; Sprecher & Regan, 1998; Tennov, 1979). These physiological and emotional reactions seem to have a reciprocal relationship (Tennov, 1979). In fact, people often decide they are "in love" largely based off of the close association with physiological cues as well as determining the strength of their passion by the intensity of emotions experienced (Hatfield & Sprecher, 1986).

In terms of behavioral consequences, a positive outcome of limerence seems to be that it

initiates beneficial change, sometimes lasting even after the relationship has ended. Limerents report elevated levels of generosity, morality, and pleasantness (Tennov, 1979). Also, limerents often develop interest in their limerent objects' activities, even picking up some of their behaviors, attitudes, or personality traits (Tennov, 1979). When the limerent object has many admirable qualities, this would be an advantageous effect for the limerent, inspiring him to change for the better.

In sustained relationships, limerence may later develop into companionate love, also called pair bonding, attachment, (Fisher, 1998; Fisher, Aron, & Brown, 2006; Hatfield, 1987; Jankowiak & Fischer, 1992; Sprecher & Regan, 1998), affectional bonding (Tennov, 1979), or true love (Hatfield & Rapson, 1996; Sprecher & Regan, 1998). This "more stable kind of love" (Hatfield & Sprecher, 1986) is characterized by "warm" (Hatfield & Rapson, 1996) and calm emotions and emphasizes comfort, care, security, and emotional union (Diamond, 2004; Fisher et al., 2002). Sternberg (1986, 1997) argues that companionate love is the combination of intimacy and commitment (i.e., deciding to love a certain person in the short-term, committing to maintain that love in the long-term). Compared to limerence, companionate love has been suggested to be less erotically charged in terms of intensity and frequency (Sternberg, 1986), but there are mixed empirical findings (i.e., sexual excitement is more closely associated with passionate love but sexual intimacy is more strongly associated with companionate love; Sprecher & Regan, 1998). Previous research has found that companionate love is associated with more positive affective experiences (e.g., joy, contentment) and greater relationship satisfaction than passionate love (Sprecher & Regan, 1998). Some research has indicated that passionate love may coexist with companionate love (Sprecher & Regan, 1998), with both declining slightly and equally over time (Traupmann & Hatfield, 1981) whereas others suggest that passionate love decreases over time

while companionate love remains stable (Sprecher & Regan, 1998). Such findings emphasize the notions that romantic relationships involve components of both passionate and companionate love (Sprecher & Regan, 1998).

Taken together, physiological arousal (i.e., "chemistry") is suggested to comprise a large component of limerence whereas companionate love is described as involving a more temperate set of emotions (Harvey & Weber, 2002; Sternberg, 1998). It is possible that as a result of prolonged exposure of having been in a long-term relationship with the love object, he has habituated to her, thus no longer exhibiting the characteristic intense physiological emotions (Sternberg, 1998). Instead, this tends to be replaced by greater commitment, attachment, trust, and intimacy.

Essentially then, romantic love can be construed as a complex, multifaceted construct. For purposes of this paper, the term "romantic love" is a complex social emotion that will refer to the combination of "limerence" or "passionate love" (Diamond, 2004; Tennov, 1979) and "companionate love" (Diamond, 2004). Thus, romantic love is operationalized as simultaneously or sequentially experiencing 1.) a constellation of feelings including happiness, excitement, yearning to be close to the love object, bashfulness, apprehension regarding reciprocation, jealousy, fear of rejection, separation anxiety, grief after rejection, embarrassment about not being able to hide physiological arousal or romantic feelings, melancholy, tenderness, admiration, adoration, loyalty, and empathy, as well as 2.) physiological correlates such as heart pounding or racing, trembling or shaking, sexual arousal, perspiration, "butterflies in the stomach," general weakness, and blushing in the imagined or actual presence of the love object. To encompass both limerence and companionate love, the emotion of romantic love can vary in intensity since that limerence is more physiologically and emotionally intense than the calmer experience of

companionate love. Finally, both limerence and companionate love are combined in this definition because it is proposed that psychopathic men do not sufficiently experience either emotion based on general affective deficiency.

Psychopathy and the Incapacity to Love

Within relationships, psychopathic individuals are characterized by pathological lying as well as having a history of short-term, superficial, uncommitted sexual relationships (Cleckley, 1982). With regards to this latter point, Seto, Khattar, Lalimiere, and Quinsey (1996) suggest that psychopathy is associated with the tendency to deceive in sexual contexts. Research has suggested that characteristics of the "Dark Triad" (Machiavellianism, narcissism, psychopathy) are associated with an exploitative, short-term mating strategy in men (Jonason, Li, Webster, & Schmitt, 2009). These behaviors may be facilitated by their lack of fear and empathy (Lykken, 1995).

Also, studies examining love and sex attitudes with relationship satisfaction found that relationship satisfaction was positively associated with Eros (passionate love) and Agape (altruistic love) and negatively associated with Ludus (game-playing, uncommitted love; e.g., "It's always a good idea to keep your lover a little uncertain about how committed you are to her"; Lee, 1977) and Instrumentality (manipulative sexuality; e.g., "the main purpose of sex is to enjoy oneself") (Hendrick, 1988; Hendrick, Hendrick, & Adler, 1988; Hendrick, Hendrick, & Dicke, 1998). Although the relationship between psychopathy and Ludus has not been empirically examined to date, the noncommittal love style seems consistent with psychopathic characteristics. Similarly, Ludus has been associated with less intimacy, passion, commitment in relationships (Levy & Davis, 1988). In addition, Ludus has been found to have a positive relationship with sensation seeking (i.e., Disinhibition, Boredom Susceptibility; Zuckerman,

Kolin, Price, & Zoob, 1964) (Hendrick & Hendrick, 1987). In general, Ludus is a love style more commonly associated with men than women (Hendrick & Hendrick, 1986, 1987; Hendrick et al., 1998), and these individuals tend to have a greater desire for novelty and excitement as well as scoring higher on extroversion (Harvey & Weber, 2002), similar to psychopathy. According to Hendrick and colleagues (1988), men who have a game-playing orientation toward intimate relationships tend to be less satisfied in their relationships. Moreover, those who are less satisfied in their relationships tend to be less committed and display less relationship investment (Hendrick, 1988). Consistently, individuals "in love" exhibited less of a game-playing and instrumental approach to love than those who were not "in love," who in turn were higher on sensation seeking (Hendrick & Hendrick, 1988). In fact, Sternberg does not regard Ludus as a genuine manifestation of love, but rather an interpersonal style that may be applied in romantic relationships (Sternberg, 1986). Moreover, these love styles or attitudes are used to describe how people approach or define love (Hendrick & Hendrick, 1986; Lee, 1973). Since psychopathic individuals tend to have such a half-hearted approach to romantic relationships (Cleckley, 1982), they may not be motivated to maintain committed long-term relationships because they find them less satisfying in comparison to non-psychopathic individuals. Interestingly, previous research has found Ludus to be associated with those who have never been "in love" as well as those were frequently "in love" (i.e., 3 or more times) (Hendrick & Hendrick, 1986). Also, those who have never been "in love" tend to score the lowest on Eros and Agape (Hendrick & Hendrick, 1986). Thus, it is altogether plausible that psychopathic men experience both less limerence and companionate love toward their partners.

The deficiency of romantic love can have a deleterious effect on shared partner experiences. For example, within a close relationship, sexuality is considered to be an act of

affection or love (Sprecher & McKinney, 1993). Moreover, to a limerent, sexual consummation may be a symbolic representation of affectional reciprocation (Tennov, 1979). In contrast, a psychopathic individual may view a sexual encounter as mere transitory gratification (Cleckley, 1982). Still, indicators of mating effort have been found to be related to psychopathy (Seto et al., 1996) as demonstrated in the finding that psychopathic individuals tend to be more sexually coercive against women than nonpsychopathic individuals (Knight & Guay, 2006; Lalumiere & Quinsey, 1996). Similarly, men who are oriented toward short-term relationships are particularly upset about sexual deception or being "led on" about a woman's willingness to have sex (Haselton, Buss, Oubaid, & Angleitner, 2005). According to Porter and colleagues (2000), sex offenders who have victimized both adults and children are more likely to be psychopathic than non-psychopathic.

Trachtenberg (1988) articulated at length on men who have the "Casanova Complex," who seem to share some characteristics with psychopathic men. For example, both groups seem incapable of forming strong romantic attachments. Their intimate relationships tend to be transient, but those who are able to sustain longer relationships are habitually unfaithful as well. Also, they both tend to be sexually careless by failing to take proper precautions against sexually transmitted diseases and pregnancy and holding a narcissistic attitude of immunity. Like psychopathic men, they are frequently deceptive and it is recommended to avoid becoming involved with them. Often times, they do not desire to be cured of their affliction. However, this group of men appears to differ from psychopathic men in that the behavior of "Casanovas" is marked by uncontrollable sexual urges, having vulnerability toward developing addictions, and being overwhelmingly drawn to women. In contrast, psychopathic individual's sexual encounters are motivated by a casual curiosity rather than driven by a strong uncontrollable desire (Cleckley,

1982). Another difference is that these “Casanovas” seem to experience guilt and regret regarding their sexual transgressions (Trachtenberg, 1988).

Another feature that supports deficient romantic love in psychopathic individuals is that they do not typically experience erotomania (delusional) or borderline erotomania (nondelusional) (Meloy, 1992). These disorders stem from an idealized non-existent romance which occasionally leads to violent acts (e.g., stalking, homicide) against the love object as a result of perceived abandonment or against people who stand between them. Ironically, an individual suffering from erotomania may be mistaken as psychopathic, as he may exhibit aggression and sadism (Meloy, 1992). In actuality, the psychopathic man is more likely to commit predatory, cold-blooded violence rather than affective violence (Williamson, Hare, & Wong, 1987). Violence perpetrated by a psychopathic man toward a romantic partner is thus unlikely to be motivated by passion or unrequited love, but rather because she has become a nuisance or is thwarting him from attaining a goal. Furthermore, he is unlikely to be angry with her for not reciprocating his feelings because he never felt intensely about her in the first place and does not yearn for or aspire for attachment with her. This is because their primary interest in significant others is for instrumental value and not to be loved (Meloy, 1992). Also, in order to be a pursuer of unrequited love, as well as falling in love in general (Dion & Dion, 1975), requires a willingness to become vulnerable (Baumeister et al., 1993), which is inconsistent with the psychopathic presentation.

Some have examined the romantic difficulties of individuals with antisocial behavior. For example, individuals with childhood onset (onset of 8 – 12 years of age) antisocial behavior problems report having the highest rates of interpartner conflict followed by those with adolescent limited (onset of 13-21 years of age) behavior problems, and those without antisocial

problems having the lowest risk (Woodward, Fergusson, & Horwood, 2002). Specifically, earlier onset of antisocial behavior has been associated with a heightened risk of being involved in violent (e.g., pushing, shoving, slapping, and throwing objects at partner) and tumultuous (e.g., arguing, confusion and ambivalence about relationship) adult relationships (Woodward et al., 2002). Although both males and females were included in this study, no significant gender differences were found for the relationship between antisocial behavior and subsequent relationship outcomes (Woodward et al., 2002).

On the extreme end of the antisocial spectrum, many psychopathic serial killers are males with a history of remaining single or having failed relationships (Schechter, 2003). History is replete with such high-profile case examples. Ted Bundy was a handsome, intelligent law student whose violent tendencies were veiled by the façade of his charms. Despite being physically unattractive, Henri Landru, a French Bluebird, charmed and swindled wealthy middle-aged widows before killing them (Schechter, 2003). George Joseph Smith or "Brides in the Bath Murderer" murdered his newlywed wives by drowning his unsuspecting victims. Herman Drenth (a.k.a. Harry Powers) conned women into marrying him as he promised them his "true love and absolute devotion" and did not hesitate to take their lives (Schechter, 2003).

In some instances psychopathic serial killers are married to wives who appear to be unaware of their secret double life (Schechter, 2003). Even when presented with evidence about their deceptively charming husbands, these women have a difficult time accepting it as truth. Moreover, some women are pathologically attracted to these men (e.g., Theo Durrant, Ted Bundy, Paul Bernardo, John Wayne Gacy, Henry Lee Lucas, Ed Gein, Edmund Kemper, Douglas Clark, Richard the "Night Stalker" Ramirez) as these serial killer "groupies" fervently pursue and sometime marry these men behind bars (Meloy, 1992; Schechter, 2003).

Despite being the predator, psychopathic men are likely to view and portray themselves as the victim (Cleckley, 1982; Hare, 1993). Retrospectively, the actual victim may be able to identify red flags of their love object. However, when people fall in love they tend to display a positive bias and focus on information that confirms that their love objects are reciprocating their feelings (Tennov, 1979). This is a perfect opportunity for psychopathic men to take advantage of them for sexual or financial profit.

Associated Physiological Correlates

Lykken (1995) described the disempathic type of alienated sociopaths. Although they may be able to emotionally invest in family members or romantic partners, they tend to respond to others as if they were objects. As indicated by their frequent occurrence of multiple marriages and sexual promiscuity, psychopathic men enter relationships with women but do not experience strong romantic sentiments for their partners. Skin conductance is the most commonly used measure of autonomic arousal in psychopathy research (Arnett, 1997). Also, Dindo and Fowles (2008) suggest that although the role of arousal has been emphasized in eliciting SC responses, it can also be elicited by stimuli of personal significance.

Physiological arousal plays a significant role in the development of romantic sentiments (Hatfield & Sprecher, 1986; White, Fishbein, & Rutstein, 1981). Common correlates of arousal associated with thoughts about the love object include blushing, experiencing heart palpitations, trembling, and perspiration for example. Prior research suggests that viewing a photograph of a loved one as well as thinking back to a specific instance during the relationship (e.g., the first time she said, “I love you,” holding hands) are consistently and predictably effective in eliciting feelings of intense romantic love (Mashek et al., 2000). Also, Mashek and colleagues found that these stimuli can evoke feelings of romantic love in less than 1 minute. Moreover, the intensity

of emotions experienced tends to dissipate after approximately 30 seconds of exposure to the picture (Mashek et al., 2000).

The use of a photograph of a loved one should be an effective method to eliciting romantic feelings as attraction research emphasizes the importance of visual appearance (e.g., Walster, Aronson, Abrahams, & Rottman, 1966). In particular, men who are "in love" tend to show relatively more activity (Fisher, 2004) than women who are "in love" in cortical areas associated with the integration of visual stimuli (i.e., Narumoto, Okada, Sadoto, Fukui, & Yonekura, 2001), further emphasizing the role of physical appearance when men fall in love. Consistently, individuals in love exhibit greater SC when viewing pictures of the beloved than that of a friend (Bartels & Zeki, 2000).

Emotionally, one may endorse happiness and anxiety concurrently if he perceives that she may return affection. Likewise, rejection may elicit visceral discomfort and sadness. Theoretically, a psychopathic individual lacks the neurological capacity to fully appreciate what this feels like. It has been suggested that psychopathic men does not experience the same degree of social blushing (Walsh & Wu, 2008), or vasodilation of the facial capillaries triggered by emotional stimuli in comparison with a normal, healthy population when confronted with potential embarrassment stemming from love (Crozier, 2006). However, it is possible that the ability to blush during sexual arousal and excitement (Crozier, 2006) is still preserved.

The Proposed Study

Examining the psychopathic individual's incapacity for love may provide an added dimension into the study of their overall emotional detachment in general. Romantic love is a complex social emotion that encompasses various other emotional states and affective components (e.g., happiness, anxiety, and jealousy) involving or aimed at a specific target. If

strong feelings are not elicited from a romantic partner or someone who is regarded with profoundly personal value, it is unlikely that they will harbor intense emotions toward less significant individuals. In general, people are motivated to seek romantic partners and maintain relationships. Psychopathic individuals, on the other hand, appear to function without affectional bonds, as relationships do not add any sentimental value to their life (Cleckley, 1982). For psychopathic individuals, partners are merely valued as a source of exploitation and instrumental purpose to achieve personal agendas. Evidence suggests psychopathic individuals make decisions based on what is advantageous for them at the moment (Cleckley, 1982; Hare, 1993). Since being with a romantic partner does not bring them satisfaction commensurate with levels found in a normal, healthy population, they find that significant investment in these relationships has few personal rewards.

Even though the incapacity of love was a prominent feature of Cleckley's classic conceptualization of psychopathy, it has been given little research attention in the field. In effect, this study sought to empirically examine their pattern of romantic experiences in order to provide a deeper understanding of psychopathy beyond that which is currently available in the psychopathic literature. Specifically, different aspects of romantic love (i.e., passionate love, companionate love, Ludus love style, relationship satisfaction, relationship history) were examined in relation to psychopathic features. Moreover, although emotions and physiological responding has been examined in psychopathic individuals, there is a lack of empirical studies examining the role of physiological responding for romantic love pertaining to psychopathy. Physiological arousal was measured in the form of SC and HR reactivity, as indices of sympathetic and parasympathetic nervous system activity. Specifically, SC was examined as a measure of sympathetic functioning whereas HR was assessed as a measure of both sympathetic

and parasympathetic nervous system influences. Therefore, the present investigation was designed to shed some light on the mechanisms underlying the psychopathic individual's incapacity for love and particularly to illuminate the role of physiological reactivity in their romantic experiences.

Hypotheses

It was hypothesized that psychopathic features will be negatively associated with romantic love (passionate love, companionate love, relationship satisfaction, relationship quantity, relationship duration), with the exception of the Ludus love style and quantity of relationships with which there is expected to be a positive relationship. This hypothesis was based on the notion of short-term, superficial, sexual relationships associated with psychopathy (Cleckley, 1982).

Further, it was expected that physiological responding to the romantic stimulus will be positively associated with romantic love, also with the exception of Ludus and relationship quantity. Also, it was expected that psychopathic features will be negatively associated with physiological responding (i.e., difference score between task and baseline). Thus, it was hypothesized that physiological responding (i.e., HR, SC) to the romantic stimulus, but not to the neutral stimulus, will partially mediate the relationship between psychopathic features and romantic love. These results would suggest that low physiological responding partially explains the attenuated romantic experiences of individuals with psychopathic features, underscoring the importance of autonomic reactivity in romantic love. Since psychopathic features is considered a trait variable, was expected to have temporal precedence over HR/SC reactivity, which is a state variable. Also, psychopathic features were examined during Phase 1 whereas HR/SC reactivity was measured during Phase 2, providing further support for the temporal relationship.

Lastly, it was expected that HR/SC reactivity will moderate the relationship between psychopathic features and romantic love, such that (1) psychopathic features is negatively associated with most aspects of romantic love (passionate love, companionate love, relationship satisfaction, relationship duration) except in conditions of high HR/SC reactivity to the romantic stimulus, and (2) psychopathic features is positively associated with Ludus and relationship quantity except in conditions of high HR/SC reactivity to the romantic stimulus. These relationships were expected to be particularly strong for the interaction between high psychopathic features and low HR/SC reactivity. Consistent with the mediational analyses, it was hypothesized that physiological responding to the romantic stimulus, but not to the neutral stimulus, will moderate the relationship between psychopathic features and romantic love. The moderation analyses may capture important relationships that may be undetected by the mediation analyses. Such findings would emphasize the influence of autonomic reactivity in experiencing feelings of romantic love. Also, it may imply that both psychopathic features and lack of physiological reactivity may lead to deficient romantic experiences. Further, those biosocial interactions may differentially influence the type of romantic experience that is experienced.

Passionate Love

Hypothesis 1a: HR/SC reactivity will mediate the relationship between Psychopathic features and Passionate love.

It was hypothesized that HR/SC responding to the romantic stimulus will mediate the relationship between psychopathic features and passionate love. Specifically, psychopathic features will be negatively associated with HR/SC reactivity (i.e., difference score) to the romantic stimulus, which will in turn be positively associated with passionate love.

Hypothesis 1b: HR/SC reactivity will moderate the relationship between Psychopathic features and Passionate love.

It was hypothesized that HR/SC responding to the romantic stimulus will moderate the relationship between psychopathic features and passionate love, such that low psychopathic features is positively associated with passionate love only in conditions of high HR/SC reactivity.

Companionate Love

Hypothesis 2a: HR/SC reactivity will mediate the relationship between Psychopathic features and Companionate love.

It was hypothesized that HR/SC reactivity will mediate the relationship between psychopathic features and companionate love. Specifically, psychopathic features will be negatively associated with HR/SC reactivity to the romantic stimulus, which will in turn be positively associated with companionate love, although to a lesser degree than with passionate love.

Hypothesis 2b: HR/SC reactivity will moderate the relationship between Psychopathic features and Companionate love.

It was hypothesized that HR/SC responding to the romantic stimulus will moderate the relationship between psychopathic features and companionate love, such that low psychopathic features is positively associated with companionate love only in conditions of high HR/SC reactivity.

Ludus

Hypothesis 3a: HR/SC reactivity will mediate the relationship between Psychopathic features and Ludus.

It was hypothesized that HR/SC reactivity will mediate the relationship between

psychopathic features and Ludus love. Specifically, psychopathic features will be negatively associated with HR/SC responding to the romantic stimulus, which will in turn be negatively associated with Ludus.

Hypothesis 3b: HR/SC reactivity will moderate the relationship between Psychopathic features and Ludus.

It was hypothesized that HR/SC responding to the romantic stimulus will moderate the relationship between psychopathic features and Ludus, such that low psychopathic features are negatively associated with Ludus, except in conditions of high HR/SC reactivity.

Relationship Satisfaction

Hypothesis 4a: HR/SC reactivity will mediate the relationship between Psychopathic features and Relationship satisfaction.

Consistent with the notion that relationship satisfaction is positively associated with Eros and Agape and negatively associated with Ludus (Hendrick, 1988; Hendrick et al., 1988, 1998), it is hypothesized that HR/SC reactivity will mediate the negative relationship between psychopathic features and relationship satisfaction. Specifically, psychopathic features will be negatively associated with HR/SC reactivity to the romantic stimulus, which will in turn be positively associated with relationship satisfaction.

Hypothesis 4b: HR/SC reactivity will moderate the relationship between Psychopathic features and Relationship satisfaction.

It was hypothesized that HR/SC responding to the romantic stimulus will moderate the relationship between psychopathic features and relationship satisfaction, such that attenuated psychopathic features is positively relationship satisfaction only in conditions of high HR/SC reactivity.

Relationship History

Hypothesis 5a: HR/SC reactivity will mediate the relationship between Psychopathic features and Relationship history.

It was hypothesized that HR/SC reactivity will mediate the relationship between psychopathic features and relationship history. Specifically, psychopathic features will be negatively associated with HR/SC reactivity to the romantic stimulus, which will in turn be positively associated with the average duration of romantic relationships and negatively associated with the total quantity of romantic relationships.

Hypothesis 5b: HR/SC reactivity will moderate the relationship between Psychopathic features and Relationship history.

It was hypothesized that HR/SC reactivity to the romantic stimulus will moderate the relationship between psychopathic features and relationship history, such that low psychopathic features is negatively associated with a shorter duration and greater quantity of romantic and sexual relationships, only in conditions of high HR/SC reactivity.

Method

Participants

This study was approved by the Institutional Review Board of Virginia Polytechnic Institute and State University as well as the Psychology Department Human Participants Committee. Participants consisted of 48 heterosexual physically healthy (e.g., no significant medical problems, cardiac arrhythmia, high blood pressure, neurological problems, chronic medication use) male college students between the ages of 18 and 29 years (M = 20.06, SD = 1.94), recruited through the undergraduate psychology pool at Virginia Tech. This sample was comprised of 42 Caucasian men (87.5%), 3 African-American/Black/African Origin men (6.3%),

and 3 Asian-American/Asian Origin/Pacific Islander men (6.3%). This should be a sufficient sample size (power of above .80) to detect a medium size effect using the product of coefficients method (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Moreover, 45 participants are needed to find a large size effect at the .05 alpha level to conduct a regression analysis with six independent variables based on a power analysis (Cohen, 1992). Furthermore, 35 participants are needed in order to achieve .8 power to find a mediated effect with large effect sizes of the α and β paths with using PRODCLIN (distribution of the PRODuct Confidence Limits for Indirect effects; Fritz & MacKinnon, 2007). This research was limited to men, based on gender differences in the manifestation of psychopathy (e.g., Salekin, Rogers, & Sewell, 1997; Vitale & Newman, 2001).

Also, only men who reported currently being in a romantic relationship (for at least 1 month) were selected, as emotions toward a current loved one may be qualitatively different than feelings toward a former significant other (e.g., these feelings may be confounding by emotions such as regret and resentment; Fisher, 2004). Additionally, feelings of unreciprocated love (Baumeister et al., 1993) seem to be experienced differently based on whether they took the role of the "would-be lovers" (i.e., feelings of longing and preoccupation, fears of rejection, perceiving "rejectors" as inconsistent and mysterious) compared with the "rejectors" (i.e., reluctance to deliver the message of rejection, anger, resentment, annoyance, seeing would-be lovers as self-deceptive and unreasonable). The one-month criterion was chosen based on previous studies examining romantic relationship problems (e.g., Woodward et al., 2002) to ensure that the couple had spent some time together. Current relationship duration for participants in phase 2 ranged from 66 to 1460 days (M = 487.86, SD = 394.119). Lastly, none of the participants in phase 1 had psychotic disorders or took psychotropic medications, and those

with invalid profiles on the PPI-R (13 men had an "atypical" score on the inconsistent responding scales) were excluded from the lab portion of the study.

Recruitment consisted of posting two different types of flyers to identify eligible participants. One targeted men in romantic relationships (i.e., "Are you currently in a romantic relationship?"), while the other was aimed toward men endorsing psychopathic features (i.e., "Are you a confident, thrill-seeker?"). They were compensated with extra credit toward their psychology classes for the first part of the study. Those who also participated in the second part of the study received another extra credit point or a $5 payment, as well an entry into a raffle for $25 gift certificate from Amazon.

Self-Report Measures

Demographics questionnaire (Appendix A). This measure involves questions about the participants' background, such as age, gender, race, socioeconomic status, religion, relationship status (e.g., dating, cohabitating, engaged, married), duration of current relationship, age of current relationship partner, and sexual orientation. Only men who were currently in a romantic relationship (of at least 1 month) were included in the lab portion of the study. Forty-four men reported that they had ever been "in love" in their lifetime, whereas 36 men reported that they were currently "in love." In terms of relationship classification, 15 men had been dating their partner for less than 6 months, 31 men were in a long-term relationship (6 months or more), 1 was cohabitating (living with dating partner), and 1 was married. The quantity of lifetime sexual partners ranged between 0 and 25 (M = 3.68, SD = 4.429) and current sexual partners ranged between 0 and 1 (M = .87, SD = .334).

Medical history questionnaire (Appendix B). This self-report questionnaire was used to screen for significant medical or neurological problems that may serve as confounds in the lab

portion of the study.

Lateral preference inventory (LPI; Coren, Porac, & Duncan, 1979; Appendix C). This measure was used to examine hemibody preference or "handedness" in participants. Comprised of 16 items, the measure asks about the preference of using the right or left hand, foot, eye, and ear based on a series of behaviorally validated items (Coren, 1993). The inventory consists of 4 subscales: Handedness (items 1-4; e.g., "With which hand do you draw?"), Footedness (items 5-8; "With which foot would you kick a ball to hit a target?"), Eyedness (items 9-12; "Which eye would you use to look through a telescope?"), and Earedness (items 13-16; e.g., "If you wanted to listen in on a conversation going on behind a closed door, which ear would you place against the door?"). In terms of internal consistency, test-retest reliability (1 year period) of 98% concordance has been found between laterality preference and behavioral indicators (Coren & Porac, 1978). The data is scored for each four-item subscale (R - L), in which R is the number of "right" responses and L is the number of "left" responses. The range of scores for each subscale is from -4 (full left hemibody preference) to +4 (full right hemibody preference), and 0 is indicative of ambilaterality.

Psychopathic personality inventory-revised (PPI-R; Lilienfeld & Widows, 2005). This 154-item self-report measure assesses the core psychopathic personality traits and can be used in both clinical (e.g., forensic) and nonclinical (e.g., student, community) settings. Since the original PPI (Lilienfeld, 1990) was developed and validated with an undergraduate sample (Lilienfeld & Andrews, 1996), the PPI-R should be appropriate for use with the current study. Respondents are asked to answer to each question on a 4-point Likert-type rating scale (1 = false, 2 = mostly false, 3 = mostly true, 4 = true). Written at the 4^{th} grade reading level, this measure has been standardized and validated for use with adult between the ages of 18 and 86.

The PPI-R assesses for one overall total score, 2 factor scales (Self-centered Impulsivity and Fearless Dominance), and 8 content scales (Machiavellian Egocentricity, 20 items; Social Influence, 18 items; Coldheartedness, 16 items; Carefree Nonplanfulness, 19 items; Fearlessness, 14 items; Blame Externalization, 15 items; Rebellious Nonconformity, 16 items; and Stress Immunity, 13 items). Example of items include "How much I like someone really depends on how much that person does for me," "I have a talent for getting people to talk to me," "I have had 'crushes' on people that were so intense that they were painful" reverse scored. The range for the total score was 33 – 89 (*M* = 50.46, *SD* = 11.823). The Self-Centered Impulsivity (*M* = 47.06, *SD* = 9.45, range = 35 – 82) factor consists of Machiavellian Egocentricity (*M* = 50.12, *SD* = 9.760; range = 27 – 81), Rebellious Nonconformity (*M* = 48.44; *SD* = 9.172; range = 33 – 76), Carefree Nonplanfulness (*M* = 48.29, *SD* = 7.877; range = 32 – 66), and Blame Externalization (*M* = 44.40; *SD* = 9.195; range = 30 – 82). The Fearless Dominance (*M* = 54.29; *SD* = 11.565; range = 32 – 79), on the other hand, includes the Social Influence (*M* = 53.77; *SD* = 10.982; range = 28 – 75), Fearlessness (*M* = 51.73; *SD* = 9.273; range = 35 – 70), and Stress Immunity (*M* = 53.79; *SD* = 9.294; range = 28 – 70). Coldheartedness (*M* = 51.08; *SD* = 11.553; range = 33 – 90) does not load on either Self-Centered Impulsivity or Fearless Dominance, but is included in the total score. These 2 factors are consistent with that of the original PPI (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003). Specifically, the PPI-R Fearless Dominance factor corresponds to the PPI Factor 1 and the Self-Centered Impulsivity to the PPI Factor 2 (Lilienfeld & Widows, 2005). Moreover, Benning and colleagues (2003) have found that the anxiety, depression, substance abuse, and risk for suicidal behavior has been positively associated with PPI Factor 2 and negatively associated with PPI Factor 1. Also, the Coldheartedness factor has been negatively associated with empathy and characteristics of borderline personality (Sandoval,

Hancock, Poythress, Edens, & Lilienfeld, 2000). PPI-R Total raw score is obtained by the sum of raw scores for the Self-Centered Impulsivity, Fearless Dominance, and Coldheartedness factors (Lilienfeld & Widows, 2005).

In order to detect problematic responding styles in psychopathic individuals, the PPI-R includes four validity scales: Virtuous Responding ("faking good", 13 items), Deviant Responding ("faking bad", 10 items), Inconsistent Responding 15 (responding to similar or related items randomly or carelessly, responding with bizarre answers in an attempt to "sabotage" the test, 30 items), and Inconsistent Responding 40 (same as the Inconsistent Responding 15 scale but with more items and a higher internal consistency, 80 items). The Inconsistent Responding 15 and Inconsistent Responding 40 are scored by adding together the absolute differences between the item scores in each pair.

In terms of internal consistencies, the Cronbach's alpha in non-offender samples have been found to be between .78 and .95 for the total score and content scales (Lilienfeld & Widows, 2005; Ross et al., 2007). In addition, the linear composite reliability estimate was .93 for the Total scale, .92 for Self-Centered Impulsivity, and .91 for Fearless Dominance in community/college samples (Lilienfeld & Widows, 2005). Also, test-retest reliabilities have been found to be between .76 and .93 for subscales and total score (Lilienfeld & Widows, 2005; Sandler, 2007). In the current sample, the Cronbach's alpha was .818 for Machiavellian Egocentricity, .846 for Rebellious Nonconformity, .868 for Blame Externalization, .789 for Carefree Nonplanfulness, .897 for Social Influence, .837 for Fearlessness, .858 for Stress Immunity, .840 for Coldheartedness, .752 for Virtuous Responding, .916 for Deviant Responding, .951 for total PPI-R, .928 for Self-Centered Impulsivity, and .916 for Fearless Dominance.

In terms of construct validity, the PPI-R has been significantly correlated with the Levenson SRP (Levenson, Kiehl, & Fitzpatrick, 1995) and the Self-Report Psychopathy Scale-II (SRP-II, Hare, 1991b). Also, 7 PPI-R Content scales (Machiavellian Egocentricity, Rebellious Nonconformity, Blame Externalization, Carefree Nonplanfulness, Social Influence, Fearlessness, and Coldheartedness), Self-Centered Impulsivity factor, Fearless Dominance factor, Coldheartedness factor, and Total score were significantly positively associated with the Primary Psychopathy scale. Five PPI-R Content scales (Machiavellian Egocentricity, Rebellious Nonconformity, Blame Externalization, Carefree Nonplanfulness, and Fearlessness), Self-Centered Impulsivity factor, and Total score were significantly positively and 1 PPI-R Content scale (Stress Immunity) and the Fearless Dominance factor were significantly negatively related to the Secondary Psychopathy scale (Lilienfeld & Widows, 2005) from Levenson's Self-Report Psychopathy Scale (Levenson et al., 1995). In relation to the SRP-II (Hare, 1991b) in community/college samples, the SRP-II Total score was significantly positively associated with the PPI-R Total (r =.82), Self-Centered Impulsivity (r =.52), Fearless Dominance (r =.67), and Coldheartedness factors (r =.44). The SRP-II Factor 1 scale was significantly associated with the Total (r =.34), Fearless Dominance (r =.59), and Coldheartedness factors (r =.45). The SRP-II Factor 2 scale was significantly positively associated with the Total (r =.75), Self-Centered Impulsivity (r =.68), Fearless Dominance (r =.41), and Coldheartness factors (r =.29) (Lilienfeld & Widows, 2005). In examining factorial validity, a principal axis factor analysis yielded 3 factors which accounted for 47% of the variance in community/college samples (Lilienfeld & Widows, 2005).

As recommended by Lilienfeld & Widows (2005), the PPI-R was used as a continuous measure rather than as a categorical measure (i.e., median split, extreme score analysis).

Lilienfeld & Widows (2005) go on to explain that recent research has suggested that psychopathy measured by the PPI is underpinned by a latent dimension instead of a taxon (Marcus, John, & Edens, 2004) and that dichotomization often reduces statistical power (Cohen, 1983; MacCallum, Zhang, Preacher, & Rucker, 2002). Also, the questionnaire was included in the online portion of the study, as a computerized (online) version of the PPI-R has been found to be equivalent (i.e., psychometric properties) to the paper version (Sandler, 2007). In fact, the computerized version was found to be superior to the paper format in that it allowed for more complete responding (e.g., less missing data) and more efficient scoring (e.g., less scoring errors that are often found in hand scoring, shorter scoring time) (Sandler, 2007).

Post-task measure (Appendix D). After completing the lab tasks (described below), the participants were asked a series of questions, based on the procedures used by Bartles and Zeki (2000). First, the participants were asked to report their emotional experience during the task to confirm the effectiveness of the manipulation (i.e., feeling "in love" while viewing the picture of their significant other). Participants were also be asked to rate their feelings of love and sexual arousal during the tasks on a Likert-type scale from 1 to 9. In addition, participants were asked to rate the quality of the pictures (Aron et al., 2005), since this could be a possible confound. Lastly, participants were asked to report any other thoughts, images, or associations they had during the tasks.

Passionate love scale (PLS; Hatfield, 1998; Appendix E). Designed to capture the cognitive, emotional, and behavioral features of passionate love, the PLS includes 30 items on a 9-point Likert scale. The cognitive component is characterized by intrusive thinking/preoccupation with loved one (items 5, 19, 21; e.g., "My partner always seems to be on my mind"), idealization of loved one/relationship (items 7, 9, 15; e.g., "For me, my partner is the

perfect romantic partner"), desire to know and be known by loved one (items 10, 22; e.g., "I yearn to know all about my partner"). The emotional component consists of attraction to loved one and positive feelings (items 16, 18, 29; e.g., "I possess a powerful attraction for my partner"), ambivalence or negative feelings when things go wrong (items 1, 2, 8, 20, 28, 30; e.g., "An existence without my partner would be dark and dismal"), longing for reciprocation (item 14; e.g., "I have an endless appetite for affection from my partner"), desire for complete and permanent union (items 11, 12, 23, 27; e.g., "Knowing that my partner cares about me makes me feel complete"), and physiological arousal (items 3, 13, 17, and 26; e.g., "Sometimes my body trembles with excitement at the sight of my partner"). Lastly, the behavioral components involve actions toward determining the loved one's feelings (item 24; e.g., "I eagerly look for signs indicating my partner's desire for me"), studying the loved one (item 4; e.g., "I take delight in studying the movements and angles of my partner's body"), and providing service and help to the loved one (items 6, 25; e.g., "If my partner was going through a difficult time, I would put away my concerns to help her out"). Scores on the PLS ranged from 71 to 258 (M = 202.23; SD = 39.945)

In terms of reliability, high internal consistency between .94 and .97 has been found (Hatfield & Sprecher, 1986; Hendrick & Hendrick, 1989), which is higher than reliability coefficients found for other established love scales (e.g., Rubin's "Liking" and "Love" scales, Larzelere & Huston's "Trust" scale, Passion of Sternberg's "Triangular Love Scale"). Similarly, Sprecher and Regan (1998) reported a Cronbach's alpha of .90 for men and .90 for men for the abbreviated PLS. The PLS has demonstrated good validity in prior studies. Principle factor analyses have yielded one major factor with strong loadings which explained 57-70% of the variance (Hatfield & Sprecher, 1986; Hendrick & Hendrick, 1989). Regarding external

validation, high correlations have been found with other measures of passionate love (e.g., positive correlations with Rubin's "Love" scale, all three subscales of Sternberg's Triangular Love Scale, and Eros, Mania, Agape from the "Love Attitudes Scale;" and negative correlation with Ludus from the "Love Attitudes Scale"; Hatfield & Sprecher, 1986; Hendrick & Hendrick, 1989) and the scores were uncontaminated by a social desirability bias (r = .09, nonsignificant) (Hatfield & Sprecher, 1986). Reliability was high for the current sample at a Cronbach's alpha of .96. The scores ranged between 71 and 258 (M = 202.23; SD = 39.945).

Companionate love scale (CLS; Sternberg, 1997, 1998; Appendix F). Adapted from the Sternberg Triangular Love Scale (TLS) which was based on his theoretical work on love (e.g., Sternberg, 1986), this 30-item measure assesses feelings of intimacy (15 items; closeness, connectedness) and commitment (15 items; deciding to be and stay together), also on a 9-point Likert scale (1 = not at all, 3 = somewhat, 5 = moderately, 7 = quite, 9 = extremely). The CLS includes the items from two of the three subscales (intimacy, commitment) of the TLS. The intimacy and commitment subscales are calculated by adding up the scores and dividing each of them by 15 to provide an average rating. Thus, the companionate love score is comprised of the sum of the commitment and intimacy score. Higher scores are indicative of greater companionate love towards his partner.

In terms of reliability, internal consistency has been found to be high at .91 for intimacy and .94 for commitment (Sternberg, 1997). Sprecher and Regan found a cronbach's alpha of .70 for men and .73 for women for the brief CLS. Additionally, a two-week test-retest reliability analysis resulted in correlations of .75 for intimacy and .77 for commitment (Chojnacki & Walsh, 1990). The TLS has evidenced with moderately high subscale intercorrelations between intimacy and commitment (r = .73), passion and commitment (r = .73), and intimacy and passion (r = .71),

(Sternberg, 1997). Consistently, Hendrick and Hendrick (1989) have suggested that the TLS measures one major dimension of romantic relationships. A possible explanation for the interrelatedness may be a selection bias in which participants were representative of a specific sample experiencing high levels intimacy, passion, and commitment, thus qualitatively different from those who are dissatisfied in their romantic relationships (Chojnacki & Walsh, 1990). A principal-component factor analysis of the TLS revealed a three-factor solution which accounted for 57% of the variance. Specifically, commitment accounted for 21%, intimacy for 21%, and passion for 15% of the variance (Sternberg, 1997). Hendrick and Hendrick (1989) found three factors that accounted for 60% of the variance from a principal-components factor analysis with considerable overlap between their factor loadings. In examining external validation, the TLS showed a moderate to high correlation with Rubin's liking and loving scales. In particular, the correlations were .61 for intimacy and liking, .70 for intimacy and loving, .56 for commitment and liking, and .71 for commitment and loving. However, the TLS seems to be a more predictive measure of relationship satisfaction than Rubin's scales, as the correlation with satisfaction was .59 for the Rubin Love Scale, .56 for the Rubin Liking Scale, .76 for Sternberg Intimacy, and .67 for Sternberg Commitment scales (Sternberg, 1997). Also, both Intimacy and Commitment were found to be positively associated with Eros (r = .53, .58 respectively), Mania (r = .17, .22), and Agape (r = .54, .54) and negatively associated with Ludus (r = .-.38, -.41), whereas Intimacy was positively associated with Storge (r = .20) from the Love Attitudes Scale (Hendrick & Hendrick, 1989).

For the current sample, there was a high reliability for the CLS at .98, as well as the intimacy subscale (Cronbach's alpha = .96) and commitment subscale (Cronbach's alpha = .97). The mean was 233.21 for CLS (SD = 37.336; range = 93 – 270), 120.06 for intimacy (SD =

15.681; range = 58 – 135), and 113.15 for commitment (*SD* = 22.548; range = 35 – 135).

Love attitudes scale (LAS; Hendrick & Hendrick, 1986; Appendix G). This 42-item measure on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) assesses attitudes toward the six love styles originally proposed by Lee (1973): Eros (passionate, romantic love; "My lover and I have the right physical 'chemistry' between us"), Agape (all-giving, selfless, altruistic love; "I cannot be happy unless I place my lover's happiness before my own"), Ludus (game-playing, manipulative, noncommittal love; "I enjoy playing the 'game of love' with a number of different partners"), Mania (obsessive, possessive, jealous, dependent love; "When my lover doesn't pay attention to me, I feel sick all over"), Storge (friendship-based love; "My most satisfying love relationships have developed from good friendships"), and Pragma (practical love; "One consideration in choosing a partner is how he/she will reflect on my career"). Each of the six subscales consists of seven items.

Past research has found reliability coefficients of .82 for the total scale (Hendrick & Hendrick, 1989) and over .70 for at least five of the six subscales (Hendrick & Hendrick, 1986, 1987, 1989; Hendrick et al., 1998) as well as test-retest correlations of .70 and above for all subscales (Hendrick & Hendrick, 1986). The mean inter-item correlations have ranged between .28 and .48 (Hendrick et al., 1998). Principal-components factor analysis formed six distinct factors that accounted for 43-51% of the total variance (Hendrick & Hendrick, 1989; Hendrick et al., 1998). For the current sample, the scores ranged between 7 and 31 (*M* = 14.583, *SD* = 6.526) and the Cronbach's alpha was .852.

Relationship assessment scale (RAS; Hendrick, 1988; Hendrick et al., 1998; Appendix H). Based on the 5-item Marital Assessment Questionnaire (Hendrick, 1981), the RAS is a succinct and psychometrically sound measure of global relationship satisfaction (e.g.,

"how well does your partner meet your needs?", "in general, how satisfied are you with your relationship?"), consisting of 7 items on a 5-point Likert scale. The RAS can be interpreted by either examining the total or average score, in which higher scores reflect greater relationship satisfaction (Vaughn & Baier, 1999).

Previous studies have found good reliability with a coefficient alpha between .86 and .93 (Hendrick, 1988; Inman-Amos, Hendrick, & Hendrick, 1994; Vaughn & Baier, 1999) and test-retest (6-7 weeks) reliability of .85 (Hendrick et al., 1998). In terms of the scale structure, principal-components factor analyses have extracted one factor which accounted for 46% to 57% of the variance and the item-total correlations ranging between .573 and .760 (Hendrick, 1988). The RAS was highly correlated (r = .80 - .84) with the Dyadic Adjustment Scale (Spanier, 1976), a global measure of marital satisfaction, which suggests convergent validity (Hendrick, 1988; Vaughn & Baier, 1999). The RAS has also demonstrated predictive validity in terms of discriminating couples who stayed together versus couples who broke up several months later (91% of couples "together" and 86% of couples "apart"; Hendrick, 1988). The mean inter-item correlation for the RAS has been found at .49 (Hendrick, 1981). For this sample, Cronbach's alpha was .82 and the scores ranged between 18 and 35 (M = 30.69; SD = 4.34).

Relationship history questionnaire (Appendix I). Participants were asked about the quantity and duration of romantic and sexual relationships they have been involved in during their lifetime. Also, participants were asked at what age they first entered romantic and sexual relationships.

Psychophysiological Measures

Skin conductance (SC; microsiemens, μS). Prior to applying the electrodes, participants were instructed to wash their hands with non-abrasive Ivory liquid soap (Procter & Gamble Co.)

and warm water. SC was recorded from isotonic pre-jelled disposable Ag/AgCl disk electrodes attached to the distal phalange of the index and middle fingers on their left hand as recommended by Scerbo and colleagues (1992). SC was continuously recorded by the VU-AMS ambulatory monitoring system (Vrije University, Amsterdam) during the 2-minute rest periods as well as the 30-second romantic love and neutral stimulus tasks, after the initial 4-minute acclimation period. The data reduction procedures are based on those used by Patrick and colleagues (e.g., Benning, Patrick, & Iacono, 2005; Patrick, Bradley, & Lang, 1993; Patrick, Cuthbert, & Lang, 1994; Verona, Patrick, Curtin, Bradley, & Lang, 2004) to examine psychophysiological responses in psychopathic individuals. Mean SC reactivity levels were calculated separately for the romantic and neutral stimulus as the baseline-to-peak difference. The baseline was calculated as the mean of all samples during the 1-second period immediately before the onset of the picture. The peak of the SC was taken as the maximum SC reached after the onset of the stimulus. For the VU-AMS, the range of detection is approximately 1-100μS and a resolution of 0.0125μS.

Heart rate (HR; bpm). Heart rate is also a commonly used measure for autonomic arousal in psychopathic individuals (Arnett, 1997). As measured by the VU-AMS ambulatory monitoring system (Vrije University, Amsterdam), participants' HR was assessed in beats per minute (bpm) based on the mean inter-beat intervals (IBI; R-R wave intervals). A pre-jelled disposable Ag/AgCl three-lead electrocardiogram, attached to the ribs and sternum, was used to continuously record r-wave intervals during the 2-minute baseline as well as the 30-second romantic and neutral stimulus tasks. HR reactivity was calculated separately for the romantic and neutral stimulus as the mean change between the task and baseline. The baseline was calculated as the mean of all samples during the 1-second period immediately before the onset of the picture.

Tasks

Vanilla baseline. The "vanilla" baseline task consisted of watching a relaxing aquatic video ("Coral Sea Dreaming", Small World Music, Inc.) for 2 minutes. According to Piferi, Kline, Younger, & Lawler (2000), watching a relaxing video is a more effective method of achieving baseline and recovery levels of cardiovascular measures compared to the traditional resting period.

Romantic love stimulus. Based on the procedures used by other researchers examining biological factors associated with romantic love (Aron et al., 2005; Mashek, Aron, & Fisher, 2000), participants were asked to view a digital color picture of their significant other for a 30-second period in the romantic love condition. While viewing the picture, the participants were instructed to think about a non-sexual positive experience they had with the loved one.

The specific instructions stated "Please think back to a specific non-sexual instance during your relationship. For example, it may be the first time you went out on a date, your first kiss, or the first time she said 'I love you.' You may have experienced these things more than once. Please choose the most powerful and memorable events." Consistently, the participants reported that they thought of the above examples as well as other experiences such as getting married, spending time together, going on trips, and anniversaries.

Neutral stimulus. Similar to the method used in the romantic love condition, participants were asked to view a digital color picture of a non-sexual female friend for a 30-second period in the neutral stimulus condition. While viewing the picture, the participants were instructed to think about a non-sexual neutral experience they had with their friend (e.g., having lunch, hanging out, hugging). Many of the participants' report consisted of having conversations, eating meals together, and attending sports events together.

Procedures

This study consisted of two phases. Phase I involved the screening instruments administered through the SONA Experiment Management System. Measures included the Informed Consent Form I (Appendix J), demographics questionnaire, medical history questionnaire, LPI, and PPI-R. Participants who met eligibility requirements were contacted by e-mail to participate in phase II of the study.

Before their scheduled session for phase II, participants were asked to send a digital color non-pornographic photograph of their significant other as well as of a non-romantic female friend with whom they had no sexual history with and is of a similar age to their significant other. Participants were informed that the submitted photographs would be deleted immediately following the completion of their session. Participants were asked to refrain from caffeine for at least 4 hours prior to the session, as caffeine has been associated with increased SC occurring approximately 20-30 minutes after ingestion and are dominant for about 25-30 minutes (Barry, Clarke, Johnstone, & Rushby, 2008; Quinlan et al., 2000), and decrease in HR (Quinlan et al., 2000). Participants were also asked to refrain from nicotine intake and engaging in rigorous exercise immediately prior to the session, both of which could artificially increase HR. Also, when participants come to the lab session, they were asked about substance intake (i.e., caffeine, nicotine) as well as engagement in rigorous exercises before the session, as these variables may serve as possible confounds.

Upon arrival to the laboratory, the participants were greeted by a research assistant. After providing informed consent (Informed Consent Form II; Appendix K), the participant's height and weight were measured. Then, the participants were instructed to attach the electrodes to measure electrocardiogram activity and SC. The participants were seated in a comfortable chair

that was positioned in front of a computer so that they can view the computer monitor with ease. Also, the participants were asked to remain as still as possible throughout the tasks.

Following a brief acclimation period of 4 minutes to adapt to the environment of the room, the participant followed the protocol of viewing the 2-minute baseline video, the romantic love stimulus condition for 30 seconds, followed by the 2-minute baseline video again, and the neutral stimulus condition for 30 seconds on the computer monitor. The participants were instructed to continue viewing the computer screen throughout the entire procedure. The romantic love and neutral stimuli conditions were counterbalanced across participants, so that half of the participants view the romantic love stimulus first and the others view the neutral stimulus first. The second baseline task was used to account for possible carryover effects of romantic love induction (Fisher et al., 2005). This protocol (i.e., baseline, romantic love stimulus, baseline, neutral stimulus) was repeated twice so that the total duration (including the initial brief acclimation period) lasted 16 minutes. Also, the order of the protocol was counterbalanced across participants (see Figure 1). The participants' HR and SC measurements were recorded continuously throughout the baseline tasks as well as the viewing of the romantic and neutral stimuli. At the end of the tasks, the participants were administered the post-task measure to serve as a manipulation check.

Then, the participants' were instructed to complete the remaining self-report measures (PLS, CLS, LAS, RAS, and relationship history questionnaire), which were administered in a randomized order across participants. A research assistant was always in the adjacent room to be available to answer any questions the participants had. After completion of all the measures, the participants were paid and thanked for their participation in the study.

Results

Demographic Effects

The data were thoroughly examined for assumptions of normality, linearity, and multicollinearity, and homoscedasticity. Descriptives and zero-order correlations are provided in Tables 1 and 2 respectively. Psychopathic features were negatively correlated with HR reactivity for the romantic stimulus, companionate love, and relationship satisfaction and positively correlated with Ludus. HR reactivity for the romantic stimulus was positively associated with passionate love. SC reactivity for the romantic stimulus was positively correlated with SC reactivity for the neutral stimulus. Passionate love was positively correlated with companionate love and relationship satisfaction, and negatively correlated with Ludus. Companionate love was negatively correlated with Ludus and positively correlated with relationship satisfaction. Ludus was also negatively correlated with relationship satisfaction. Lastly, relationship quantity was negatively correlated with relationship duration. Effects were examined for subjects' age and body mass index (i.e., height and weight) with psychopathic features and romantic love measures (i.e., PLS, CLS, Ludus, RAS, relationship history). T-tests were conducted to examine the differences in physiological responding (i.e., HR, SC) and post-task emotional responses to the picture of a significant other compared to an opposite-sex friend.

Data Screening Analyses

The following variables were found to be positively skewed: Total PPI-R, Machiavellian Egocentricity, Blame Externalization, Coldheartedness, Self-Centered Impulsivity, Ludus, Relationship Quantity, and Relationship Duration. Log transformations were used to normalize these distributions. Reflect (reverse the distribution) and square root transformations were used for the following negatively skewed scales: Companionate and Passionate Love. Finally, reflect

and log transformation was used for Relationship Satisfaction. As such, the transformed values were used for all of the analyses.

Confounds for PPI-R

The relationship between the PPI-R content and factor scales and the validity scales were examined. It has been recommended that the Virtuous Responding and Deviant Responding scales be statistically controlled in analyses, rather than used as exclusion criteria, because such characteristics may be associated with psychopathy (Lilienfeld and Widows, 2005; Piedmont et al., 2000). Four men had elevated scores (i.e., T-score at or above 65) for Virtuous Responding and three men had elevated scores for Deviant Responding. For Virtuous Responding, significant correlations were found for Machiavellian Egocentricity (r = -.387, p = .007) and Blame Externalization (r = -.317, p = .028). For Deviant Responding, significant correlations were found for total PPI-R (r = .370, p = .010), Self-Centered Impulsivity (r = .661, p < .001), Machiavellian Egocentricity (r = .457, p = .001), Rebellious Nonconformity (r = .451, p = .001), Blame Externalization (r = .660, p < .001), Carefree Nonplanfulness (r = .302, p = .037), and Coldheartedness (r = .297, p = .040).

Confounds for SC

Age was significantly correlated with the average SC reactivity for both the romantic (r = .347, p = .016) and neutral (r = .292, p = .044) stimuli. BMI was not correlated with HR or SC. As such, age was included as a control variable in the regression analyses for average SC reactivity for the romantic and neutral stimuli.

Confounds for Romantic Love Measures

Age was significantly correlated with the total quantity of romantic relationships (r = .315, p = .029). Thus, age was included as a control variable in the regression analyses for

relationship quantity.

T-tests

A series of paired sample t-tests were conducted to explore the differences in physiological responses between the stimuli. A statistically significant difference between the partner and friend pictures was not found for HR. However, a statistically significant difference emerged between the partner and friend pictures for SC. Interestingly, average SC reactivity was higher for the friend (M = .3713, SD = .028) than for the partner (M = .3213, SD = .026, $t(47)$ = -2.789, p = .008). This was also found for the first presentation (friend: M = .3971, SD = .029; partner: M = .3488, SD = .028, $t(47)$ = -2.177, p = .035) as well as the second presentation (friend: M = .4673, SD = .025; partner: M = .3643, SD = .0289; $t(47)$ = -4.273, $p < .001$) of the photos.

Since their self-report of the degree of affect and arousal violated the assumption of normality, the non-parametric measure of the Wilcoxon Signed Ranks Test was used to examine the differences between the romantic and neutral stimuli. The rating of feeling "in love" was significantly higher for the partner than the friend (Z = -5.901, $p < .001$). Also, the rating of sexual arousal was significantly higher for the partner than the friend (Z = -4.554, $p < .001$). Finally, although the level of feeling "in love" was significantly higher than sexual arousal for the partner (Z = -4.554, $p < .001$), this difference was not found for the friend. These findings indicate that the manipulation was effective, as higher levels of self-reported loving feelings, and not sexual arousal, were elicited by photographs of the significant other compared to the female friend.

Regression Analyses

A series of regression analyses were conducted to test the mediation analyses

(MacKinnon, Fairchild, & Fritz, 2007). Confirmation of mediation was conducted using PRODCLIN (MacKinnon, Fritz, Williams, & Lockwood, 2007). The analyses were run separately for HR and SC reactivity to the romantic love and neutral stimuli. HR and SC reactivity scores were averaged across the two presentations of each stimulus.

To examine the moderating role of physiological reactivity (HR, SC), hierarchical multiple regressions were conducted separately for each romantic love variable. Each of the models examined the main effect for psychopathic features in the first block, the main effect for HR/SC in the second block, and their interaction effect (psychopathic features X HR/SC) in the third block. The analyses were run separately for HR and SC reactivity to the romantic love and neutral stimuli. As recommended by Aiken and West (1991) and Holmbeck (2002), post hoc probing was conducted in order to confirm the significant interactions.

Passionate Love

Hypothesis 1a: HR/SC reactivity will mediate the relationship between Psychopathic features and Passionate love.

First, simple regression analyses were run with psychopathic features predicting HR/SC reactivity (i.e., difference scores). Then, simple regression analyses were conducted with HR/SC reactivity predicting passionate love. Confirmation of mediation was conducted using PRODCLIN.

Results supported the mediation hypothesis for HR. Specifically, there was a significant negative association between psychopathic features and HR reactivity for the romantic stimulus ($t(46) = -2.268$, $p = .028$, unstandardized $\beta = -9.627$) and HR reactivity was significantly positively associated with passionate love ($t(46) = 2.051$, $p = .046$, unstandardized $\beta = .262$). Moreover, PRODCLIN revealed that the 95% confidence interval did not contain zero (-

6.389536 and -.043527), indicating that the partial mediation was significant. In addition, the relationship between psychopathic features and HR reactivity remained significant after controlling for Deviant Responding ($t(45) = -2.239$, $p = .030$, unstandardized $\beta = -10.322$) and mediation was confirmed (confidence interval of -6.879088 to -.036903).

Hypothesis 1b: HR/SC reactivity will moderate the relationship between Psychopathic features and Passionate love.

The models predicting passionate love were not significant for psychopathic features and HR reactivity for the romantic $F(3,44)=1.716$, $p=.487$ and neutral stimulus $F(3,44)=2.147$, $p=.108$. Also, the interaction terms in block three were not significant for the romantic (unstandardized $\beta=-.096$, partial $t(44)=-.089$, $p=.929$, partial $r = -.013$) and neutral stimulus (unstandardized $\beta=-4.038$, partial $t(44)=-1.913$, $p=.062$, partial $r = -.277$).

Also, the models predicting passionate love were not significant for psychopathic features and SC reactivity for the romantic $F(3,44)=.825$, $p=.487$ and neutral stimulus $F(3,44)=1.452$, $p=.241$. In addition, the interaction terms in block three were not significant for the romantic (unstandardized $\beta=-5.275$, partial $t(44)=-.212$, $p=.833$, partial $r = -.032$) and neutral stimulus (unstandardized $\beta=-38.836$, partial $t(44)=-1.348$, $p=.184$, partial $r = -.199$).

Companionate love

Hypothesis 2a: HR/SC reactivity will mediate the relationship between Psychopathic features and Companionate love.

First, a simple regression analysis was run with psychopathic features predicting HR/SC reactivity. Then, a simple regression analysis was conducted with HR/SC reactivity predicting companionate love. Mediation was not found for HR or SC. Although there was a significant association between psychopathic features and HR reactivity for the romantic stimulus ($t(46) = -$

2.268, $p < .028$, unstandardized $\beta = -9.627$), there was no significant association between HR reactivity and companionate love.

Hypothesis 2b: HR/SC reactivity will moderate the relationship between Psychopathic features and Companionate love.

The models predicting companionate love were significant for psychopathic features and HR reactivity for the romantic $F(3,44)=3.884$, $p=.015$ and neutral stimulus $F(3,44)=4.989$, $p=.005$. However, the interaction terms in block three were not significant for the romantic (unstandardized $\beta=.879$, partial $t(44)=.754$, $p=.455$, partial $r = .113$) and neutral stimulus (unstandardized $\beta=-4.038$, partial $t(44)=-1.913$, $p=.062$, partial $r = -.277$).

Also, the models predicting companionate love were significant for psychopathic features and SC reactivity for the romantic $F(3,44)=4.148$, $p=.011$ and the neutral stimulus $F(3,44)=3.439$, $p=.025$, but the interaction terms in block three were not significant for the romantic (unstandardized $\beta=29.736$, partial $t(44)=1.146$, $p=.258$, partial $r = .170$) and neutral stimulus (unstandardized $\beta=-3.809$, partial $t(44)=-1.701$, $p=.096$, partial $r = -.248$).

Ludus

Hypothesis 3a: HR/SC reactivity will mediate the relationship between Psychopathic features and Ludus.

Although there was a significant association between psychopathic features and HR reactivity for the romantic stimulus ($t(46) = -2.268$, $p<.028$, unstandardized $\beta = -9.627$), there was no significant association between HR reactivity and Ludus. Therefore, mediation was not supported.

Hypothesis 3b: HR/SC reactivity will moderate the relationship between Psychopathic features and Ludus.

The model predicting Ludus was significant for psychopathic features and average HR reactivity for the neutral stimulus $F(3,44)=5.843$, $p=.002$. There was a trend for the interaction terms in block three for the interaction of psychopathic features with average HR reactivity predicting Ludus, unstandardized $\beta=.266$, partial $t(44)=1.970$, $p=.055$, partial $r = .285$ (see Table 3).

Therefore, in order to determine how HR reactivity influences the relationship between psychopathic features and Ludus, separate simultaneous regressions were conducted testing the effect for psychopathic features, a conditional HR reactivity moderator (i.e., high or low HR), and their respective interaction terms on Ludus. As recommended by Aiken and West (1991), the low moderator was computing by adding one standard deviation and the high moderator was computed by subtracting one standard deviation to the centered values. Regression lines were then plotted for high and low HR reactivity using the centered values for psychopathic features predicting Ludus. As illustrated in Figure 2, psychopathic features were differentially related to Ludus dependent upon levels of HR reactivity. In particular, psychopathic features were positively associated with Ludus when average HR reactivity was high ($b=1.564$, $p=.001$), but psychopathic features were not significantly associated with Ludus when average HR reactivity was low ($b=.371$, $p=.317$).

When the model controlled for the effect of Deviant Responding, results remained similar, with a significant effect for the average HR reactivity $F(4,43)=4.329$, $p=.005$ of the neutral stimulus. Also, there was a trend for the interaction terms, unstandardized $\beta=.270$, partial $t(43)=1.973$, $p=.055$, partial $r = .288$. Post-hoc probing again indicated that psychopathic features

were positively associated with Ludus when average HR reactivity was high (b=1.611, p=.001), but psychopathic features were not significantly associated with Ludus when HR reactivity was low (b=.400, p=.297).

Relationship Satisfaction

Hypothesis 4a: HR/SC reactivity will mediate the relationship between Psychopathic features and Relationship satisfaction.

Although there was a significant association between psychopathic features and HR reactivity for the romantic stimulus (t(46) = -2.268, p<.028, unstandardized β = -9.627), there was no significant association between HR reactivity and relationship satisfaction. Therefore, mediation was not supported.

Hypothesis 4b: HR/SC reactivity will moderate the relationship between Psychopathic features and Relationship satisfaction.

The model predicting relationship satisfaction was significant for psychopathic features and HR reactivity for the romantic stimulus F(3,44)=4.073, p=.012, but the interaction terms in block three were not significant (unstandardized β=.122, partial t(44)=.909, p=.368, partial r = .136). Also, the model predicting relationship satisfaction was not significant for psychopathic features and HR reactivity for the neutral stimulus F(3,44)=.689, p=.564, and the interaction terms were not significant (unstandardized β=.083, partial t(44)=.373, p=.711, partial r = .055).

The models predicting relationship satisfaction were significant for psychopathic features and SC reactivity for the romantic F(3,44)=4.257, p=.010 and the neutral stimulus F(3,44)=4.818, p=.005, but the interaction terms in block three were not significant for the romantic (unstandardized β=3.098, partial t(44)=1.030, p=.308, partial r = .153) and neutral stimulus (unstandardized β=.110, partial t(44)=.032, p=.975, partial r = .005).

Relationship History

Hypothesis 5a: HR/SC reactivity will mediate the relationship between Psychopathic features and Relationship history.

Regression analyses were conducted separately for average duration and total quantity of romantic relationships. There was a significant association between psychopathic features and HR reactivity for the romantic stimulus ($t(46) = -2.268$, $p = .028$, unstandardized $\beta = -9.627$), but there was no significant relationship between HR and relationship quantity or duration.

Hypothesis 5b: HR/SC reactivity will moderate the relationship between Psychopathic features and Relationship history.

The models predicting relationship quantity were not significant for psychopathic features and HR reactivity for the romantic $F(3,44)=.394$, $p=.758$ and the neutral stimulus $F(3,44)=.689$, $p=.564$, and the interaction terms in block three were not significant for the romantic (unstandardized $\beta=-.010$, partial $t(44)=-.088$, $p=.930$, partial $r = -.013$) and neutral stimulus (unstandardized $\beta=.083$, partial $t(44)=.373$, $p=.711$, partial $r = .056$).

Also, the models predicting relationship quantity were not significant for psychopathic features and SC reactivity for the romantic $F(3,44)=.719$, $p=.546$ and the neutral stimulus $F(3,44)=.696$, $p=.559$, and the interaction terms in block three were not significant for the romantic (unstandardized $\beta=2.515$, partial $t(44)=1.001$, $p=.322$, partial $r = .149$) and neutral stimulus (unstandardized $\beta=-.041$, partial $t(44)=-.014$, $p=.989$, partial $r = -.002$).

The models predicting relationship quantity were not significant for psychopathic features and HR reactivity for the romantic $F(3,44)=.015$, $p=.997$ and the neutral stimulus $F(3,44)=.951$, $p=.424$, and the interaction terms in block three were not significant for the romantic (unstandardized $\beta=-.019$, partial $t(44)=-.130$, $p=.897$, partial $r = -.020$) and neutral

stimulus (unstandardized β=.157, partial t(44)=.565, p=.575, partial r = .085).

Also, the models predicting relationship quantity were not significant for psychopathic features and SC reactivity for the romantic F(3,44)=.154, p=.927 and the neutral stimulus F(3,44)=.987, p=.408, and the interaction terms in block three were not significant for the romantic (unstandardized β=-2.146, partial t(44)=-.665, p=.510, partial r = -.100) and neutral stimulus (unstandardized β=4.136, partial t(44)=1.118, p=.270, partial r = .166).

Supplemental Analyses

To examine differential relationships for the PPI-R subscales, supplemental mediation and moderation analyses were conducted. Mediation was found for the relationship between Self-Centered Impulsivity, HR reactivity for the romantic stimulus, and passionate love. Specifically, there was a significant negative association between Self-Centered Impulsivity and HR reactivity after controlling for Deviant Responding (t(45) = -2.232, p = .031, unstandardized β = -15.487), and HR reactivity was positively associated with passionate love (t(46) = 2.051, p = .046, unstandardized β = .262). Lastly, partial mediation was confirmed with PRODCLIN (confidence interval of -10.331849 to -.051627).

For moderation, multiple regression analyses were conducted separately for the 2 factor scales (Self-centered Impulsivity and Fearless Dominance) and 8 content scales (Machiavellian Egocentricity, Social Influence, Coldheartedness, Carefree Nonplanfulness, Fearlessness, Blame Externalization, Rebellious Nonconformity, and Stress Immunity) of the PPI-R to examine whether they contributed to the relationship between psychopathic features, HR/SC, and romantic love. Interaction terms were significant for Rebellious Nonconformity, Coldheartedness, Self-Centered Impulsivity, Carefree Nonplanfulness, Blame Externalization, Fearless Dominance, Social Influence, and Stress Immunity with HR/SC for predicting companionate love, Ludus,

relationship satisfaction, and relationship history (see Tables 4 – 17) and these interactions remained significant after post hoc probing was conducted.

Thus, in order to determine how HR/SC reactivity influences the relationship between PPI-R subscales and romantic love, separate simultaneous regressions were conducted testing the effect for the confounding variables, PPI-R subscales, a conditional HR/SC reactivity moderator, and their respective interaction terms on romantic love. Then, regression lines were plotted for high and low HR/SC reactivity using the centered values for the PPI-R subscales predicting companionate love, Ludus, relationship satisfaction, and relationship history. These relationships were differentially related to romantic love variables dependent upon levels of HR/SC reactivity for the romantic and neutral stimulus (see Figures 3 – 16). Coldheartedness was negatively associated with companionate love when HR reactivity for the neutral stimulus was high, but not significantly associated when HR reactivity was low. Rebellious Nonconformity was negatively associated with companionate love when SC reactivity for the romantic stimulus was low, but not significantly associated with high SC reactivity. Self-centered Impulsivity, Blame Externalization, and Carefree Nonplanfulness were positively associated with Ludus when HR reactivity for the neutral stimulus was high, but not significantly associated when HR reactivity was low. Also, Carefree Nonplanfulness was positively associated with Ludus when SC reactivity for the romantic stimulus was low and HR reactivity for the neutral stimulus was high, but not significantly associated when SC reactivity for the romantic stimulus was high and HR reactivity for the neutral stimulus was low. Rebellious Nonconformity was negatively associated with relationship satisfaction when SC for the romantic and neutral stimulus was low, but not significantly associated with high SC reactivity for the romantic and neutral stimulus. Fearless Dominance, Social Influence, and Stress Immunity were positively associated with relationship

quantity when SC reactivity for the romantic stimulus and HR reactivity for the neutral stimulus were high, but not significantly associated with low SC and HR reactivity. Blame Externalization was positively associated with relationship quantity when SC reactivity for the romantic stimulus was low, but negatively associated when SC reactivity was high. Coldheartedness was negatively associated with relationship duration when HR reactivity for the neutral stimulus was low, but positively associated when HR reactivity was high. Finally, Machiavellian Egocentricity was negatively associated with relationship duration when HR reactivity for the neutral stimulus was high, but not significantly associated when HR was low. In sum, the supplemental findings indicate that the interactions between psychopathic features and romantic love are associated with most characteristics of psychopathy, but the various subscales were differentially related to the different love variables.

Discussion

Overall, the hypotheses were partially supported as physiological arousal mediated and moderated the relationship between psychopathic features and some romantic experiences. Specifically, low HR reactivity to the romantic stimulus partially mediated the negative relationship between psychopathic features and passionate love. As such, men with self-centered and disinhibited traits seem to be less physiologically reactive to their significant other, which is in turn related to less passionate and romantic feelings toward their partner. In addition, high HR reactivity for the neutral stimulus moderated the positive relationship between psychopathic features and Ludus love style, suggesting that men who tended to be callous and careless, and not take responsibility for their behavior exhibited a game-playing approach to love when they experienced greater physiological arousal to a female friend.

In terms of mediation relationships for the factor scales, low HR reactivity to the

romantic stimulus partially mediated the negative association between Self-Centered Impulsivity and passionate love. As such, men with impulsive, egocentric, exploitative tendencies seem to be less physiologically reactive to their significant other, and thus experience attenuated romantic feelings toward her.

With regard to moderation relationships for the factor and content scales, low physiological arousal for the partner and high physiological arousal for the opposite-sex friend seemed to moderate the relationship between psychopathic features and several romantic experiences. In general, psychopathic features were negatively associated with companionate love, relationship satisfaction, and relationship quantity and positively associated with Ludus and relationship duration when SC reactivity was low for the partner and HR reactivity was high for the friend. Moderation relationships were significant for all subscales of the PPI-R except for Fearlessness. It is possible that the absence of fear in and of itself may not be problematic and may even be beneficial in initiating romantic interactions. When unrestrained by anticipatory anxiety and concerns about potential risks, men may be more willing to express romantic interest in a potential mate.

More specifically, the moderator analyses indicated that the negative relationship between Coldheartedness and companionate love was moderated by high HR reactivity for the neutral stimulus. This suggests men lacking in compassion, empathy, and loyalty and experience high physiological arousal for a female friend may feel less connected with and not care as strongly for their partner. Also, low SC reactivity for the romantic stimulus moderated the negative association between Rebellious Nonconformity and companionate love. As such, those who tend to disregard social convention seem to be less committed and emotionally intimate with their significant other when they are less physiologically reactive towards her.

High reactivity for both HR and SC for the neutral stimulus moderated the positive relationship between Self-Centered Impulsivity/Blame Externalization/Carefree Nonplanfulness and Ludus, suggesting that men who tended to be impulsive, blame others for their problems, and are careless about their behaviors exhibited a game-playing approach to love when they experienced greater physiological arousal to a female friend. Also, low SC reactivity for the romantic stimulus moderated the positive relationship between Carefree Nonplanfulness and Ludus. Those who fail to learn from mistakes seem to be more manipulative and noncommittal in love when they were less physiologically responsive to their mate. It is possible that men with a nonchalant approach about planning for the future may have entered the relationship without much forethought. As such, their decision to choose their mate may have been based on short-term (e.g., opportunity for sexual conquest) rather than long-term goals (e.g., serious, committed relationship).

Low SC reactivity for the romantic and neutral stimulus moderated the negative relationship between Rebellious Nonconformity and relationship satisfaction. As such, a proclivity towards boredom susceptibility and disregard for social norms seems to be associated with being less satisfied in current romantic relationships when they also experience low physiological arousal towards their partner and opposite-sex friend.

The positive relationship between Blame Externalization and relationship quantity was moderated by low SC reactivity for the romantic stimulus. It is possible that men who blame their significant others for relationship problems may be more willing to quickly leave current relationships for new ones when they are less physiologically reactive to their current partner. On the other hand, high SC reactivity for the romantic stimulus moderated the relationship between Fearless Dominance/Social Influence/Stress Immunity and relationship quantity. This suggests

that those who are unrestrained by fear, perceive themselves as charming and charismatic, and are able to remain calm under pressure and are physiologically reactive to their partner may also have more opportunities for romantic encounters.

Finally, HR reactivity for the neutral stimulus moderated the relationship between Coldheartedness and relationship duration such that their average relationships were longer when they were less callous and less physiologically reactive to their opposite-sex friend, and shorter when they experienced less empathy and loyalty and greater physiological arousal to their female friend. However, the positive relationship between Machiavellian Egocentricity and relationship duration was moderated by high HR reactivity for the neutral stimulus, such that those with a ruthless and narcissistic attitude tended to have longer relationships when they were more physiologically reactive to an opposite-sex friend. It is possible that they are more willing to manipulate their partner to stay in the relationship for their own personal gain, even if they are also attracted to other women.

Interestingly, contrary to previous studies examining physiological responses for romantic love (e.g., Bartels & Zeki, 2000), SC reactivity was higher for looking at a picture of a friend than for their partner. A potential explanation for this is that prior studies recruited those who were madly in love, whereas this study recruited those who had been in a relationship for at least one month. This may indicate a varying degree of affect that is endorsed by those in relationships, and love may not be the only or most important reason for entering or maintaining a romantic relationship (e.g., societal pressures, security, status, financial reasons, etc). It is also possible that based on the longer duration of the relationship, they may experience more temperate emotions of tenderness and comfort rather than the intense passionate feelings experienced at the beginning of relationships.

Also, some relationships between psychopathic features and romantic experiences were moderated by high HR reactivity for the female friend whereas others were moderated by low SC reactivity for the partner. A possible explanation for this is that while SC is regulated by the sympathetic nervous system, HR involves contributions of both the sympathetic and parasympathetic nervous systems. As such, the high HR reactivity for the friend may be associated with tihe parasympathetic changes related to sexual excitement (Stern, Ray, and Quigley, 2001). Alternatively, the divergent directions among HR and SC reactivity may be explained by the generation of autonomic response patterns from the sympathetic nervous system based on the involvement of different cortical regions (Cacioppo et al., 1992).

Limitations.

The main limitations of this study consist of the small sample size of 48 participants and the use of a predominantly Caucasian male college population. Specifically, the small sample size decreases power and the ability to explore more fine-grained interactions. Also, the use of a college sample compromises generalizeability to men with more serious levels of psychopathic features and antisocial behavior. Taking these factors into consideration, these results may not apply to more high risk populations and women with psychopathic features.

Another limitation of this study is the nature of the self-report measures used. Such instruments are subject to inaccuracies, including lack of knowledge, inaccurate reports, and poor recall. Also, social desirability (e.g., responding in a socially appropriate way), could result in inaccurate or unreliable responses. However, those with elevated scores on the validity scales of the PPI-R (i.e., Inconsistent Responding scales) were not invited for phase 2 of the study. Finally, cross-informant measures or behavioral observations may have been used to counteract potential biases from self-report. In particular, future studies may be enhanced by including

partner reports as well.

Implications and future directions.

Despite such limitations, this study provides useful information about the influence of psychopathic features and physiological arousal in romantic experiences. Specifically, men with psychopathic features who experience less physical attraction to their partner, but more physiological arousal while thinking about a female friend seem to experience reduced levels of passionate and companionate love, relationship satisfaction, and shorter relationships but greater levels of Ludus love and more frequent relationships. Since they do not experience love as strongly and find committed relationships to be less satisfying, psychopathic men are less likely to significantly invest in romantic relationships. As such, they may hold a simplistic understanding of love (e.g., equating it with sexual arousal, Hare, 1993) and thus approach romantic encounters in a casual and superficial manner.

Moreover, the current study contributes to a more comprehensive understanding of the role of physiological reactivity in romantic experiences of men with psychopathic features. Specifically, Fearless Dominance, characteristic of primary psychopathy, was associated with an interaction between high overall physiological reactivity and relationship quantity, which may lead to greater sexual opportunities. On the other hand, Self-Centered Impulsivity, which is consistent with secondary psychopathy, was associated with high HR reactivity to the female friend and attenuated levels of companionate love, shorter relationships, and a more game-playing orientation to love. Also, the combination of this trait with lower reactivity to the significant other was associated with reduced companionate love, relationship satisfaction, fewer relationships, and lack of commitment. As such, Self-Centered Impulsivity may lead to a lack of restraint and poor decision making with romantic partners. Lastly, the interaction of

Coldheartedness and high HR reactivity to the opposite-sex friend was associated with shorter relationships and less companionate love, suggesting difficulty with empathy and loyalty which are key features of attachment. Hence, the "incapacity to love" may be more complex than a lack of affective responses as it involves unique interactions between the different factors of psychopathy and physiological reactivity.

In terms of emotional deficits, psychopathy has been associated with reduced fear and empathy (Cleckley, 1982). The results of this study also suggest that men with high psychopathic features also do not experience romantic love to the fullest extent, and hold an exploitative, game-playing approach towards love. Moreover, the absence of fear and empathy may relate to their incapacity to love, as they are likely to be less restrained by a fear of rejection in making more charismatic entreaties towards the opposite sex and not feeling guilty about taking advantage of their victims. Also, these individuals seem to be adept at identifying vulnerable victims (Wilson, Demetrioff, & Porter, 2008).

Once they are in a relationship, they may lack remorse with regard to hurting their partner. According to Czar, Dahlen, Bullock, & Nicholson (2011), primary and secondary psychopathic features are predictive of relational aggression (e.g., gossiping, spreading rumors, covert manipulation, social exclusion, making ultimatums) in romantic relationships. Also, it is possible that they may leave their relationships on a whim when they lose interest or gain interest in another person. Consistently, traits of the Dark Triad (Machiavellianism, narcissism, psychopathy) are associated with leaving current partners for new relationships and poaching mates from others (Jonason, Li, & Buss, 2010). Furthermore, Munoz and colleagues (2011) suggest that primary psychopathy predicts the use of short-term mating strategies to obtain sex through subtle coercive techniques, such as evoking sexual arousal through touch, emotional

manipulation, and exploitation by intoxication. However, when these tactics are ineffective, they may ultimately resort to aggression and violence to achieve self-gratification. In addition, psychopathy has been associated with partner sexual coercion (Camiller & Quinsey, 2009).

Literature regarding treatment of psychopathy is controversial. Some suggest that psychopathy has a poor prognosis as available treatment options are generally ineffective (e.g., Hare, 1996) or exacerbate behavioral problems (Seto & Barbaree, 1999) as they seem to lack the motivation for meaningful change (Hare, 1993). As such, it may be helpful to inform current relationship partners of the negative consequences of entering and maintaining relationships with these individuals. Also, therapy efforts may be focused on treating victims who have suffered emotional, physical, or sexual abuse from psychopathic perpetrators.

On the other hand, Salekin (2002) challenged the notion of the pessimistic prognosis based on insufficient empirical studies on treatment efficacy, lack of agreement in the conceptualization of psychopathy, and a limited understanding of the developmental pathways of the disorder. He added that some clinical interventions from various theoretical orientations were successful in reducing psychopathic tendencies (e.g., increased empathy and remorse, improved interpersonal relationships) and encouraged further scientific inquiry into prevention and intervention.

In light of the interaction effects found between psychopathic traits and physiological reactivity in this study, it may be helpful to consider treatments involving a biological component to enhance feelings of love and compassion, or more specifically empathy. For instance, intranasal oxytocin treatment has been found to enhance emotional empathy and socially reinforced learning (Hurlemann et al., 2010). Also, high levels of oxytocin and vasopressin contribute to monogamous pair-bonding behavior in prairie voles (Hammock & Young, 2006).

Examining the impact of neuropeptide treatments on the romantic experiences of men with psychopathic features may enrich the field's understanding of psychopathy and, although speculative at this point, could provide potential avenues for intevention.

In sum, these findings suggest that while psychopathic men may be able to enter and maintain romantic relationships, they are unlikely to fully appreciate loving feelings for their partner based on their low or mis-directed physiological reactivity. Despite being a prominent feature of Cleckey's classic depiction of psychopathy, the incapacity to love and its physiological basis has lacked empirical attention. Interestingly, fearlessness alone was not associated with deficient romantic experiences, suggesting that the combination of fear and empathy as well as an exploitative interpersonal approach that contribute to the predatory nature of psychopathy.

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Appendix A

Demographics Questionnaire

1. Today's date (mm/dd/yyyy): _____
2. What is your age? _____ years
3. What is your birth date (mm/dd/yyyy)? _____
4. What is your major? _____
5. What is your sex?
    a. _____ Male
    b. _____ Female
    c. _____ Transgendered
6. Which of the following ***best*** describes your race/ethnicity?
    a. _____ Caucasian/ White
    b. _____ African-American/ Black/ African Origin
    c. _____ Hispanic/ Latino-a
    d. _____ Asian-American/ Asian Origin/ Pacific Islander
    e. _____ Middle Eastern
    f. _____ American Indian/ Alaska Native
    g. _____ Bi-racial/ Multi-racial
    h. _____Other (specify): _____
7. Which of the following ***best*** describes your sexual orientation?
    a. _____ Heterosexual
    b. _____ Gay

c. _____ Lesbian

d. _____ Bisexual

e. _____ Other (specify): _____

8. Have you ***ever*** been "in love" in your lifetime?

   a. _____ Yes

   b. _____ No

9. With how many people have you been "in love" with in your ***lifetime***? _____

10. Are you ***currently*** "in love"?

    a. _____ Yes

    b. _____ No

11. How many people are you ***currently*** "in love" with? _____

12. If you are currently "in love," how long have you been "in love"? _____ # years

    _____ # months _____ # days

13. If you are currently "in love," have you declared your love to him/her?

    a. _____ Yes

    b. _____ No

14. If you are currently "in love," has this person indicated that he/she is "in love" with you?

    a. _____ Yes, he/she told me directly

    b. _____ Yes, but only indirectly

    c. _____ No

15. Which of the following best describes your ***current*** relationship status? Check all that apply

    a. _____ Single (not currently dating or in a relationship)

b. _____ Dating (less than 6 months)

c. _____ Long term relationship (6 months or more)

d. _____ Cohabitating (living with dating partner)

e. _____ Engaged

f. _____ Engaged and cohabitating (living with fiancé)

g. _____ Married

h. _____ Separated

i. _____ Divorced

j. _____ Widowed

16. If you are currently in a romantic relationship, how old is your relationship partner?

_____

17. If you are currently in a romantic relationship, how long have you been with this partner?

_____# years _____#months _____#days

18. How many sexual partners have you had in your ***lifetime***? _____

19. How many sexual partners do you have ***currently***? _____

20. How many vaginal-sex partners have you had in your ***lifetime***? _____

21. How many vaginal-sex partners do you have ***currently***? _____

22. Which of the following best describes the majority of people who live within comfortable walking distance of the place where you are ***originally from***?

a. _____ Wealthy

b. _____ Upper middle class/ professionals

c. _____ Middle class

d. _____ Lower middle class

e. _____ Blue-collar, working class

f. _____ Poor, working class

g. _____ Poor, unemployed

23. Which of the following numbers best describe the total annual income of the household where you grew up?

a. _____ less than $10,000

b. _____ $10,000-$25,000

c. _____$25,000-$50,000

d. _____ $50,000-$75,000

e. _____$75,000-$100,000

f. _____ more than $100,000

24. Which of the following best describes your religious orientation?

a. _____ Protestant

b. _____ Catholic

c. _____ Jewish

d. _____ Muslim

e. _____ Other (specify): _____

Appendix B

Medical History Questionnaire

1	Do you have any history of congenital or developmental problems?	Yes	No
2	Do you have any history of learning disabilities or special education?	Yes	No
3	Do you have any history of hypoglycemia (low blood glucose)?	Yes	No
4	Do you have any history of hyperglycemia (diabetes)?	Yes	No
5	Are you experiencing blood glucose problems at present?	Yes	No
6	Do you have any history of hypertension? (high blood pressure)	Yes	No
7	Do you have any history of hypotension? (low blood pressure)	Yes	No
8	Do you have any history of hyperthyroidism?	Yes	No
9	Do you have any history of hypothyroidism?	Yes	No
10	Have you ever suffered a head injury resulting in a hospital stay longer than 24 hours?	Yes	No
11	Have you ever been knocked out or rendered unconscious (more than 5 minutes)?	Yes	No
12	Have you ever suffered "black-out" or fainting spells?	Yes	No
13	Do you have a history of other neurological disorders (e.g. stroke or brain tumor)?	Yes	No
14	Have you ever received psychiatric/psychological care or counseling?	Yes	No
15	Have you ever been hospitalized in a psychiatric facility/hospital?	Yes	No
16	Have you ever been diagnosed with a psychiatric/psychological disorder?	Yes	No
17	Have you ever been administered any (neuro)psychological tests or measures?	Yes	No
18	Do you have a history of substance abuse or alcohol abuse?	Yes	No
19	Do you have any history of heart disease?	Yes	No
20	Do you have any history of pancreatic disease?	Yes	No
21	Are you currently taking any prescription blood-thinning medications?	Yes	No
22	Do you have a history of high blood pressure?	Yes	No
23	Do you have any uncorrected visual or hearing impairments?	Yes	No
24	Are you able to read, write, and speak English effectively?	Yes	No
25	Do you consume three or more alcoholic more than two nights a week?	Yes	No
26	Have you ever experienced a medical or psychiatric condition that could potentially affect cognitive functioning, such as stroke, electroconvulsive treatment, epilepsy, brain surgery, encephalitis, meningitis, multiple sclerosis, Parkinson's Disease, Huntington's Chorea, Alzheimer's dementia, Schizophrenia, or Bipolar Disorder?	Yes	No
27	Have you ever used smoked or used tobacco products?	Yes	No
28	Do you use any unprescribed or "illegal/street" drugs?	Yes	No
29	Are you taking any of the following medications: antidepressant, antianxiety, antipsychotic?	Yes	No

30	Are you taking any allergy or cold medication?	Yes	No
31	Do you frequently experience migraine headaches?	Yes	No
32	Do you have a history of chronic earache that lasted more than a month?	Yes	No
33	Do you often experience pressure in the inner ear?	Yes	No
34	Do you frequently hear a persistent ringing, buzzing, or hissing sound?	Yes	No
35	Have you ever been diagnosed with any of the following vestibular disorders: Orthostatic dysregulation, Meniere's Disease, Cogan's syndrome, Labyrinthine Infarct, Neurolabyrinthitis?	Yes	No
36	Do you have a history of panic attacks or agoraphobia?	Yes	No
37	Do you frequently experience sensations of nausea?	Yes	No
38	Do you frequently experience dizziness?	Yes	No

With the exception of question #24, if you answered "yes" to any of the above please explain fully:

_____

_____

_____

_____

Appendix C

The Lateral Preference Inventory

Simply read each of the questions below. Decide which hand, foot, etc. you use for each activity and then put a check mark next to the answer that best describes you the best. If you are unsure of any answer, try to act out the action.

1. With which hand do you draw? ___ Left ___ Right ___ Either
2. Which hand would you use to throw a ball to hit a target? ___ Left ___ Right ___ Either
3. In which hand would you use an eraser on paper? ___ Left ___ Right ___ Either
4. With hand removes the top card when you are dealing from a deck? ___ Left ___ Right ___ Either
5. With which foot do you kick a ball to hit a target? ___ Left ___ Right ___ Either
6. If you wanted to pick up a pebble with your toes, which foot would you use? ___ Left ___ Right ___ Either
7. Which foot would you use to step on a bug? ___ Left ___ Right ___ Either
8. If you had to step up on a chair, which foot would you place on the chair first? ___ Left ___ Right ___ Either
9. Which eye would you use to look through a telescope? ___ Left ___ Right ___ Either
10. If you had to look into a dark bottle to see how full it was, which eye would you use? ___ Left ___ Right ___ Either
11. Which eye would you use to peep through a keyhole? ___ Left ___ Right ___ Either
12. Which eye would you use to sight down a rifle? ___ Left ___ Right ___ Either
13. If you wanted to listen in on a conversation going on behind a closed door, which ear would you place against the door? ___ Left ___ Right ___ Either
14. Into which ear would you place the earphone of a transistor radio? ___ Left ___ Right ___ Either
15. If you wanted to hear someone's heartbeat which ear would you place against his or her chest? ___ Left ___ Right ___ Either
16. Imagine a small box resting on a table. This box contains a small clock. Which ear would you press against the box to find out if the clock was ticking? ___ Left ___ Right ___ Either

Appendix D

Post-task Measure

1. How did you feel while you looked at the picture of (insert name of significant other here)?
   _____

2. On a scale of 1 to 9 in which 1 is the least and 9 is the most, rate your feeling of being "in love" when you looked at the picture of (insert name of significant other here).

   1 2 3 4 5 6 7 8 9

3. On the same scale, rate your level of sexual arousal when you looked at the picture of (insert name of significant other here).

   1 2 3 4 5 6 7 8 9

4. Rate the quality of the picture of (insert name of significant other here).

   1 2 3 4 5 6 7 8 9

5. What specific event(s) did you think about when you looked at the picture of (insert name of significant other here)?
   _____
   _____

6. Did you have any other thoughts, images, or associations when you looked at the picture of (insert name of significant other here)? If so, what were they?
   _____
   _____

7. How did you feel while you looked at the picture of (insert name of opposite-sex neutral acquaintance here)? _____

8. Rate your feeling of being "in love" when you looked at the picture of (insert name of opposite-sex neutral acquaintance here).

   1 2 3 4 5 6 7 8 9

9. Rate your level of sexual arousal when you looked at the picture of (insert name of opposite-sex neutral acquaintance here).

   1 2 3 4 5 6 7 8 9

10. Rate the quality of the picture of (insert name of opposite-sex acquaintance here).

1 2 3 4 5 6 7 8 9

11. What specific event(s) did you think about when you looked at the picture of (insert name of opposite-sex neutral acquaintance here)?

_____
_____

12. Did you have any other thoughts, images, or associations when you looked at the picture of (insert name of opposite-sex neutral acquaintance here)? If so, what were they?

_____
_____

Appendix E

Passionate Love Scale

In this section of the questionnaire, you will be asked to describe how you feel when you are passionately in love. Some common terms for this feeling are passionate love, infatuation, love sickness, or obsessive love.

Please think of the person who you love most passionately *right now.* If you are not in love right now, please think of the last person you loved passionately. If you have never been in love, think of the person whom you came closest to caring for in that way. Keep this person in mind as you complete this section of the questionnaire. (The person you choose should be of the opposite sex if you are heterosexual or of the same sex if you are homosexual.) Try to tell us how you felt at the time when your feelings were the most intimate.

Who are you thinking of?
____ Someone I love *right now.*
____ Someone I *once* loved.
____ I have never been in love but am describing how I think I *would* feel if I were in love.

Possible responses to each item range from:

1 2 3 4 5 6 7 8 9
Not at all true — Moderately true — Definitely true

1. Since I've been involved with _____, my emotions have been on a roller coaster.

1 2 3 4 5 6 7 8 9

2. I would despair if _____ left me.

1 2 3 4 5 6 7 8 9

3. Sometimes my body trembles with excitement at the sight of _____.

1 2 3 4 5 6 7 8 9

4. I take delight in studying the movements and angles of ____'s body.

1 2 3 4 5 6 7 8 9

5. Sometimes I feel I can't control my thoughts; they are obsessively on _____.

1 2 3 4 5 6 7 8 9

6. I feel happy when I am doing something to make _____ happy.

1 2 3 4 5 6 7 8 9

7. I would rather be with _____ than anyone else.

1 2 3 4 5 6 7 8 9

8. I'd get jealous if I thought ____ were falling in love with someone else.

1 2 3 4 5 6 7 8 9

9. No one else could love _____ like I do.

1 2 3 4 5 6 7 8 9

10. I yearn to know all about _____.

1 2 3 4 5 6 7 8 9

11. I want ____ - physically, emotionally, mentally.

1 2 3 4 5 6 7 8 9

12. I will love ____ forever.

1 2 3 4 5 6 7 8 9

13. I melt when looking deeply into _____'s eyes.

1 2 3 4 5 6 7 8 9

14. I have an endless appetite for affection from _____.

1 2 3 4 5 6 7 8 9

15. For me, _____ is the perfect romantic partner.

1 2 3 4 5 6 7 8 9

16. _____ is the person who can make me feel the happiest.

1 2 3 4 5 6 7 8 9

17. I sense my body responding when _____ touches me.

1 2 3 4 5 6 7 8 9

18. I feel tender toward _____.

1 2 3 4 5 6 7 8 9

19. _____ always seems to be on my mind.

1 2 3 4 5 6 7 8 9

20. If I were separated from _____ for a long time, I would feel intensely lonely.

1 2 3 4 5 6 7 8 9

21. I sometimes find it difficult to concentrate on work because thoughts of _____ occupy my mind.

1 2 3 4 5 6 7 8 9

22. I want _____ to know me – my thoughts, my fears, and my hopes.

1 2 3 4 5 6 7 8 9

23. Knowing that _____ cares about me makes me feel complete.

1 2 3 4 5 6 7 8 9

24. I eagerly look for signs indicating _____'s desire for me.

1 2 3 4 5 6 7 8 9

25. If _____ were going through a difficult time, I would put away my concerns to help her out.

1 2 3 4 5 6 7 8 9

26. _____ can make me feel effervescent and bubbly.

1 2 3 4 5 6 7 8 9

27. In the presence of _____, I yearn to touch and be touched.

1 2 3 4 5 6 7 8 9

28. An existence without _____ would be dark and dismal.

1 2 3 4 5 6 7 8 9

29. I possess a powerful attraction for _____.

1 2 3 4 5 6 7 8 9

30. I get extremely depressed when things don't go right in my relationship with _____.

1 2 3 4 5 6 7 8 9

Appendix F

Companionate Love Scale

We would like to know how you feel (or once felt) about the person you love, or have loved, most *companionately.* Some common terms for companionate love are *affectionate love, tender love, true love,* or *marital love.*

Please think of the person whom you love most companionately *right now.* If you are not in love right now, please think of the last person you loved. If you have never been companionately in love, think of the person you came closest to caring for in that way. Try to tell us how you felt at the time when your feelings were the most intense.

Who are you thinking of?
____ Someone I love *right now.*
____ Someone I *once* loved.
____ I have never been in love but am describing how I think I *would* feel if I were in love.

Please indicate your feelings on the following scale:

1	2	3	4	5	6	7	8	9
Not at all true		Somewhat true		Moderately true		Quite true		Extremely true

Intimacy

1. I am actively supportive of _____'s well-being.

1 2 3 4 5 6 7 8 9

2. I have a warm and comfortable relationship with _____.

1 2 3 4 5 6 7 8 9

3. I am able to count on _____ in times of need.

1 2 3 4 5 6 7 8 9

4. _____ is able to count on me in times of need.

1 2 3 4 5 6 7 8 9

5. I am willing to share myself and my possessions with _____.

1 2 3 4 5 6 7 8 9

6. I receive considerable emotional support from _____.

1 2 3 4 5 6 7 8 9

7. I give considerable emotional support to _____.

1 2 3 4 5 6 7 8 9

8. I communicate well with _____.

1 2 3 4 5 6 7 8 9

9. I value _____ greatly in my life.

1 2 3 4 5 6 7 8 9

10. I feel close to _____.

1 2 3 4 5 6 7 8 9

11. I have a comfortable relationship with _____.

1 2 3 4 5 6 7 8 9

12. I feel that I really understand _____.

1 2 3 4 5 6 7 8 9

13. I feel that _____ really understands me.

1 2 3 4 5 6 7 8 9

14. I feel that I really can trust _____.

1 2 3 4 5 6 7 8 9

15. I share deeply personal information about myself with _____.

1 2 3 4 5 6 7 8 9

Commitment

1. I know that I care about _____.

1 2 3 4 5 6 7 8 9

2. I am committed to maintaining my relationship with _____.

1 2 3 4 5 6 7 8 9

3. Because of my commitment to _____, I would not let other people come between us.

1 2 3 4 5 6 7 8 9

4. I have confidence in the stability of my relationship with _____.

1 2 3 4 5 6 7 8 9

5. I could not let anything get in the way of my commitment to _____.

1 2 3 4 5 6 7 8 9

6. I expect my love for _____ to last for the rest of my life.

1 2 3 4 5 6 7 8 9

7. I will always feel a strong responsibility for _____.

1 2 3 4 5 6 7 8 9

8. I view my commitment to _____ as a solid one.

1 2 3 4 5 6 7 8 9

9. I can't imagine ending my relationship with _____.

1 2 3 4 5 6 7 8 9

10. I am certain of my love for _____.

1 2 3 4 5 6 7 8 9

11. I view my relationship with _____ as permanent.

1 2 3 4 5 6 7 8 9

12. I view my relationship with _____ as a good decision.

1 2 3 4 5 6 7 8 9

13. I feel a sense of responsibility toward _____.

1 2 3 4 5 6 7 8 9

14. I plan to continue in my relationship with _____.

1 2 3 4 5 6 7 8 9

15. Even when _____ is hard to deal with, I remain committed to our relationship.

1 2 3 4 5 6 7 8 9

Appendix G

Attitudes Toward Love

Some of the items refer to a specific love relationship, while others refer to general attitudes and beliefs about love. Whenever possible, answer the questions with your current partner in mind. If you are not currently dating anyone, answer the questions with your most recent partner in mind. If you have never been in love, answer in terms of what you think your responses would most likely be.

Please read each statement carefully and circle the number which you believe most adequately represents your opinion.

1. Strongly agree
2. Moderately agree
3. Neutral
4. Moderately disagree
5. Strongly disagree

Eros

1. My lover and I were attracted to each other immediately after we first met.

   1 2 3 4 5

2. My lover and I have the right physical "chemistry" between us.

   1 2 3 4 5

3. Our lovemaking is very intense and satisfying.

   1 2 3 4 5

4. I feel that my lover and I were meant for each other.

   1 2 3 4 5

5. My lover and I became emotionally involved rather quickly.

   1 2 3 4 5

6. My lover and I really understand each other.

   1 2 3 4 5

7. My lover fits my ideal standards of physical beauty.

1 2 3 4 5

Ludus

8. I try to keep my lover a little uncertain about my commitment to her.

1 2 3 4 5

9. I believe that what my lover doesn't know about me won't hurt her.

1 2 3 4 5

10. I have sometimes had to keep two of my lovers from finding out about each other.

1 2 3 4 5

11. I can get over love affairs pretty easily and quickly.

1 2 3 4 5

12. My lover would get upset if she knew of some of the things I've done with other people.

1 2 3 4 5

13. When my lover gets too dependent on me, I want to back off a little.

1 2 3 4 5

14. I enjoy playing the "game of love" with a number of different partners.

1 2 3 4 5

Storge

15. It is hard to say exactly where friendship ends and love begins.

1 2 3 4 5

16. Genuine love first requires *caring* for awhile.

1 2 3 4 5

17. I expect to always be friends with the one I love.

1 2 3 4 5

18. The best kind of love grows out of a long friendship.

1 2 3 4 5

19. Our friendship merged gradually into love over time.

1 2 3 4 5

20. Love is really a deep friendship, not a mysterious, mystical emotion.

1 2 3 4 5

21. My most satisfying love relationships have developed from good friendships.

1 2 3 4 5

Pragma

22. I consider what a person is going to become in life before I commit myself to her.

1 2 3 4 5

23. I try to plan my life carefully before choosing a lover.

1 2 3 4 5

24. It is best to love someone with a similar background.

1 2 3 4 5

25. A main consideration in choosing a lover is how she reflects on my family.

1 2 3 4 5

26. An important factor in choosing a partner is whether or not she will be a good parent.

1 2 3 4 5

27. One consideration in choosing a partner is how she will reflect on my career.

1 2 3 4 5

28. Before getting very involved with anyone, I try to figure out how compatible her hereditary background is with mine in case we ever have children.

1 2 3 4 5

Mania

29. When things aren't right with my lover and me, my stomach gets upset.

1 2 3 4 5

30. When my love affairs break up, I get so depressed that I have even thought of suicide.

1 2 3 4 5

31. Sometimes I get so excited about being in love that I can't sleep.

1 2 3 4 5

32. When my lover doesn't pay attention to me, I feel sick all over.

1 2 3 4 5

33. When I am in love, I have trouble concentrating on anything else.

1 2 3 4 5

34. I cannot relax if I suspect my lover is with someone else.

1 2 3 4 5

35. If my lover ignores me for a while, I sometimes do stupid things to get her attention back.

1 2 3 4 5

Agape

36. I try to always help my lover through difficult times.

1 2 3 4 5

37. I would rather suffer myself than let my lover suffer.

1 2 3 4 5

38. I cannot be happy unless I place my lover's happiness before my own.

1 2 3 4 5

39. I am usually willing to sacrifice my own wishes to let my lover achieve hers.

1 2 3 4 5

40. Whatever I own is my lover's to use as she chooses.

1 2 3 4 5

41. When my lover gets angry with me, I still love her fully and unconditionally.

1 2 3 4 5

42. I would endure all things for the sake of my lover.

1 2 3 4 5

Appendix H

Relationship Assessment Scale

Possible responses to each item range from:

1 2 3 4 5

Low satisfaction High satisfaction

1. How well does your partner meet your needs?

   1 2 3 4 5

2. In general, how satisfied are you with your relationship?

   1 2 3 4 5

3. How good is your relationship compared to most?

   1 2 3 4 5

4. How often do you wish you hadn’t gotten into this relationship?

   1 2 3 4 5

5. To what extent has your relationship met your original expectations?

   1 2 3 4 5

6. How much do you love your partner?

   1 2 3 4 5

7. How many problems are there in your relationship?

   1 2 3 4 5

Appendix I

Relationship History Questionnaire

1. How many romantic relationship have you had in your lifetime? _____
2. If you are currently in a romantic relationship, how long have you been with this partner?

   _____# years _____#months _____#days
3. At what age did you enter your first romantic relationship? _____
4. How long were you with previous romantic partners?
   a. _____# years _____#months _____#days when you were _____ years old
   b. _____# years _____#months _____#days when you were _____ years old
   c. _____# years _____#months _____#days when you were _____ years old
   d. _____# years _____#months _____#days when you were _____ years old
   e. _____# years _____#months _____#days when you were _____ years old
   f. _____# years _____#months _____#days when you were _____ years old
5. How many sexual partners have you had in your lifetime? _____
6. If you are currently in a sexual relationship, how long have you been with this partner?

   _____# years _____#months _____#days
7. How old were you when you first engaged in sexual intercourse? _____

8. How long were you with previous sexual partners?

   a. _____# years _____#months _____#days when you were _____ years old

   b. _____# years _____#months _____#days when you were _____ years old

   c. _____# years _____#months _____#days when you were _____ years old

   d. _____# years _____#months _____#days when you were _____ years old

   e. _____# years _____#months _____#days when you were _____ years old

   f. _____# years _____#months _____#days when you were _____ years old

9. How many “one night stands” have you had in your lifetime? _____

10. At what age did you have your first “one night stand”? _____

Appendix J

Informed Consent Form I

Study Title: Personality and Emotion: Role of Physiological Arousal

Investigators: Akiho Tanaka, M.S.
Angela Scarpa, Ph.D.

I. Purpose of this research

As the first part of a two-part study, the purpose of this study is to examine personality features in college men.

II. Procedures

You will be asked to complete a questionnaire about personality, interpersonal, and lifestyle characteristics. If you decide to participate, you will be asked to respond to an online questionnaire consisting of approximately 232 items online and expected to last between 45 to 60 minutes. Based on your responses to the measures, you may or may not be contacted for participation in the second portion of the study. In the event that you are eligible for the second part of the study, you will be asked to send digital pictures of familiar people prior to the session. If any stressful or difficult issues arise at any time during the completion of the questionnaires, emergency contact phone numbers will be listed on the main webpage.

III. Risks

There will be minimal discomfort associated with the completion of the questionnaires.

IV. Benefits

Your participation in this study will help advance the understanding of personality, interpersonal, and lifestyle characteristics of college men.

V. Confidentiality

Any information you provide will be confidential. You will be asked to provide your name, phone number, and e-mail address solely for the purpose of obtaining extra credit and being contacted for the second study. A participant number will be assigned to your responses and only this number will be associated with your information for purposes of data analyses and writing of results. Please note that although the responses to the questionnaire require a password for entry and completion for the questionnaire, this does not guarantee complete confidentiality in the even the responses are intercepted inappropriately from the internet.

At no time will the researchers release identifying information from this study to anyone other than those working on the study without your written consent. However, confidentiality may be broken if you express intent to harm yourself or someone else, in which case the

researchers are legally obliged to inform the appropriate authorities. In such a case, you will be informed of the need to do so, and are encouraged to contact the Cook Counseling Center (231-6557) or the Psychological Services Center (231-6914). Research findings may be published or presented for scientific purposes, but your identity will not be revealed in the description or publication of this research.

VI. Compensation

You may receive one extra credit point for the psychology class you are currently enrolled in. If you are not currently enrolled in a psychology class, please speak with your professor about alternative methods of receiving extra credit.

VII. Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. If you choose to withdraw, you will still receive the extra credit and will not be penalized by reduction in points.

VIII. Participant Responsibilities

I voluntarily agree to participate in this study and complete the questionnaires and lab tasks.

IX. Participant Permission

I have read and understand the informed consent and conditions of this project. I have had my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project. If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

_____

Participant Signature Date

By completing the online questionnaire, you are giving consent to participate in this study. If you do not wish to participate, simply exit the survey now.

Should I have any further questions about this research or its conduct, I will contact:

_____

Akiho Tanaka
atanaka@vt.edu
540-231-2594

_____
Angela Scarpa, Ph.D.
ascarpa@vt.edu
540-231-2615

_____
David Moore, Ph.D.
IRB Chair
mooredv@vt.edu
540-231-4991

_____
David Harrison, Ph.D.
Psychology Human Subjects Committee Chair
dwh@vt.edu
540-231-4422

Appendix K

Informed Consent Form II

Study Title: Personality and Emotion: Role of Physiological Arousal

Investigators: Akiho Tanaka, M.S.
Angela Scarpa, Ph.D.

X. Purpose of this research

You are invited to participate in a study examining the relationship between personality features, emotional experiences, and physiological responding.

XI. Procedures

You will be asked to complete a series of tasks in which you will be viewing a picture of a loved one and a casual acquaintance. During these tasks, heart rate and skin conductance measures will be recorded. A male experimenter will provide a tutorial for you to apply electrodes on the surface of your skin (over your collarbone, below the lower ribs, and on your hand). Also, your height and weight will be measured. Lastly you will be asked to complete a series of questionnaires about your emotional experiences. This study is expected to last for approximately 1 hour.

XII. Risks

There will be minimal discomfort associated with the completion of the questionnaires and tasks. There may be some mild discomfort from wearing or removing the electrodes, much like the sensation of a Band-Aid.

XIII. Benefits

Your participation in this study will help advance the understanding of the relationship between personality features, emotional experiences, and psychophysiological responding in college men.

XIV. Confidentiality

Any information you provide will be confidential. You will be asked to provide your name, phone number, and e-mail address solely for the purpose of obtaining extra credit and being contacted for participation in the laboratory portion of the study. A participant number will be assigned to your responses and only this number will be associated with your information for purposes of data analyses and writing of results. Please note that although the responses to the questionnaire require a password for entry and completion for the questionnaire, this does not guarantee complete confidentiality in the event the responses are intercepted inappropriately

from the internet.

At no time will the researchers release identifying information from this study to anyone other than those working on the study without your written consent. However, confidentiality may be broken if you express intent to harm yourself or someone else, in which case the researchers are legally obliged to inform the appropriate authorities. In such a case, you will be informed of the need to do so, and are encouraged to contact the Cook Counseling Center (231-6557) or the Psychological Services Center (231-6914). Research findings may be published or presented for scientific purposes, but your identity will not be revealed in the description or publication of this research.

XV. Compensation

You may receive one extra credit point for the psychology class you are currently enrolled in. If you are not currently enrolled in a psychology class, extra credit may be granted as determined by your course instructor. Alternatively, you may receive $5 for participation in this study. In addition, you will be entered into a raffle to win a $25 gift certificate from Amazon. The drawing will be held at the end of data collection.

XVI. Freedom to Withdraw

You are free to withdraw from this study at any time without penalty. If you choose to withdraw, you will still receive the extra credit and will not be penalized by reduction in points.

XVII. Participant Responsibilities

I voluntarily agree to participate in this study and complete the questionnaires and lab tasks.

XVIII. Participant Permission

I have read and understand the informed consent and conditions of this project. I have had my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project. If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

_____

Participant Signature Date

Should I have any further questions about this research or its conduct, I will contact:

_____

Akiho Tanaka
atanaka@vt.edu
540-231-2594

_____

Angela Scarpa, Ph.D.
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_____

David Moore, Ph.D.
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540-231-4991

_____

David Harrison, Ph.D.
Psychology Human Subjects Committee Chair
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540-231-4422

Table 1. Means, Standard Deviations (SDs), and Ranges

Variables	Mean	SD	Range
Psychopathic Features	50.46	11.82	33 – 89
Fearless Dominance	54.29	11.57	32 – 79
Self-Centered Impulsivity	47.06	9.05	35 – 82
Machiavellian Egocentricity	50.12	9.76	27 – 81
Rebellious Nonconformity	48.44	9.17	33 – 76
Blame Externalization	44.40	9.20	30 – 82
Carefree Nonplanfulness	48.29	7.88	32 – 66
Social Influence	53.77	10.98	28 – 75
Fearlessness	51.73	9.27	35 – 70
Stress Immunity	53.79	10.98	28 – 75
Coldheartedness	51.08	11.55	33 – 90
HR reactivity (RS)	.57	2.85	-8.05 – 7.50
HR reactivity (NS)	.37	2.24	-6.65 – 4.60
SC reactivity (RS)	1.26	1.05	-.05 – 3.80
SC reactivity (NS)	1.36	1.14	-.02 – 5.25
Passionate Love	202.23	39.95	71 – 258
Companionate Love	233.21	22.55	93 – 270
Ludus	14.58	6.52	7 – 31
Relationship Satisfaction	30.96	4.34	18 – 35
Relationship Quantity	3.12	1.86	1 – 9
Relationship Duration	366.92	259.45	70 – 1060

Note. Non-centered values are shown and reflect actual values reported. $N = 48$. $*p<.05$. RS = Romantic Stimulus. NS = Neutral Stimulus.

Table 2. Zero-order Correlations between Psychopathic Features, Physiological Reactivity, and Romantic Love variables

	1	2	3	4	5	6	7	8	9	10	11
1. Psychopathic features	1										
2. HR reactivity (RS)	-0.317*	1									
3. HR reactivity (NS)	0.041	0.23	1								
4. SC reactivity (RS)	-0.138	-0.138	-0.271	1							
5. SC reactivity (NS)	-0.053	-0.125	-0.135	0.812**	1						
6. Passionate love	-0.229	0.289*	-0.063	0.055	0.033	1					
7. Companionate love	-0.435**	0.233	-0.143	0.006	0.057	0.654**	1				
8. Ludus	0.468**	-0.217	0.072	0.137	0.131	-0.42**	-0.639**	1			
9. Relationship satisfaction	-0.442**	0.219	-0.02	0.172	0.258	0.411**	0.732**	-0.486**	1		
10. Relationship quantity	0.157	-0.013	0.138	0.017	0.123	-0.128	-0.147	0.267	-0.04	1	
11. Relationship duration	0.02	0.009	-0.231	-0.02	-0.195	0.121	0.105	0.12	-0.192	-0.48	1

Note: ** $p<.01$. *$p\leq.05$.

Table 3

Hierarchical regressions with Psychopathic Features and HR for the Neutral Stimulus predicting Ludus

Variable	B	SE B	B	ΔR^2
Block 1				.020
Deviant Responding	.003	.004	.142	
Block 2				.200**
Deviant Responding	-.001	.003	-.035	
Psychopathic Features	.934	.275	.481**	
Block 3				.002
Deviant Responding	-.001	.003	-.029	
Psychopathic Features	.926	.279	.477**	
HR	.004	.011	.050	
Block 4				.065*
Deviant Responding	-.001	.003	-.051	
Psychopathic Features	1.005	.273	.518**	
HR	.009	.011	.106	
Psychopathic Features X HR	.270	.137	.264*	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 4

Hierarchical regressions with Coldheartedness and HR for the Neutral Stimulus predicting Companionate Love

Variable	B	SE B	β	ΔR^2
Block 1				.049
Deviant Responding	-.086	.056	-.221	
Block 2				.137**
Deviant Responding	-.041	.055	-.106	
Coldheartedness	-12.473	4.543	-.387**	
Block 3				.025
Deviant Responding	-.047	.055	-.120	
Coldheartedness	-12.403	4.523	-.385**	
HR	-.210	.178	-.159	
Block 4				.065*
Deviant Responding	-.026	.054	-.067	
Coldheartedness	-11.358	4.414	-.352*	
HR	-.196	.172	-.148	
Coldheartedness X HR	-5.184	2.635	-.265*	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 5

Hierarchical regressions with Rebellious Nonconformity and SC for the Romantic Stimulus predicting Companionate Love

Variable	B	SE B	B	ΔR^2
Block 1				.049
Deviant Responding	.-.086	.056	-.221	
Block 2				.001
Deviant Responding	-.087	.057	-.222	
Age	-.047	.222	-.031	
Block 3				.237**
Deviant Responding	.015	.057	.039	
Age	.151	.201	.099	
Rebellious Nonconformity	-.182	.048	-.564**	
Block 4				.001
Deviant Responding	.012	.059	.032	
Age	.167	.215	.109	
Rebellious Nonconformity	-.182	.048	-.562**	
SC	-.493	2.131	-.033	
Block 5				.061+
Virtuous Responding	.028	.057	.073	
Deviant Responding	.115	.210	.075	
Rebellious Nonconformity	-.173	.047	-.535**	
SC	-.633	2.062	-.024	
Rebellious Nonconformity X SC	.497	.250	.325+	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 6

Hierarchical regressions with Self-Centered Impulsivity and HR for the Neutral Stimulus predicting Ludus

Variable	B	SE B	β	ΔR^2
Block 1				.020
Deviant Responding	.003	.004	.142	
Block 2				.213**
Deviant Responding	-.006	.004	-.264	
Self-Centered Impulsivity	1.450	.411	.615**	
Block 3				.007
Deviant Responding	-.006	.004	-.257	
Self-Centered Impulsivity	1.449	.413	.614**	
HR	.007	.011	.084	
Block 4				.122**
Deviant Responding	.125	.004	-.254	
Self-Centered Impulsivity	.000	.383	.618**	
HR	.117	.011	.208	
Self-Centered Impulsivity X HR	.006	.147	.371**	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 7

Hierarchical regressions with Blame Externalization and HR for the Neutral Stimulus predicting Ludus

Variable	B	SE B	B	ΔR^2
Block 1				.006
Virtuous Responding	.001	.002	.079	
Block 2				.024
Virtuous Responding	.002	.002	.103	
Deviant Responding	.004	.004	.158	
Block 3				.068
Virtuous Responding	.002	.002	.123	
Deviant Responding	.004	.003	.174	
Age	.025	.014	.263	
Block 4				.028
Virtuous Responding	.003	.002	.176	
Deviant Responding	.001	.005	.027	
Age	.026	.013	$.275^{+}$	
Blame Externalization	.515	.436	.235	
Block 5				.003
Virtuous Responding	.003	.002	.175	
Deviant Responding	.001	.005	.037	
Age	.026	.014	$.272^{+}$	
Blame Externalization	.496	.443	.227	

HR	.005	.012	.057	
Block 6				
Virtuous Responding				.070^{+}
Deviant Responding	.002	.002	.137	
Age	.001	.005	.057	
Blame Externalization	.024	.013	.257	
HR	.454	.430	.207	
Blame Externalization X	.010	.012	.126	
HR	.406	.214	.275^{+}	

** $p<.01$. *$p\leq.05$. $^{+}p<.07$

Table 8

Hierarchical regressions with Carefree Nonplanfulness and SC for the Neutral Stimulus predicting Ludus

Variable	B	SE B	B	ΔR^2
Block 1				.113 (trend)
Deviant Responding	.003	.004	.142	
Block 2				.117*
Deviant Responding	.004	.003	.155	
Age	.024	.013	.253	
Block 3				.018
Deviant Responding	.002	.004	.089	
Age	.018	.014	.196	
CN	.005	.004	-.211	
Block 4				.154**
Deviant Responding	.002	.004	.100	
Age	.013	.015	.140	
Carefree Nonplanfulness	.006	.004	.254	
SC	.124	.153	.132	
Block 5				.073*
Deviant Responding	.003	.004	.104	
Age	.020	.015	.218	
Carefree Nonplanfulness	.005	.004	.228	
SC	.093	.148	.100	
Carefree Nonplanfulness X SC	-.034	.017	-.279*	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 9

Hierarchical regressions with Carefree Nonplanfulness and SC for the Romantic Stimulus predicting Ludus

Variable	B	SE B	B	ΔR^2
Block 1				.113 (trend)
Deviant Responding	.003	.004	.142	
Block 2				.117*
Deviant Responding	.004	.003	.155	
Age	.024	.013	.253	
Block 3				.018
Deviant Responding	.002	.004	.089	
Age	.018	.014	.196	
Carefree Nonplanfulness	.005	.004	-.211	
Block 4				.154**
Deviant Responding	.002	.004	.100	
Age	.013	.015	.140	
Carefree Nonplanfulness	.006	.004	.254	
SC	.124	.153	.132	
Block 5				.073*
Virtuous Responding	.003	.004	.104	
Deviant Responding	.020	.015	.218	
Carefree Nonplanfulness	.005	.004	.228	
SC	.093	.148	.100	
Carefree Nonplanfulness X SC	-.034	.017	-.279*	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 10

Hierarchical regressions with Rebellious Nonconformity and SC for the Neutral Stimulus predicting Relationship Satisfaction

Variable	B	SE B	B	ΔR^2
Block 1				.113*
Deviant Responding	.-.015	.006	-.336*	
Block 2				.000
Deviant Responding	-.015	.006	-.336*	
Age	-.001	.025	-.008	
Block 3				.117*
Deviant Responding	-.007	.007	-.153	
Age	.015	.024	.083	
Rebellious Nonconformity	-.015	.006	-.396*	
Block 4				.051
Deviant Responding	-.005	.007	-.109	
Age	.003	.025	.017	
Rebellious Nonconformity	-.015	.006	-.407**	
SC	.458	.262	.240	
Block 5				.127**
Virtuous Responding	-.005	.006	-.106	
Deviant Responding	-.011	.023	-.061	
Rebellious Nonconformity	-.016	.005	-.426**	
SC	.255	.250	.133	
Rebellious Nonconformity X SC	.089	.030	.388**	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 11

Hierarchical regressions with Rebellious Nonconformity and SC for the Romantic Stimulus predicting Relationship Satisfaction

Variable	B	SE B	B	ΔR^2
Block 1				.113*
Deviant Responding	.-.015	.006	-.336*	
Block 2				.000
Deviant Responding	-.015	.006	-.336*	
Age	-.001	.025	-.008	
Block 3				.117*
Deviant Responding	-.007	.007	-.153	
Age	.015	.024	.083	
Rebellious Nonconformity	-.015	.006	-.396*	
Block 4				.018
Deviant Responding	-.005	.007	-.120	
Age	.006	.026	.035	
Rebellious Nonconformity	-.015	.006	-.407*	
SC	.260	.254	.148	
Block 5				.154**
Virtuous Responding	-.002	.006	-.055	
Deviant Responding	-.003	.023	-.019	
Rebellious Nonconformity	-.014	.005	-.365*	
SC	.234	.230	.133	
Rebellious Nonconformity X SC	.091	.028	.407**	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 12

Hierarchical regressions with Fearless Dominance and SC for the Romantic Stimulus predicting Relationship Quantity

Variable	B	SE B	B	ΔR^2
Block 1				.099*
Age	.042	.019	.315*	
Block 2				.017
Age	.039	.019	.289*	
Fearless Dominance	.003	.003	.135	
Block 3				.011
Age	.044	.021	.331*	
Fearless Dominance	.003	.003	.123	
SC	-.151	.200	-.114	
Block 4				.068^{+}
Age	.040	.020	.303*	
Fearless Dominance	.005	.003	.212	
SC	-.191	.196	-.144	
Fearless Dominance X SC	.031	.016	.279^{+}	

** $p<.01$. *$p\leq.05$. $^{+}p<.07$

Table 13

Hierarchical regressions with Social Influence and SC for the Romantic Stimulus predicting Relationship Quantity

Variable	B	SE B	B	ΔR^2
Block 1				.099*
Age	.042	.019	.315*	
Block 2				.034
Age	.035	.019	.263	
Social Influence	.005	.003	.192	
Block 3				.005
Age	.040	.021	.297	
Social Influence	.004	.004	.171	
SC	-.108	.205	-.081	
Block 4				.091*
Age	.033	.021	.249	
Social Influence	.004	.003	.181	
SC	-.178	.199	-.134	
Social Influence X SC	.037	.016	.313*	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 14

Hierarchical regressions with Blame Externalization and SC for the Romantic Stimulus predicting Relationship Quantity

Variable	B	SE B	B	ΔR^2
Block 1				.099*
Age	.042	.019	.315*	
Block 2				.000
Age	.042	.019	.316*	
Virtuous Responding	.000	.003	.018	
Block 3				.001
Age	.042	.019	.318*	
Virtuous Responding	.001	.003	.023	
Deviant Responding	.001	.005	.030	
Block 4				.021
Age	.044	.019	.329*	
Virtuous Responding	.002	.003	.069	
Deviant Responding	-.003	.007	-.096	
Blame Externalization	.628	.621	.202	
Block 5				.007
Age	.048	.021	.359*	
Virtuous Responding	.002	.003	.072	
Deviant Responding	-.003	.007	-.090	
Blame Externalization	.516	.657	.166	
SC	-.123	.221	-.093	
Block 6				
Age	.047	.020	.352*	.102*

Virtuous Responding	.001	.003	.049
Deviant Responding	-.005	.006	-.144
Blame Externalization	.859	.642	.276
SC	-.175	.211	-.132
BE X SC	-6.192	2.660	-.339*

** $p<.01$. *$p\leq.05$. $^{+}p<.07$

Table 15

Hierarchical regressions with Stress Immunity and HR for the Neutral Stimulus predicting Relationship Quantity

Variable	B	SE B	β	ΔR^2
Block 1				.013
Stress Immunity	.003	.004	.116	
Block 2				.014
Stress Immunity	.003	.004	.095	
HR	.014	.017	.121	
Block 3				.089*
Stress Immunity	.003	.004	.124	
HR	.017	.017	.150	
Stress Immunity X HR	.004	.002	.302*	

** $p<.01$. *$p\leq.05$. $^{+}p<.07$

Table 16

Hierarchical regressions with Coldheartedness and HR for the Neutral Stimulus predicting Relationship Duration

Variable	B	SE B	β	ΔR^2
Block 1				.020
Deviant Responding	.006	.006	.141	
Block 2				.001
Deviant Responding	.007	.007	.152	
Coldheartedness	-.129	.550	-.036	
Block 3				.048
Deviant Responding	.006	.007	.131	
Coldheartedness	-.118	.542	-.033	
HR	-.032	.021	-.220	
Block 4				.132*
Deviant Responding	.009	.006	.208	
Coldheartedness	.046	.512	.013	
HR	-.030	.020	-.204	
Coldheartedness X HR	-.815	.305	-.377*	

** $p<.01$. * $p\leq.05$. $^{+}p<.07$

Table 17

Hierarchical regressions with Machiavellian Egocentricity and HR for the Neutral Stimulus predicting Relationship Duration

Variable	B	SE B	B	ΔR^2
Block 1				.137**
Virtuous Responding	.-.011	.004	-.371*	
Block 2				.107
Virtuous Responding	-.010	.004	.358*	
Deviant Responding	.004	.006	.088	
Block 3				.098
Virtuous Responding	-.009	.004	.317*	
Deviant Responding	.002	.007	.037	
Machiavellian Egocentricity	.497	.662	.126	
Block 4				.133
Virtuous Responding	-.009	.004	-.321*	
Deviant Responding	.001	.007	.017	
Machiavellian Egocentricity	.492	.649	.124	
HR	-.033	.020	-.226	
Block 5				.194*
Virtuous Responding	-.009	.004	-.312*	
Deviant Responding	-.001	.006	-.027	
Machiavellian Egocentricity	.786	.641	.199	
	-.030	.019	-.204	

HR	.638	.308	.208*
Machiavellian Egocentricity X HR			

** $p<.01$. *$p\leq.05$. $^{+}p<.07$

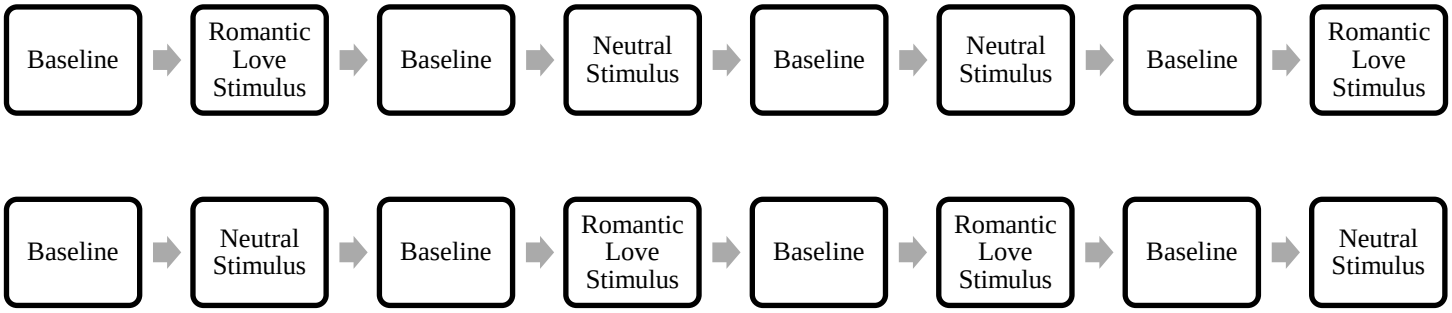

Figure 1. The order of the protocol was counterbalanced across participants.

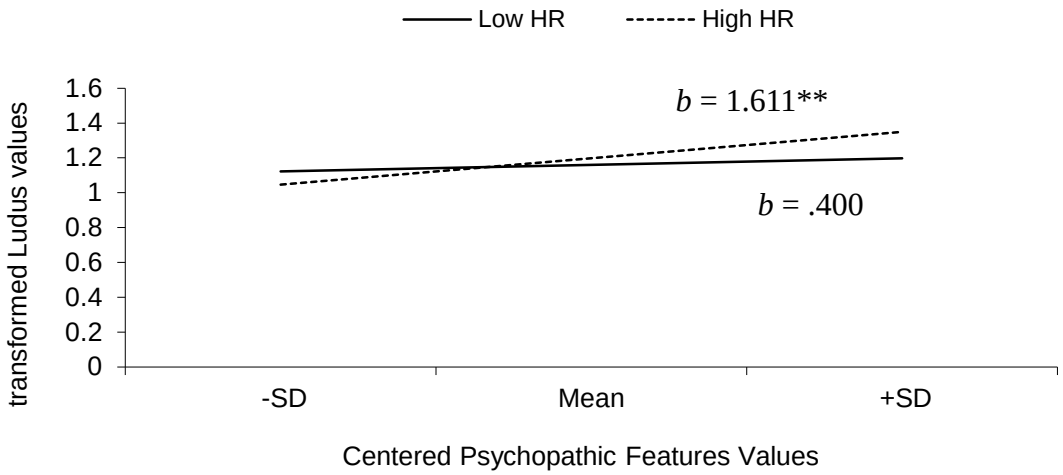

Figure 2. Regression lines for relationship between Psychopathic Features and Ludus as moderated by HR for the Neutral Stimulus. *b*= unstandardized coefficient. ** $p<.01$. *$p<.05$.

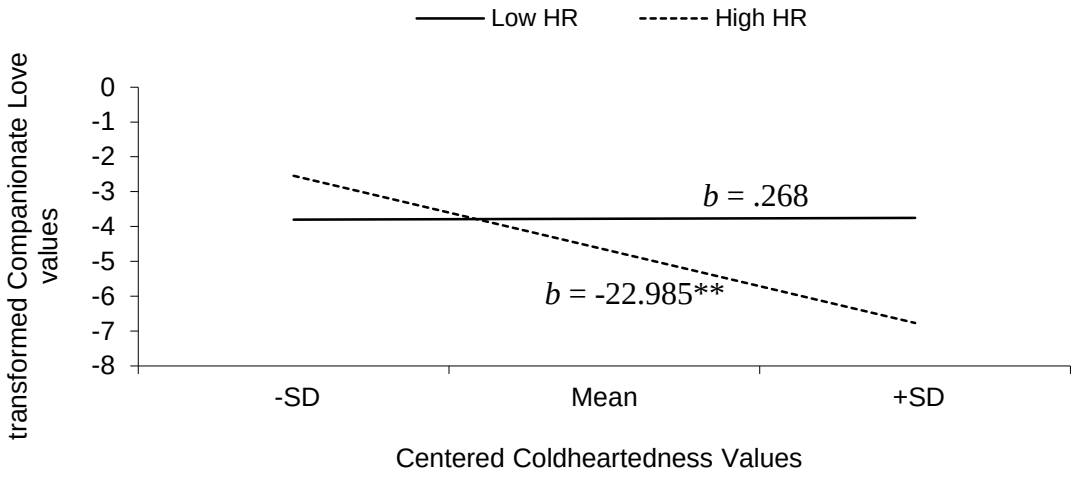

Figure 3. Regression lines for relationship between Coldheartedness and Companionate Love as moderated by HR for the Romantic Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

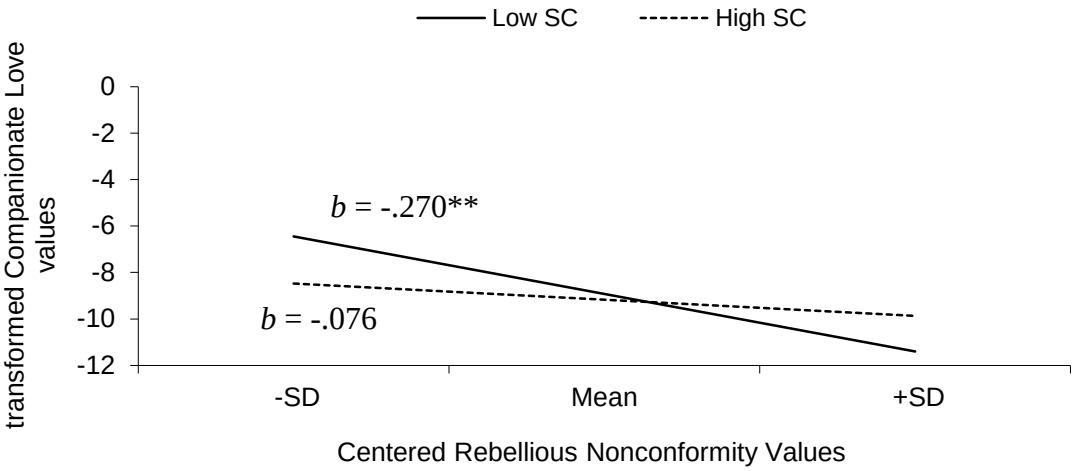

Figure 4. Regression lines for relationship between Rebellious Nonconformity and Companionate Love as moderated by SC for the Romantic Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

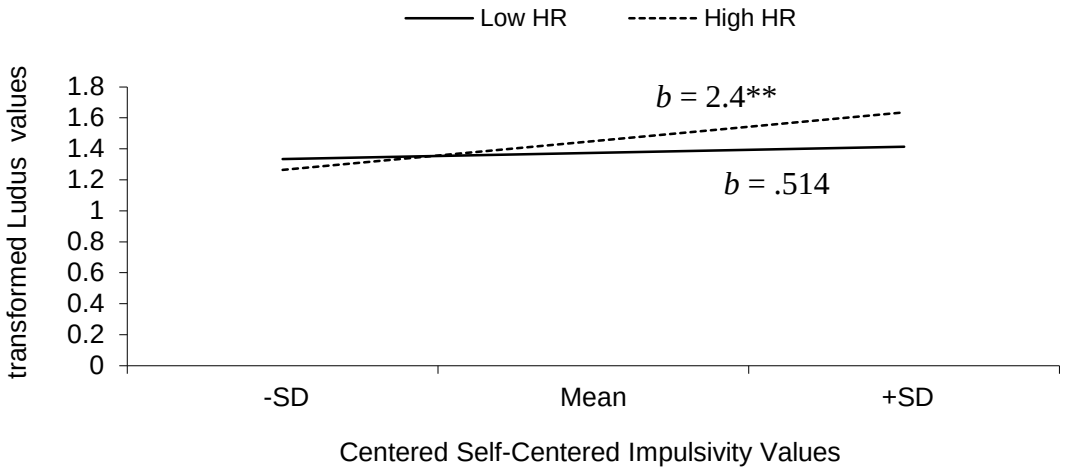

Figure 5. Regression lines for relationship between Self-Centered Impulsivity and Ludus as moderated by HR for the Neutral Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

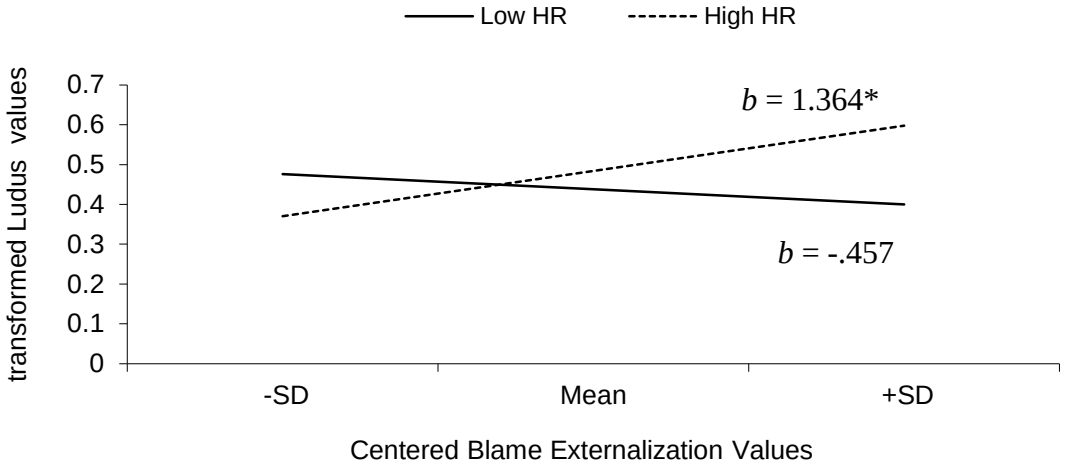

Figure 6. Regression lines for relationship between Blame Externalization and Ludus as moderated by HR for the Neutral Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

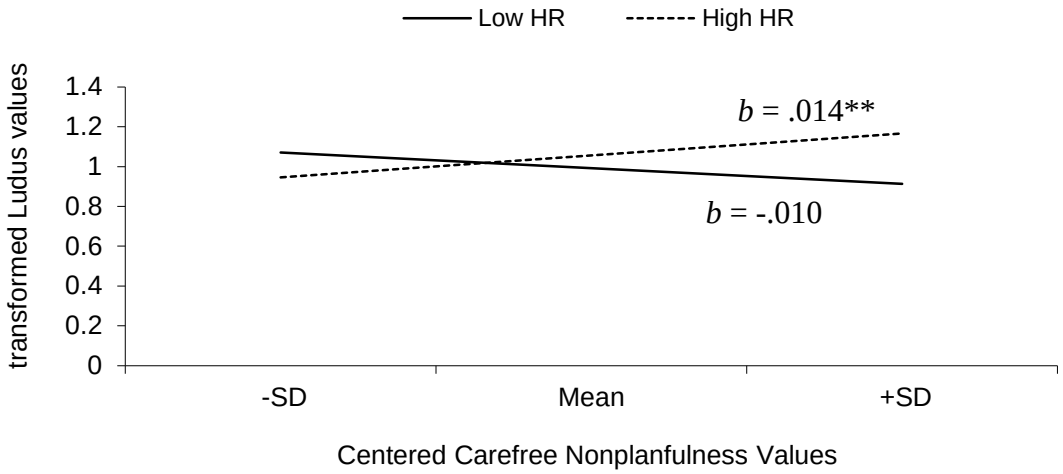

Figure 7. Regression lines for relationship between Carefree Nonplanfulness and Ludus as moderated by HR for the Neutral Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

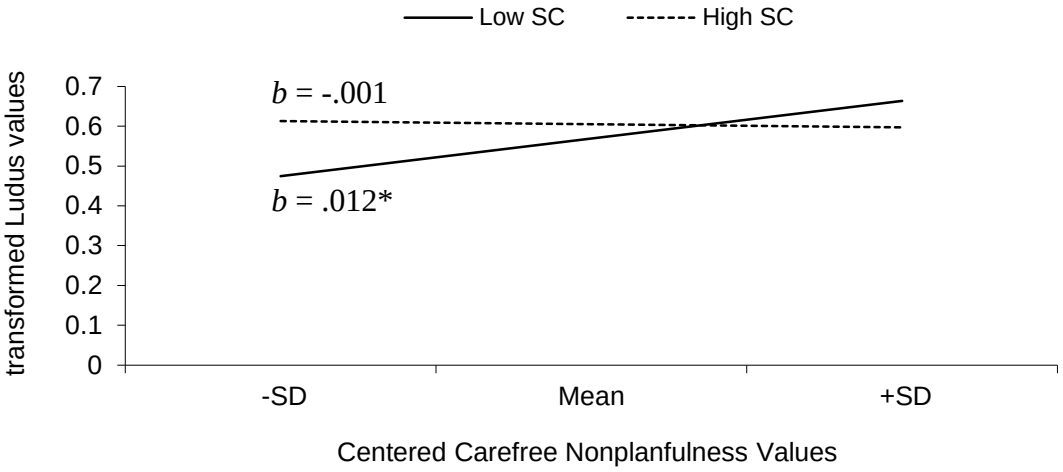

Figure 8. Regression lines for relationship between Carefree Nonplanfulness and Ludus as moderated by SC for the Romantic Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

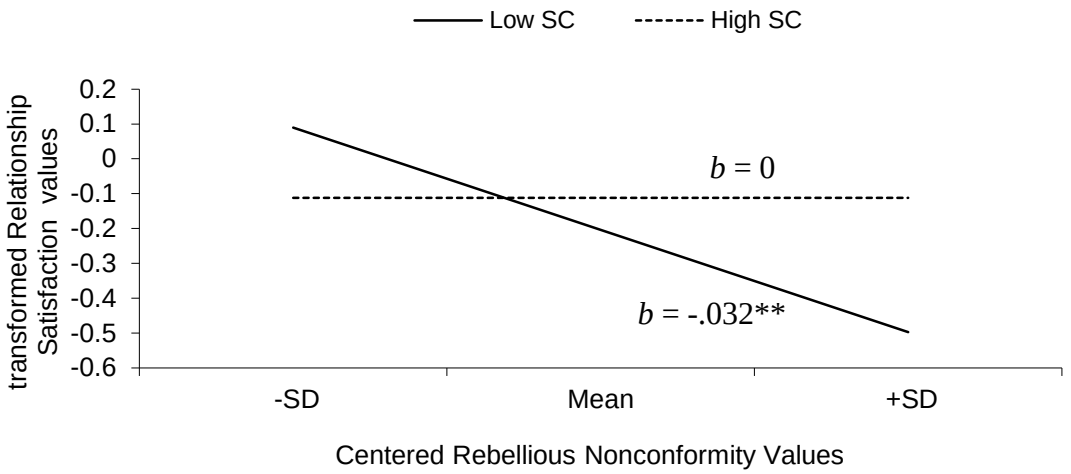

Figure 9. Regression lines for relationship between Rebellious Nonconformity and Relationship Satisfaction as moderated by SC for the Neutral Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

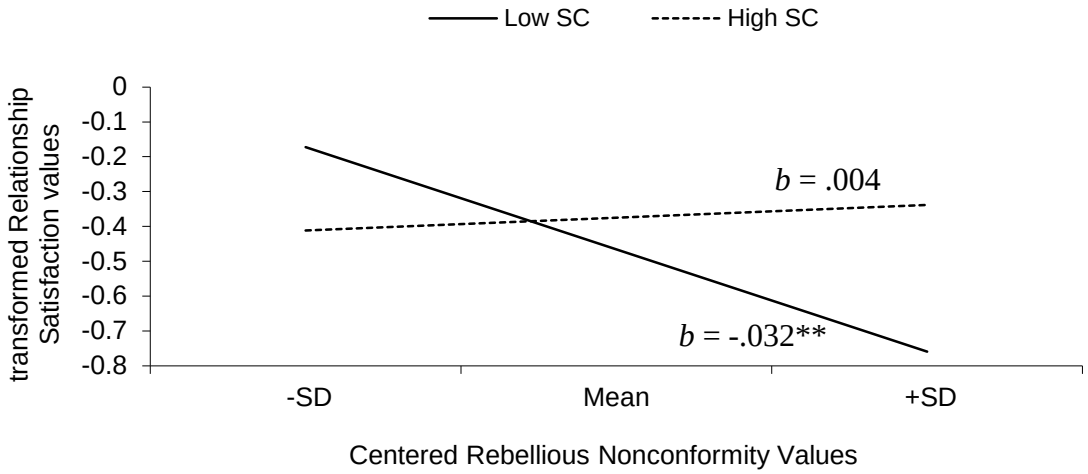

Figure 10. Regression lines for relationship between Rebellious Nonconformity and Relationship Satisfaction as moderated by SC for the Romantic Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

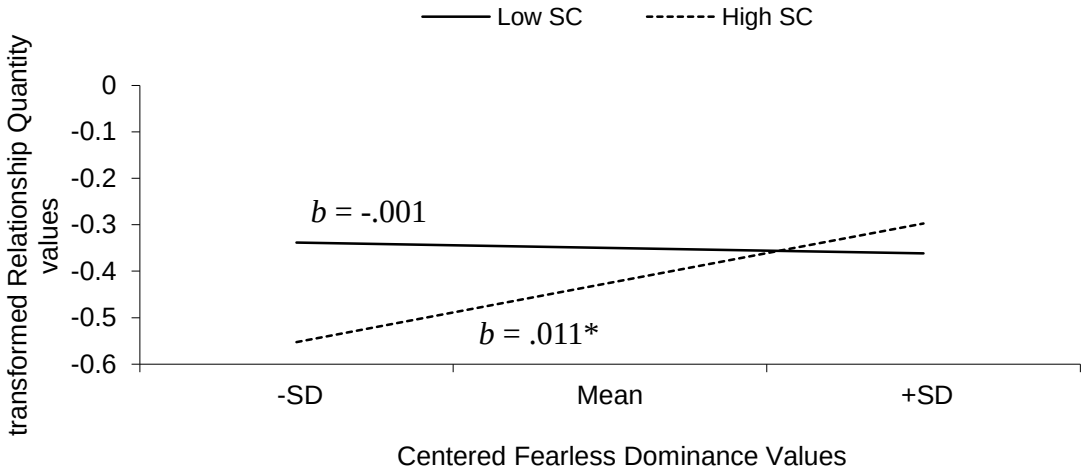

Figure 11. Regression lines for relationship between Fearless Dominance and Relationship Quantity as moderated by SC for the Romantic Stimulus. *b*= unstandardized coefficient. ** *p*<.01. *p<.05.

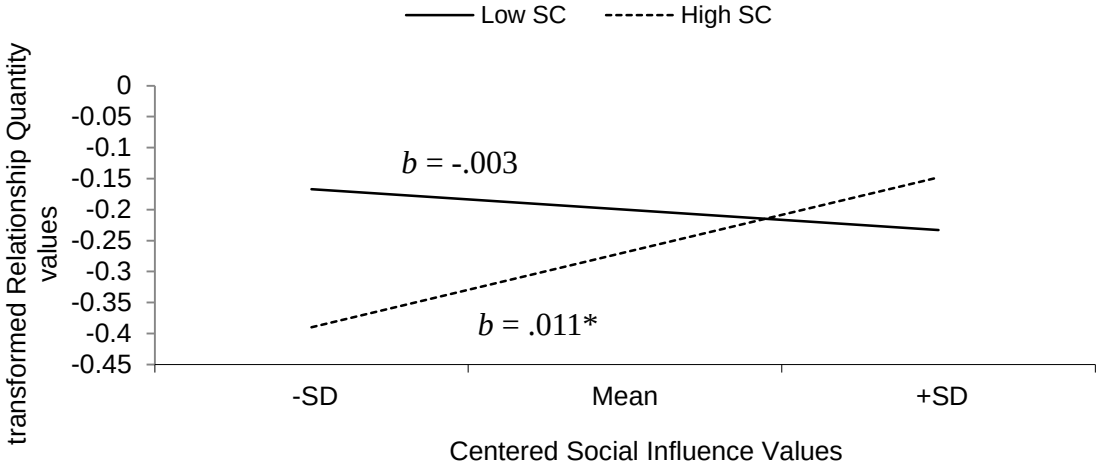

Figure 12. Regression lines for relationship between Social Influence and Relationship Quantity as moderated by SC for the Romantic Stimulus. *b*= unstandardized coefficient. ** *p*<.01. *p<.05.

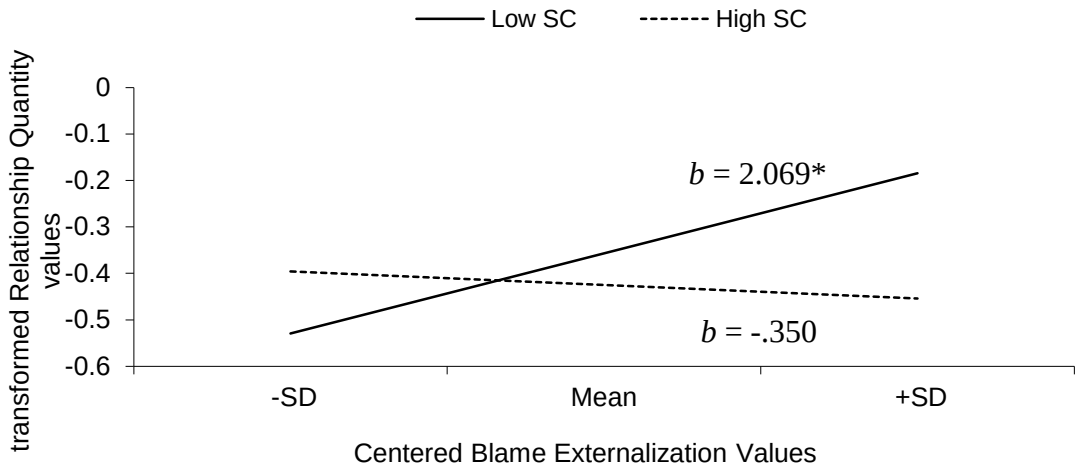

Figure 13. Regression lines for relationship between Blame Externalization and Relationship Quantity as moderated by SC for the Romantic Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

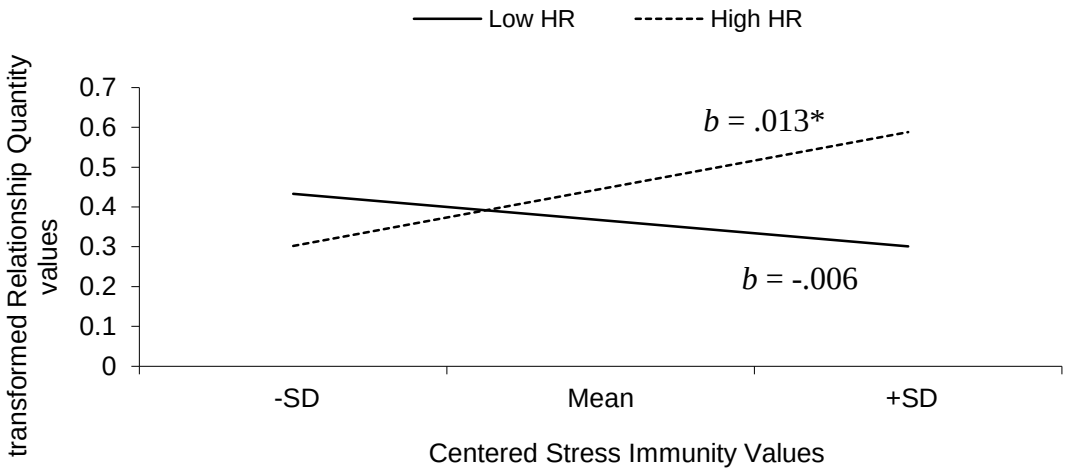

Figure 14. Regression lines for relationship between Stress Immunity and Relationship Quantity as moderated by HR for the Neutral Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

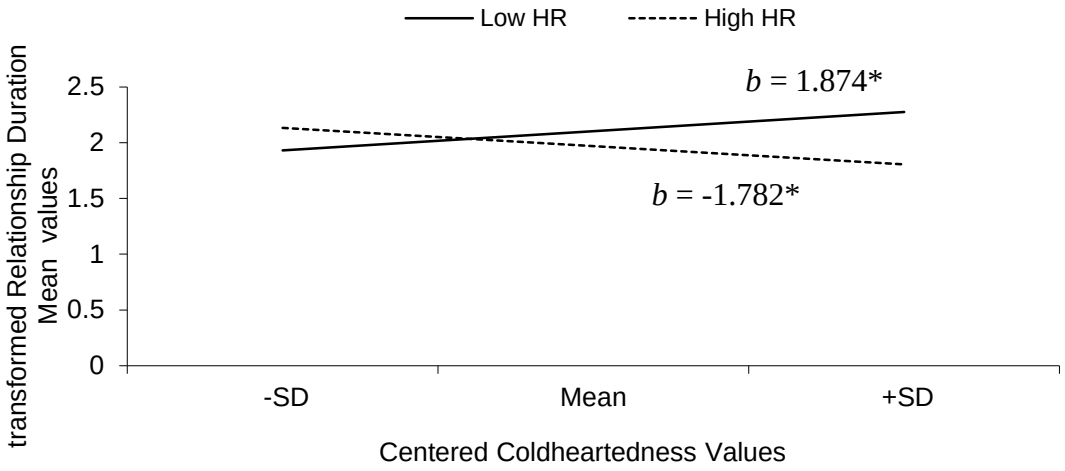

Figure 15. Regression lines for relationship between Coldheartedness and Relationship Duration as moderated by HR for the Neutral Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.

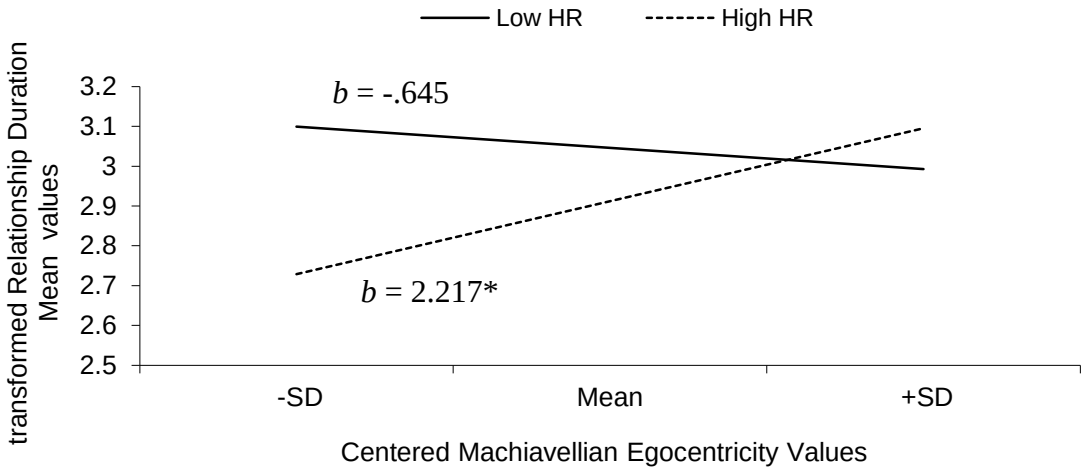

Figure 16. Regression lines for relationship between Machiavellian Egocentricity and Relationship Duration as moderated by HR for the Neutral Stimulus. *b*= unstandardized coefficient. ** *p*<.01. **p*<.05.