

Autonomic Arousal and Relational Aggression in Heterosexual Dating Couples

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Abstract

This study investigated the association between romantic relational aggression and autonomic nervous system (ANS) arousal in the context of heterosexual dating couples ($N = 115$ couples). Results indicated that romantic relational aggression was associated with low resting sympathetic arousal, high resting parasympathetic arousal, and exaggerated fight or flight responses to a conflict discussion (sympathetic activation and parasympathetic withdrawal). However, ANS activity was more strongly associated with romantic relational aggression in the context of low-quality romantic relationships, and sympathetic activity was more strongly associated with aggression among females whereas parasympathetic activity was more strongly associated with aggression among males. Results indicate that psychophysiological functioning may serve as a risk factor for the perpetration of relational aggression against romantic partners.

Keywords: aggression, romantic relationships, autonomic arousal, physiological arousal

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Aggressive behavior within the context of close romantic relationships is associated with a number of adjustment difficulties, including poor relationship quality, psychological problems, and behavioral difficulties (e.g., Callahan, Tolman, & Saunders, 2003; Ellis, Crooks, & Wolfe, 2009; Holt & Espelage, 2005; Jouriles, Garrido, Rosenfield, & McDonald, 2009). Although a number of studies have examined potential contributors to aggression against romantic partners, this work has been limited in three important ways. First, the vast majority of work in this area has focused on physical forms of aggression (e.g., hitting, punching, slapping) to the exclusion of relational forms of aggression (e.g., giving a partner the “silent treatment”; Ellis et al., 2009; Linder, Crick, & Collins, 2002). Second, limited work in this area has examined the role of biological risk factors such as autonomic arousal in the development of such conduct (Babcock, Green, Webb, & Yerington, 2005). Third, few studies have examined potential moderators of the association between autonomic arousal and partner aggression, such as relationship quality and gender. The purpose of the present study was to address these limitations by examining the association between autonomic arousal and relational aggression against a romantic partner in a community sample of young heterosexual dating adults. Moreover, we examined whether relationship quality and gender moderated these associations.

Romantic relationships become increasingly important social contexts during adolescence and young adulthood (Furman & Buhrmester, 1992; Roisman, Masten, Coatsworth, & Tellegen, 2004). Despite the many advantages of involvement in high quality romantic relationships (e.g., Moore & Leung, 2002), research suggests that approximately one third of young adults have engaged in physical aggression against their romantic partners (e.g., Straus, 2004; Sugarman & Hotaling, 1989), and approximately 10% have experienced physical victimization within the last

year (Jose & O’Leary, 2009). These high levels of romantic aggression are alarming given evidence suggesting that aggression against romantic partners is associated with low relationship quality (e.g., Linder et al., 2002). In addition, victims of intimate aggression suffer from a number of adjustment difficulties, such as anxiety, depression, and low life satisfaction (Callahan et al., 2003; Goldstein, Chesir-Tera, & McFaul, 2008; Holt & Espelage, 2005).

Romantic Relational Aggression

Given the deleterious outcomes associated with intimate aggression, a number of studies have examined potential contributors to such conduct. However the majority of this research focuses on physical forms of aggression to the exclusion of more psychological or relational forms of such conduct (Ellis et al., 2009; Linder et al., 2002). The limited work on other forms of aggression is surprising given emerging evidence that these forms of aggression are more common (Holt & Espelage, 2005) and are sometimes more strongly associated with psychological distress (Jouriles et al., 2009; O’Leary, 1999) than physical aggression.

Researchers have recently begun to address this limitation by examining the use of non-physical forms of aggression such as psychological aggression (e.g., insults, ridicule; Jouriles et al., 2009; Murphy & O’Leary, 1989; O’Leary, 1999). However, an emerging body of research in developmental psychology has highlighted the importance of studying an additional form of aggression, termed relational aggression (Crick, Ostrov, & Kawabata, 2007). Relational aggression is defined as behaviors intended to hurt or harm others through damage to interpersonal relationships, and includes behaviors such as spreading malicious gossip or using the “silent treatment” (Crick et al., 2007). Relationally aggressive behaviors emerge early in interactions with peers (e.g., in children as young as 3 years of age; Ostrov, Woods, Jansen, Casas, & Crick, 2004), and by middle childhood these behaviors are frequently used in the

context of close dyadic relationships such as friendships (Grotmeter & Crick, 1996). Moreover, research with adolescents suggests that the use of relational aggression against peers is moderately correlated with perpetration of relational aggression against dating partners (Ellis et al., 2009), highlighting the possibility that relationally aggressive behaviors learned in the context of early peer relationships may be used against romantic partners once these relationships become salient during adolescence and early adulthood (see Murray-Close, Ostrov, Nelson, Crick, & Coccaro, 2010).

Several researchers have begun to examine the use of relational aggression against romantic partners (Linder et al., 2002; Murray-Close et al., 2010). *Romantic relational aggression*, defined as behaviors intended to hurt or harm one's romantic partner through the damage or manipulation of relationships, includes behaviors such as intentionally making a partner jealous or giving him or her the "silent treatment" when angry (Linder et al., 2002). Unlike physical, verbal, and psychological forms of aggression, romantic relational aggression specifically focuses on damage to interpersonal relationships (Linder et al., 2002). Although some behaviors, such as threatening to break up with a romantic partner, fit within the definition of both psychological aggression and romantic relational aggression, psychological aggression is a broader construct (Linder et al., 2002). Moreover, a large body of research has documented that relational forms of aggression are distinct from other forms of aggression frequently used in the context of romantic relationships, such as physical and verbal aggression (e.g., Crick & Grotmeter, 1995; Crick et al., 2007).

Recent research has demonstrated that targets of romantic relational aggression suffer from a number of adjustment difficulties, including poor relationship quality, depressive symptoms, and drug and alcohol use (Bagner, Storch, & Preston, 2007; Linder et al., 2002;

Schad, Szwedo, Antonishak, Hare, & Allen, 2008). In addition, perpetrators exhibit difficulties such as elevated anger, hostility, psychopathy, hostile attribution biases, depressive symptoms, and alcohol use (Coyne, Nelson, Graham-Kevan, Keister, & Grant, 2010; Murray-Close et al., 2010; Schad et al., 2008). Given the distinct developmental salience of relational aggression and the emerging body of research documenting the harmful nature of these behaviors in the context of romantic relationships, additional research is necessary to examine risk factors for engagement in romantic relational aggression.

Autonomic Arousal

Resting Autonomic Arousal. Despite the recent suggestion that the incorporation of physiological measures in studies of intimate aggression is one of the “top 10” important findings in this area (Langhinrichsen-Rohling, 2005), little work to date has focused on physiological risk factors such as autonomic arousal (Babcock et al., 2005). However, an emerging body of research suggests that autonomic nervous system activity (ANS) at rest and during stress may be associated with aggressive conduct. ANS activity includes functioning in two branches: the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS). The sympathetic branch involves the “fight or flight” response to stressful stimuli, thus providing the individual with increased metabolic resources to cope with environmental threat. The PNS, in contrast, involves “rest and digest” functions and down-regulates arousal (Hastings et al., 2008). To examine the association between SNS and PNS functioning and aggression, researchers have examined indices of arousal such as skin conductance (SCL; a measure of perspiration which is an index of SNS functioning), respiratory sinus arrhythmia (RSA; a measure of the ebbing and flowing of heart rate during respiration that is an index of PNS functioning), and heart rate (HR;

reflecting both SNS and PNS functioning) (e.g., Beauchaine, 2001; Erath, El-Sheikh, & Cummings, 2009; Hubbard et al., 2002; Michonski & Babcock, 2009).

A number of researchers have demonstrated that low resting arousal is associated with aggressive conduct. Low levels of arousal may be indicative of fearlessness (Raine, 2002). Low fear, in turn, may result in a lack of concern about the consequences associated with aggression (e.g., punishment or retaliation by victims), thus resulting in elevated levels of aggression (van Goozen, Fairchild, Snoek, & Harold, 2007). Consistent with this perspective, researchers have documented that aggressive individuals exhibit low resting SCL (e.g., Raine, Venables, & Williams, 1990). Recently researchers have begun to examine the association between indices of resting parasympathetic activity, such as RSA, and aggression (e.g., Beauchaine, 2001). Low RSA is thought to reflect the inability to regulate emotions and the inability to flexibly adapt to environmental demands (Hessler & Katz, 2007), and some evidence suggests that low RSA during rest is associated with aggression and conduct disorder (Beauchaine, Gatzke-Kopp, & Mead, 2007; Mezzacappa et al., 1997). That said, some studies with community samples have failed to find this association (see Hinnant & El-Sheik, 2009) and Dietrich and colleagues (2007) actually found a positive association between baseline RSA and externalizing problems.

Although limited research has examined the association between resting ANS arousal and aggression against romantic partners, one study did find that low resting HR was associated with intimate psychological abuse among clinical-level batterers (but not low-level aggressors; Babcock, Green, Webb, & Graham, 2004). These findings suggest that low resting arousal may also serve as a risk factor for aggression against romantic partners. Based on this research, we expected that low SCL at rest would be associated with perpetration of romantic relational

aggression; however, given the mixed findings regarding resting RSA, we did not have directional hypotheses regarding its association with romantic relational aggression.

Autonomic Reactivity. In addition, researchers have examined the association between SNS and PNS reactivity to stress and aggression. On the one hand, exaggerated “fight or flight” responses (reflecting SNS activation and/or PNS withdrawal; see Hinnant and El-Sheikh, 2009) to stress or provocation may be associated with aggressive conduct. Exaggerated “fight or flight” responses may reflect heightened emotional reactivity, resulting in aggressive responding (Scarpa & Raine, 1997). Consistent with this perspective, some research suggests that hostility and aggression are positively associated with heightened skin conductance reactivity (SCR) (Lorber, 2004) and RSA withdrawal (Beauchaine, 2001).

Alternatively, other researchers have provided evidence that blunted “fight or flight” responses to stress, indexed by blunted SNS activation and/or blunted PNS withdrawal, are associated with aggression. This approach draws on the theories regarding the association between low resting arousal and aggression and suggests that blunted reactivity to stress, in addition to low resting arousal, may reflect fearlessness (Ortiz & Raine, 2004). In one meta-analysis, blunted heart rate reactivity (HRR) was associated with heightened levels of antisocial behavior (Ortiz & Raine, 2004), and some recent work has provided evidence that poor RSA suppression and/or RSA augmentation during threat or challenge is associated with externalizing problems (Calkins, Graziano, & Keane, 2007; Katz, 2007; Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996).

The mixed findings regarding the association between ANS reactivity to stress and aggression may in part reflect the severity of the aggressive conduct. In fact, several studies have reported that blunted “fight or flight” responses to stress were associated with severe abuse or

aggression (e.g., using a weapon, choking) whereas exaggerated stress responses predicted less severe violent or antisocial behavior (e.g., slapping; Babcock et al., 2004; Gottman et al., 1995). To our knowledge, no studies have examined the association between ANS reactivity and romantic relational aggression. However, although romantic relational aggression involves harmful acts, these acts tend to be relatively non-severe (e.g., giving the partner the “silent treatment”) and do not tend to result in serious levels of harm for victims (e.g., hospitalization or police involvement). Instead, the use of romantic relational aggression in community samples likely reflects similar processes as those involved in “common couple violence”, involving periodic failures in self-control during conflict situations rather than severe battery or abuse used to systematically control relationship partners (see Archer, 2000). Thus, we expected that these behaviors would be associated with exaggerated “fight or flight” responses to conflict with partners (i.e., sympathetic activation and/or parasympathetic withdrawal).

Moderators of the Association between Autonomic Arousal and Aggression

An additional limitation of research in this area is a failure to examine potential moderators of the association between ANS arousal and intimate aggression (Raine, 2002). In fact, emerging research supports the hypothesis that physiological risk factors are most strongly associated with aggressive conduct when combined with social or cognitive risk factors (e.g., Farrington, 1997; Sijtsema, Shoulberg, & Murray-Close, in press). One potential moderator is the quality of the romantic relationship, a factor that has been found to be associated with romantic relational aggression in previous research (Linder et al., 2002). In fact, although poor relationship quality is often conceptualized as a consequence of romantic aggression (e.g., Linder et al., 2002), it seems likely that poor relationship quality may exacerbate aggressive behaviors in at-risk individuals. This perspective is consistent with a developmental systems model of

intimate aggression (Capaldi, Kim, & Shortt, 2004), in which individual risk factors for aggression interact with current contextual influences such as partner behavior in the prediction of aggression, and with the suggestion that intimate aggression results from poor self-regulation during conflicts with romantic partners (Finkel, DeWall, Slotter, Oaten, & Foshee, 2009). In effect, physiological risk may be especially likely to result in romantic relational aggression in the context of interactions with romantic partners who exhibit high levels of conflict, disagreement, and negative affect. Thus, in the present study, we examined whether partner-reported relationship quality and observed partner negative affect during a conflict resolution task moderated the association between arousal and romantic relational aggression.

A second potential moderator of the association between autonomic arousal and romantic relational aggression is gender. To date, studies assessing the association between physiological reactivity and intimate aggression have tended to focus on male samples (e.g., Gottman et al., 1995; Babcock et al., 2005). As a result, it is unclear whether similar patterns are evident in the prediction of intimate aggression by female perpetrators. It is notable, however, that two recent studies did find an association between autonomic arousal and peer-directed relational aggression in female children and adolescents (Murray-Close & Crick, 2007; Sijtsema et al., in press), suggesting that these processes may be relevant to the development of aggression in females. Given the limited research in this area, however, we ran exploratory analyses to examine whether the association between autonomic arousal, relationship quality, and romantic relational aggression differed for males and females.

Study Hypotheses

In sum, the goal of the present study was to examine whether ANS arousal at rest and during a moderately stressful conflict resolution task was associated with romantic relational

aggression in a sample of heterosexual dating couples. We hypothesized that low resting SNS activity and exaggerated “fight or flight” responses to stress (SNS activation and/or PNS withdrawal) would be associated with heightened levels of romantic relational aggression. In addition, we examined whether relationship quality (partner-reported and partner negative affect during conflict) moderated the association between arousal and aggression. We expected that the predicted associations between ANS activity and romantic relational aggression would be strongest in low-quality relationships. Finally, we examined whether gender moderated the association between arousal, relationship quality, and aggression; however, these analyses were exploratory in nature.

Method

Participants

Participants included 115 heterosexual dating couples (mean length of relationship = 15.24 months, range = 3 weeks to 69 months, 73.9% Caucasian) who were recruited from a small Midwestern community via flyers and Listservs. The men averaged 20.73 years ($SD = 1.8$, range = 18-25) and the women averaged 20.15 years ($SD = 1.5$, range = 18-25). Each participant received \$10.00 as compensation for their participation.

Procedure

Before arriving in the laboratory, participants completed self-report questionnaires about themselves, their significant other, and their relationship in general. Couples were separated and each was interviewed about their childhood experiences (see Holland & Roisman, 2010). Following the interview, participants completed several self-report measures, including a questionnaire that listed 11 common relationship problem areas (e.g., money, communication, sex); participants rated the degree to which each problem area was currently an issue in their

relationship using a ten-point scale (1=*not a problem*, 10=*is a serious problem*). Importantly, participants were informed that their partner would see this questionnaire in the next part of the session. Next, couples were reunited to engage in a standard couple interaction task. Couples used the problem area questionnaire to decide on a problem area that they disagreed on most in their relationship and were given ten minutes to discuss the problem and arrive at a solution to this problem. Couples were also given five minutes to discuss areas they agreed about most in their relationship.

Physiological sensors were attached to participants' torsos and relevant readings were monitored second-by-second from an adjoining room during the interaction as well as during a three-minute rest period prior to the interaction, which provided a baseline measure of responding. Prior to the baseline, a research assistant instructed participants to be silent and to empty their minds of all thoughts, feelings, and emotions.

Physiological equipment. The acquisition system consisted of two Pentium computers, Snapmaster software, and James Long, Inc. bioamplifiers. This system allowed continuous recordings of physiological response from both participants during the interaction.

Video equipment. High-resolution color video cameras recorded the couples' interactions. The video cameras were embedded within a bookshelf located across the room from the participants and microphones were clipped to the participants' clothing to record conversation during the interactions.

Measures

Relational aggression. Each partner provided reports of the frequency that their romantic partner engaged in relational aggression within the context of the romantic relationship before arriving in the laboratory. Partners rated 5 items (e.g., "When my romantic partner is mad at me,

s/he won't invite me to do things with our friends", "My romantic partner tries to make me feel jealous as a way of getting back at me") on a scale from 1 ("not at all true") to 7 ("very true"). Scores were averaged across items to yield an overall relational aggression score. Previous research has demonstrated favorable psychometric properties of this measure and has included all subscale items in an appendix (Linder et al., 2002). This scale exhibited adequate internal consistency in the present sample, $\alpha = .76$.

Dyadic adjustment scale. Couples individually completed the Dyadic Adjustment Scale (DAS; Spanier, 1976) prior to arriving at the laboratory. The DAS is a 32-item questionnaire that has been used to assess adjustment/satisfaction in romantic relationships. More specifically, this measure assessed the degree of differences between couples, the amount of satisfaction felt in the relationship, the cohesion among partners, and the agreement about issues related to dyadic satisfaction. All of the items on the DAS were composited to create a total dyadic adjustment score (alpha = .88 for males and .86 for females), with higher scores indicating greater adjustment/satisfaction (theoretical range = 0 to 151).

Observed negative affect. The Interactional Dimensions Coding System (Kline et al., 2004) was used to code the couples' interactions and negative affect was specifically utilized for this analysis. Lack of eye contact, a cold or angry voice, and a tense or rigid posture would all be rated on this negative affect scale, which was rated on a Likert scale ranging from 1 (extremely uncharacteristic) to 9 (extremely characteristic). Fifty-two percent of dyads were rated by 2 coders for reliability purposes; the intra-class correlation for male negative affect was .76 and the intra-class correlation for female negative affect was .78.

Autonomic arousal. Physiological responses were recorded from participants during a baseline period and the disagreement discussion. Electrodermal response was measured by skin

conductance level (SCL; measured in microsiemens). A constant-voltage device was used to pass a small voltage between electrodes attached to the fingertips of the second and fourth fingers of the non-dominant hand. Both mean levels during the baseline period and reactivity in physiological responding were utilized in this analysis. Reactivity was calculated by subtracting mean levels of physiological responses during the baseline from mean levels during the disagreement epochs of the interaction.

To assess RSA, electrode stickers were placed on opposite sides of each participant's torso and a ground lead was placed on the sternum. Cardiac inter-beat intervals (IBI) were measured in milliseconds between successive R waves of the electrocardiogram (EKG). RSA was calculated by spectral analysis of the electrocardiogram data using a fast Fourier transformation. Fast Fourier transformation consists of separating HR variability into the spectral bands that produce it. To estimate RSA (measured in ms^2), variability between .12 and .40 Hz (high frequency variability typically connected with respiration in adults) was sampled during the baseline period and the conflict resolution discussion. Resting RSA was the natural log of mean level during the baseline period and RSA change scores were calculated after natural log transformations of the raw RSA data. Note that the procedure described above is used widely in the psychophysiological literature (e.g., the approach used is virtually identical to Porges' well known algorithm).

Results

Descriptives

Descriptive information and correlations among study variables for males and females are presented in Table 1. Consistent with previous research in this area (e.g., Bagner et al., 2007; Linder et al., 2002), the frequency of relational aggression was low, suggesting that these

behaviors were relatively infrequent in the context of romantic relationships. In addition, among both males and females, relational aggression was negatively associated with partner-reported relationship quality and positively associated with partner expression of negative affect during the interactions. Relational aggression was associated with low resting skin conductance for males but not females.

Reactivity to Conflict Discussion

We conducted a series of analyses to verify that the conflict discussion did result in an autonomic stress response among participating couples. Given the nested nature of the data, analyses were run separately for males and females. Paired sample *t*-test analyses with physiological arousal at rest and during the conflict discussion as the repeated measures factor indicated that males exhibited increases in skin conductance during the conflict discussion ($M = 15.54$, $SD = 5.25$), relative to resting arousal, ($M = 11.19$, $SD = 4.53$), $t(114) = 19.02$, $p < .001$. In contrast, males did not exhibit change in RSA ($M = 6.88$, $SD = .91$ versus $M = 6.86$; $SD = .98$). Females exhibited increases in skin conductance ($M = 14.72$; $SD = 4.17$ versus $M = 10.43$; $SD = 3.77$), $t(114) = 21.00$, $p < .001$, and RSA withdrawal to the conflict discussion relative to baseline ($M = 6.97$, $SD = .92$ versus $M = 7.11$, $SD = .97$), $t(114) = -2.17$, $p < .05$. In other words, males and females exhibited SNS activation whereas females but not males exhibited PNS withdrawal to the conflict discussion.

Resting Autonomic Arousal

Resting Skin Conductance. A series of Hierarchical Linear Models (HLMs) were run following recommendations by Campbell and Kashy (2002) to account for the nested nature of the data. All continuous predictors were centered prior to analyses. When significant interaction effects emerged, follow-up simple slope analyses for HLM (see Preacher, Curran, & Bauer,

2006) at 1 SD above and below the mean of the moderator variable were used to probe these interactions. Moreover, given the statistical challenges in detecting interactions in nonexperimental designs (McClelland & Judd, 1993) and the relatively complex analyses, 3-way interactions that approach conventional levels of statistical significance ($p < .10$) are reported. Finally, given the overlap in the models, significant findings for effects that emerged in multiple analyses are only reported once.

The first analyses examined whether relationship quality moderated the association between resting SCL and relational aggression. In the first HLM analysis, SCL, partner-reported relationship quality, gender (males = -1; females = 1), and the interactions between these factors served as predictors of relational aggression. The results, depicted in Table 2, indicated that lower partner-reported relationship quality was associated with heightened levels of relational aggression; in addition, gender was associated with relational aggression, with females exhibiting higher levels of these behaviors than males. Finally, the interaction between resting SCL, gender, and relationship quality was significant. Follow-up analyses indicated that relational aggression was high in low-quality relationships regardless of SCL. However, in high quality relationships, high SCL was associated with romantic relational aggression among females whereas low SCL was marginally associated with romantic relational aggression among males ($p = .07$; see Figure 1).

A parallel analysis examined whether observed relationship quality, as indexed by partner negative emotional expression during conflict, moderated the association between SCL and relational aggression. The results, depicted in Table 2, indicated that observed negative affect was associated with heightened relational aggression. In addition, there was a significant interaction between SCL and partner negative affect. Follow-up simple slope analyses indicated

that low SCL was associated with heightened relational aggression when partner negative affect was high but not when partner negative affect was low. This effect was further qualified by a marginally significant interaction between SCL, partner negative affect, and gender ($p = .07$). Follow-up simple slope analyses indicated that, for males, low SCL was marginally associated with romantic relational aggression at high levels of partner negative affect ($p = .07$) but not at low levels of partner negative affect. For females, low SCL was associated with romantic relational aggression at high levels of partner negative affect whereas high SCL was associated with romantic relational aggression at low levels of partner negative affect (see Figure 2).

Resting Respiratory Sinus Arrhythmia. A parallel set of analyses were conducted to examine the interaction between baseline RSA, partner-reported relationship quality, and gender in the prediction of relational aggression. Results indicated that RSA was positively associated with heightened levels of relational aggression (see Table 3); additionally, the interaction between RSA and partner-reported relationship quality was also significant. Follow-up analyses indicated that RSA was most strongly associated with romantic relational aggression when relationship quality was low. Moreover, these effects were qualified by a significant interaction between gender, partner-reported relationship quality, and RSA. Follow-up analyses indicated that the association between RSA and relational aggression was strongest among males whose partners reported low relationship quality. The results of the analysis including partner negative affect indicated that negative affect did not moderate the association between RSA and romantic relational aggression (see Table 3).

Autonomic Reactivity to Conflict Discussion

Skin Conductance Reactivity. In the next set of analyses, autonomic reactivity, relationship quality, gender, and the interactions between autonomic reactivity, relationship

quality, and gender served as predictors of relational aggression. Results for SCR, depicted in Table 2, indicated that the interaction between SCR, partner negative affect, and gender approached conventional levels of statistical significance, $p = .09$. Follow-up simple slope analyses indicated that SCR was marginally associated with relational aggression among women whose partners exhibited high levels of negative affect during the conflict discussion ($p = .08$). In contrast, SCR was not associated with relational aggression among men or among women whose partners exhibited low levels of negative affect during the conflict discussion (see Figure 3). The results of the analysis including partner-reported relationship quality indicated that this measure did not moderate the association between baseline SCR and romantic relational aggression (see Table 2).

Respiratory Sinus Arrhythmia Reactivity. Findings for analyses including RSAR indicated that RSA withdrawal was associated with heightened relational aggression; however, this effect was moderated by partner reports of relationship quality (see Table 3). Follow-up simple slope analyses indicated that although RSA withdrawal during conflict was associated with relational aggression in low- and high-quality relationships, this effect was stronger in partner-reported low-quality relationships. In contrast, partner negative affect did not moderate the association between RSAR and relational aggression.

Discussion

The current study demonstrated that ANS arousal was associated with romantic relational aggression in a sample of young adult heterosexual dating partners. Specifically, low SNS arousal (indexed by SCL), high PNS arousal (indexed by RSA) and heightened “fight or flight” responses to conflict (SCL activation and RSA withdrawal) were associated with romantic relational aggression. These findings are consistent with fearlessness and sensation-seeking

theories (e.g. Raine, 2002; van Goozen et al., 2007), and suggest that exaggerated stress responses following conflict may serve as a risk factor for aggressive conduct. Moreover, ANS risk appeared to be exacerbated by low-quality romantic relationships. Finally, participant gender was also an important moderator of the proposed relations. These findings are some of the first to explore the association between ANS functioning and romantic relational aggression, and contribute to a growing research literature implicating biological factors such as physiological arousal in aggression against romantic partners (e.g., Babcock et al., 2005; Gottman et al., 1995). Additionally, these results highlight the importance of considering moderators of the association between physiological arousal and romantic aggression.

Resting Autonomic Arousal

The results of the present study indicated that low resting SNS and high resting PNS predicted heightened perpetration of relational aggression against romantic partners. However, these findings primarily emerged in the context of low-quality relationships. For example, low resting SCL was associated with romantic relational aggression when partners exhibited high, but not low, levels of negative affect during conflict. Similarly, resting RSA was associated with romantic relational aggression, particularly in the context of partner-reported low quality relationships. Although some researchers have argued that low resting RSA will serve as a risk factor for aggression because it is an index of emotional dysregulation (e.g., Beauchaine et al., 2007; Mezzacappa et al., 1997), other researchers have found a positive association between RSA functioning and aggression, particularly in community samples (e.g., Dietrich et al., 2007). Moreover, a large body of research has documented an association between low resting heart rate and aggressive behavior (Lorber, 2004; Scarpa & Raine, 1997), and low resting heart rate can reflect low SNS arousal and/or heightened PNS arousal (Scarpa & Raine, 1997). These findings

suggest that the well-replicated finding that low resting heart rate is associated with aggressive conduct may reflect both atypical SNS and PNS functioning among aggressive youth.

Autonomic Reactivity

Results from the present study indicated that heightened “fight or flight” responses to conflict were associated with romantic relational aggression, particularly in the context of low quality relationships. For example, SCR reactivity was marginally associated with heightened levels of romantic relational aggression among women whose partners exhibited high levels of negative affect during the conflict discussion. In addition, RSA withdrawal predicted heightened levels of romantic relational aggression, particularly among males in low partner-reported quality relationships. These findings are consistent with previous research demonstrating that SNS activation and PNS withdrawal in response to stress are risk factors for aggressive behavior (Scarpa & Raine, 1997) and findings from previous research documenting that exaggerated “fight or flight” responses are most predictive of relatively non-severe levels of aggression against romantic partners (Babcock et al., 2005).

Relationship Quality

The majority of findings indicated that ANS activity was most strongly associated with romantic relational aggression in the context of low quality relationships. These findings highlight the importance of considering the dyad (see Campbell & Kashy, 2002) when examining processes involved in intimate aggression. In fact, results are consistent with a developmental systems model of intimate aggression (Capaldi, Kim, & Shortt, 2004), which suggests that negative partner behaviors may interact with violent predispositions in the emergence of aggression against romantic partners. For example, low resting arousal is thought to predict aggressive conduct because it is an index of fearlessness (Scarpa & Raine, 1997).

However, findings from the present study suggest that this fearlessness may only translate into romantic relational aggression in the context of relationships that frequently involve negative or strained interactions. These results are also consistent with an emerging body of research suggesting that physiological risk factors for aggression may only result in such conduct when combined with negative social or contextual experiences (e.g., Farrington, 1997; Sijtsema et al., in press).

However, in several instances, ANS arousal was associated with romantic relational aggression in high quality relationships. Specifically, among males, low SCL was marginally associated with relational aggression in partner-reported high quality relationships. Follow-up analyses indicated that males exhibited relatively high levels of relational aggression in partner-reported low quality relationships, regardless of SCL. These findings suggest that the distressed relationship may have overwhelmed individual differences in autonomic risk in the prediction of males' relational aggression. In addition, among females, an unexpected pattern emerged in which SCL was positively associated with relational aggression in the context of high quality relationships (as assessed by both partner-reported quality and partner negative affect). High resting SCL may reflect anxiety and fear (Clark & Watson, 1991). In high quality relationships, women may be unlikely to use relational aggression against their partners unless they have high levels of anxiety surrounding their romantic relationship (e.g., they are frequently jealous). In fact, researchers have suggested that relational aggression may be used in close relationships to gain control over relationship partners and to manipulate partners to avoid interactions with others who potentially pose a threat to the relationship (see Grotjeter & Crick, 1996 for a discussion of this process within close friendships). However, future research is necessary to investigate this possibility.

Gender Differences

Interestingly, a number of sex differences emerged in the association between ANS arousal and romantic relational aggression. In general, SNS activity was more strongly associated with aggression among females whereas PNS activity was most strongly associated with aggression among males. These findings are consistent with previous research documenting gender differences in the association between ANS activity and relational aggression against peers (Murray-Close & Crick, 2007). The findings also highlight the possibility that different mechanisms underlying resting arousal and stress responses may place males and females at risk for aggression against romantic partners. RSA activity is theorized to underlie emotion regulation functions such as self-soothing, calming, and inhibiting arousal (Porges, 2007), whereas as skin conductance reactivity is thought to reflect intensity of emotional responses (Lorber, 2004). Taken together, these findings highlight the possibility that the activation of intense emotions may be a stronger predictor of female intimate aggression whereas atypical emotion regulation capabilities may be a stronger predictor of male intimate aggression. However, additional research is necessary to investigate this possibility.

Study Strengths and Limitations

Although this study provides a number of interesting findings regarding the association between ANS arousal and romantic relational aggression, it is important to consider the study in the context of its strengths and limitations. Strengths include the use of varied physiological measures, including skin conductance and RSA. This approach allows for the consideration of both SNS and PNS functioning and provides a more nuanced understanding of physiological arousal than studies with a focus on measures such as blood pressure and heart rate (which are influenced by both SNS and PNS activity). In addition, although the majority of research in the

area of psychophysiological risk for intimate aggression has focused on reactivity (Michonski & Babcock, 2009) rather than resting arousal (see Babcock et al. 2004, for a notable exception), many of our significant findings emerged regarding resting arousal, highlighting the importance of considering both factors in studies of intimate aggression. Finally, to date, few studies have examined physiological risk factors for intimate aggression in women, and to our knowledge no studies have examined how ANS functioning may relate to romantic relational aggression.

Despite these strengths, it is important to acknowledge the limitations of the present study. Given the relatively small sample size (115 couples), power was limited. As a result, several findings approached but did not reach conventional levels of statistical significance and marginally significant findings must be interpreted with caution. In addition, we only examined heterosexual romantic relationships. It will be important for future studies to explore how ANS arousal may be related to the use of romantic relational aggression in the context of homosexual relationships. Because we did not have measures of intimate violence or physical aggression, it was not possible to compare findings for physical versus relational forms of romantic aggression. Future research should assess both physical and relational aggression in the context of romantic relationships. In addition, the participants in this study might not be representative of community members. For example, our sample included a number of college students and focused on dating relationships. Although research suggests that dating relationships in young adults are a salient context of aggression against romantic partners (Straus, 2004), future research would benefit from replicating our findings with representative samples and with older couples. Finally, consistent with previous research, the frequency of relational aggression in the context of romantic relationships was relatively low. As a result, these behaviors likely reflect similar processes as those involved in “common couple violence,” in which aggression results from

infrequent lapses of control in conflict situations (Archer, 2000). Additional research exploring the use of relational aggression in contexts of abuse or among perpetrators who frequently engage in such behaviors may reveal distinct physiological profiles in these populations (e.g., blunted, rather than exaggerated, “fight or flight” responses to stress may be associated with aggression). However, future research is necessary to address this possibility.

Conclusion

Despite these limitations, our findings provide some of the first evidence that ANS arousal (resting and reactivity) is associated with romantic relational aggression. Overall, the results have a number of important implications for understanding the use of aggression against romantic partners. For example, given the moderating role of relationship quality, interventions may benefit from the inclusion of relationship skills training (see Murphy, Meis, & Eckhardt, 2009). Given the many deleterious effects of romantic relational aggression (e.g., Linder et al., 2002), it is important that interventions include a focus on these potentially more subtle but nonetheless harmful forms of romantic aggression. Finally, consideration of accumulating risk factors, including both physiological and social, may provide important insights regarding the identification of individuals at-risk for intimate partner aggression and, ultimately, suggest effective approaches regarding the prevention of these harmful behaviors.

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Table 1

Means, Standard Deviations, and Correlations among Study Variables for Males and Females (in parentheses)

	1.	2.	3.	4.	5.	6.	7.
1. Relational Aggression							
2. DAS	-.29** (-.22*)						
3. Negative Affect	.27** (.26**)	-.23* (-.23*)					
4. Resting SC	-.19* (.04)	.15 (-.03)	.11 (.09)				
5. Resting RSA	.06 (-.11)	-.10 (.02)	.00 (-.02)	.09 (-.02)			
6. SC Reactivity	-.04 (.07)	.01 (.14)	.08 (.01)	.04 (-.06)	-.09 (.11)		
7. RSA Reactivity	-.04 (.08)	.18† (-.07)	.05 (.17†)	-.13 (.00)	-.48** (-.41**)	.00 (-.11)	
<i>Mean</i>	1.77 (2.09)	119.42 (120.79)	4.50 (4.75)	11.19 (10.43)	6.86 (7.11)	4.35 (3.94)	.03 (-.13)
<i>Standard Deviation</i>	.90	13.95	1.73	4.53	.98	2.45	.75

(1.07) (12.36) (1.82) (3.77) (.97) (2.01) (.66)

Note. † $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$

Table 2

Skin Conductance Arousal, Relationship Quality (Partner-Reported and Observed), and Relational Aggression.

Relationship Quality	Resting SC		SC Reactivity	
	Reported	Observed	Reported	Observed
Estimate (SE)				
Intercept	1.92*** (.06)	1.98*** (.07)	1.94*** (.06)	1.96*** (.07)
Skin Conductance (SC)	-.006 (.01)	-.02 (.02)	.01 (.03)	.04 (.03)
Rel. Quality (RQ)	-.04*** (.005)	.08* (.04)	-.04*** (.005)	.09* (.04)
Gender	.15** (.05)	.19** (.06)	.13* (.05)	.18** (.06)
Gender X SC	.03† (.01)	.02 (.01)	.02 (.02)	.04 (.03)
Gender X RQ	-.005 (.004)	.04 (.03)	.00 (.004)	.06† (.03)
SC X RQ	.001 (.001)	-.03* (.01)	.002 (.002)	.00 (.02)
SC X RQ X Gender	.003* (.001)	-.02† (.01)	.00 (.002)	.03† (.02)

Note. Reported quality = Partner Dyadic Adjustment Scale. Observed quality = partner negative affect during conflict.

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

Table 3

RSA Arousal, Relationship Quality (Partner-Reported and Observed), and Relational Aggression.

Relationship Quality	Resting RSA		RSA Reactivity	
	Reported	Observed	Reported	Observed
Estimate (SE)				
Intercept	1.93*** (.06)	1.93*** (.07)	1.93*** (.06)	1.94*** (.07)
RSA	1.23* (.49)	.02 (.07)	-2.23** (.72)	-.01 (.09)
Rel. Quality (RQ)	-.04*** (.004)	.09* (.04)	-.04*** (.004)	.08* (.04)
Gender	.15** (.05)	.15* (.06)	.15** (.05)	.16** (.06)
Gender X RSA	-.09 (.06)	-.04 (.06)	.05 (.08)	.05 (.09)
Gender X RQ	-.001 (.004)	.05† (.03)	.001 (.004)	.05 (.03)
RSA X RQ	-.01* (.004)	-.06 (.04)	.02** (.006)	.04 (.05)
RSA X RQ X Gender	.012** (.004)	-.02 (.04)	-.009 (.006)	-.01 (.05)

Note. Reported quality = Partner Dyadic Adjustment Scale. Observed quality = partner negative affect during conflict.

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

Figure Captions

Figure 1. Three-way interaction of resting skin conductance, partner-reported relationship quality (PDAS), and gender predicting romantic relational aggression.

Figure 2. Three-way interaction of resting skin conductance, partner negative affect (PNA), and gender predicting romantic relational aggression.

Figure 3. Three-way interaction of skin conductance reactivity, partner negative affect (PNA), and gender predicting romantic relational aggression.

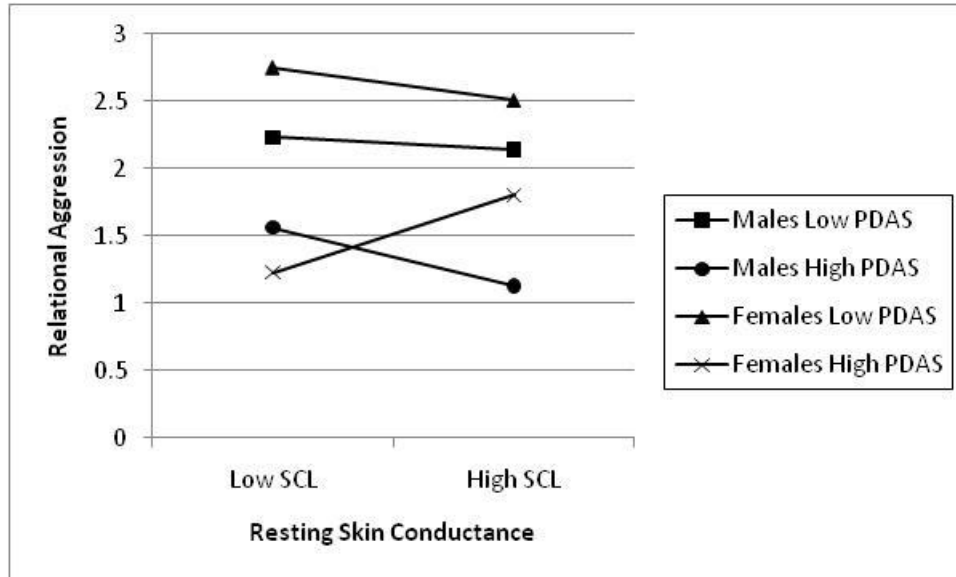


Figure 1. Three-way interaction of resting skin conductance, partner-reported relationship quality (PDAS), and gender predicting romantic relational aggression.

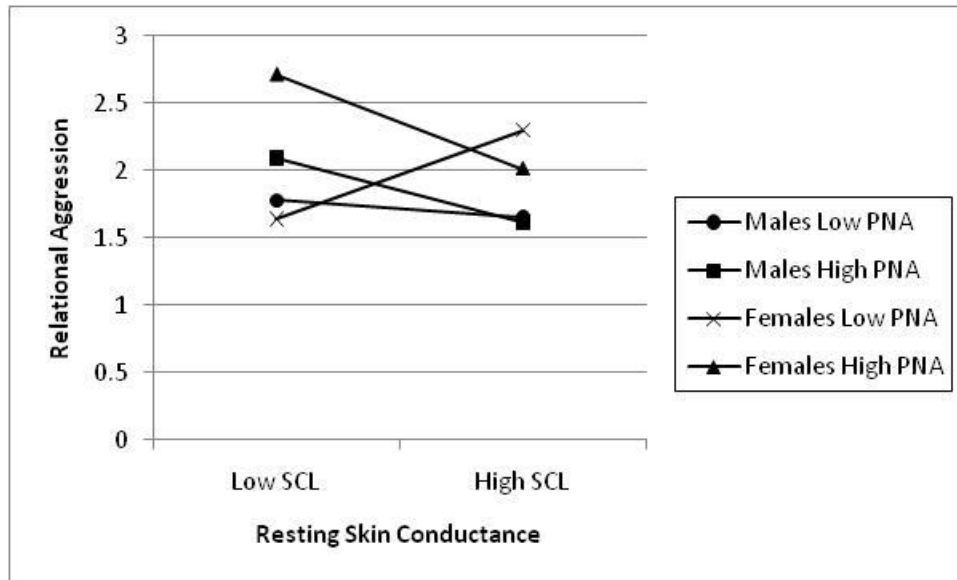


Figure 2. Three-way interaction of resting skin conductance, partner negative affect (PNA), and gender predicting romantic relational aggression.

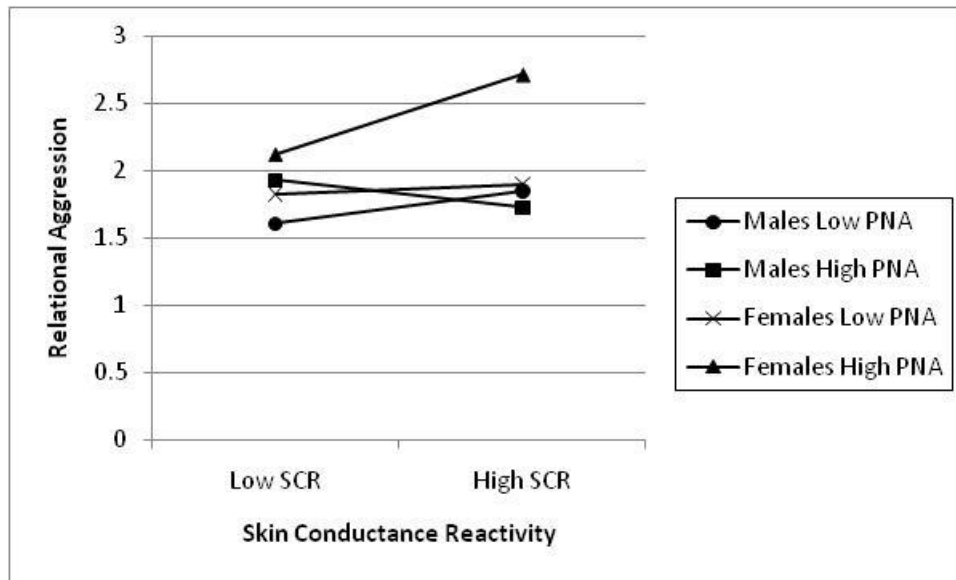


Figure 3. Three-way interaction of skin conductance reactivity, partner negative affect (PNA), and gender predicting romantic relational aggression.