Journal of Research in Personality 57 (2015) 89–99

Contents lists available at ScienceDirect

Journal of Research in Personality

journal homepage: www.elsevier.com/locate/jrp

Attachment insecurity as a moderator of cardiovascular arousal effects following dyadic support

Hadil Kordahji [a], Eran Bar-Kalifa [b], Eshkol Rafaeli [a,b,*]

[a] Gonda Multidisciplinary Brain Research Center, Bar-Ilan University, Israel
[b] Department of Psychology, Bar-Ilan University, Israel

ARTICLE INFO

Article history:
Available online 6 May 2015

Keywords:
Emotional support
Attachment anxiety
Attachment avoidance
Intimate relationships
Psychophysiology
Actor–partner-interdependence-model
Multi-level modeling
Dyadic interaction

ABSTRACT

We examine the cardiovascular arousal effects of emotional support receipt, and the moderation of these by the support recipient's and provider's attachment. Seventy couples engaged in a laboratory dyadic supportive interaction, while their ECG was monitored. With more emotional support, men with high attachment anxiety showed greater arousal reduction during the dyadic interaction, whereas men with low attachment anxiety showed less reduction; additionally, women coupled with partners with high attachment anxiety showed greater arousal reduction, whereas women coupled with partners with low attachment anxiety showed less reduction. Men and women with high attachment avoidance showed less arousal reduction, whereas those with low attachment avoidance showed greater reduction. These results highlight the differential ways in which support gets under the skin.

1. Introduction

1.1. Support

From cradle to grave, humans are social beings who rely on help and comfort from significant others at times of need and stress (cf., Bowlby, 1969). Indeed, the perceived availability of significant others' support is strongly associated with health and well-being (e.g., Cohen & Wills, 1985; Gruenewald & Seeman, 2010; Hobfoll, 2009; Taylor, 2007). Once we enter adulthood, the most salient bonds for many people are their romantic relationships; *perceiving* these as supportive is associated with both individual well-being and relationship satisfaction and functioning (e.g., Brock & Lawrence, 2009; Collins, Dunkel Schetter, Lobel, & Scrimshaw, 1993; Cutrona, Russell, & Gardner, 2005; Gable, Gosnell, Maisel, & Strachman, 2012; Rafaeli & Gleason, 2009; Sullivan, Pasch, Johnson, & Bradbury, 2010).

However, the last decade has uncovered a paradox with regards to social support. In contrast to *perceived support availability* which has consistent positive outcomes, *enacted* support has been unexpectedly associated with mixed outcomes. It sometimes has positive effects, but null or even negative effects are also common (c.f., Gable et al., 2012; McClure et al., 2014; Rafaeli & Gleason, 2009; Rini & Dunkel Schetter, 2010). The effectiveness of enacted support seems to hinge on several factors, including the nature of the stressful situations (e.g., Cohen & McKay, 1984; Cutrona & Russell, 1990), the timing of support provided (e.g., Bolger & Amarel, 2007; Pearlin & McCall, 1990), the need of the recipient (Bar-Kalifa & Rafaeli, 2013; Cutrona, Shaffer, Wesner, & Gardner, 2007), the skill of the support provider (e.g., Howland & Simpson, 2010; Rafaeli & Gleason, 2009; Rini & Dunkel Schetter, 2010), the type of relationship between provider and recipient (Thoits, 2011), and the recipient's and provider's personality traits (e.g., Collins, Ford, Guichard, Kane, & Feeney, 2010; Verhofstadt, Buysse, Ickes, Davis, & Devoldre, 2008).

1.2. Attachment

One personality trait that has been widely found to determine the effectiveness of support is *attachment style* (e.g., Campbell, Simpson, Kashy, & Rholes, 2001; Collins, Ford, & Feeney, 2011; Rini & Dunkel Schetter, 2010). According to attachment theory (Bowlby, 1973, 1980, 1982; Mikulincer & Shaver, 2008), humans are born with an innate psychobiological attachment behavioral system. This system motivates people to seek proximity to significant others (attachment figures) in times of need and stress, and to create emotional bonds with people they rely on for protection, comfort, and support (Bowlby, 1982; Mikulincer & Shaver, 2008; Waters & Cummings, 2003). Optimally, when an attachment figure serves as a *safe haven* (i.e., is available, sensitive, and responsive in

* Corresponding author at: Bar-Ilan University, Department of Psychology, Ramat-Gan 5290002, Israel.
E-mail address: eshkol.rafaeli@gmail.com (E. Rafaeli).

http://dx.doi.org/10.1016/j.jrp.2015.04.004
0092-6566/

time of need) and as a *secure base* (i.e., provides a safe place to retreat should one's exploration become too threatening), one will build a stable sense of attachment security and confidence in seeking support. In contrast, when attachment needs are not met, one may develop a sense of attachment insecurity. These secure or insecure working models tend to persist and accompany people throughout their lifespan, thus influencing their future close relationships (Collins et al., 2010; Hazan & Shaver, 1987; Mikulincer & Shaver, 2008).

Individual differences in attachment are generally conceptualized along two relatively orthogonal continuous dimensions: anxiety and avoidance (Brennan, Clark, & Shaver, 1998; Simpson, Rholes, & Phillips, 1996). The former reflects the degree to which a person worries that attachment figures (e.g., spouse) will not be available in times of need. The latter reflects the extent to which a person mistrusts attachment figures and strives to maintain independence and emotional distance from them. Accordingly, *securely* attached individuals are low on these two dimensions (Collins et al., 2011; Hazan & Shaver, 1987; Kobak & Sceery, 1988; Mikulincer & Shaver, 2008).

Attachment styles can be understood in terms of rules that guide cognitive and behavioral responses (Bowlby, 1973, 1980, 1982), particularly to emotionally distressing situations. For relatively securely attached individuals, activation of the attachment system involves engaging in the *primary* attachment strategy: *proximity seeking* (Mikulincer & Shaver, 2003), which increases the use of effective emotional regulation strategies in times of need (Collins et al., 2010; Fraley & Shaver, 2000; Kobak & Sceery, 1988; Mikulincer & Shaver, 2007, 2008). These strategies aim to decrease stress and maintain comfortable and supportive intimate relationships. They include optimistic beliefs about others' trustworthiness and goodwill as well as a sense of self-efficacy, an ability to acknowledge and express distress, and an ease in relying on others' support and in being grateful for it (Collins et al., 2010; Mikulincer & Shaver, 2008).

In contrast, insecurely attached individuals engage in *secondary* attachment strategies. Specifically, due to their perceptions that attachment figures are unavailable, *anxiously attached* individuals tend to engage in *hyperactivating strategies:* making stronger attempts to seek proximity and gain attention in times of need (Collins, Ford, Guichard, & Feeney, 2006; Collins et al., 2010; Mikulincer & Shaver, 2008). These strategies include: urgent, energetic, and insistent attempts to attain proximity and love, as well as begging for support, insisting on it, or attempting to coerce another person into providing it (Cassidy & Berlin, 1994; Collins et al., 2011; Mikulincer & Shaver, 2007, 2008). These ineffective strategies cause the anxiously attached individual to remain perpetually vigilant regarding threat-related cues of unavailability; in turn, this hypervigilance intensifies distress (Collins et al., 2010; Mikulincer & Shaver, 2008) and produces anger and dissatisfaction in the partners (Downey, Freitas, Michaelis, & Khouri, 1998).

Due to their distrust about attachment figures' ability to alleviate their distress, *avoidantly attached* individuals tend to engage in *deactivating strategies:* trying to shut down the attachment system in order to deny their needs (Cassidy & Kobak, 1988; Mikulincer & Shaver, 2008). These strategies include: denying emotions in time of need, harboring negative thoughts or feelings, concealing anger and relying on ineffective problem solving, and maintaining strong feelings of defensiveness and hostility in reaction to their partners (Collins & Feeney, 2000; Collins et al., 2006; Collins et al., 2010; Mikulincer & Shaver, 2007; Mikulincer & Shaver, 2008).

1.3. Attachment and support

Not surprisingly, individuals with different attachment styles differ in the manner in which they engage in support transactions within close romantic relationships (Campbell et al., 2001; Collins et al., 2010). If individuals experience their partners as a *"secure base"* and *"safe haven"*, they could turn to them in stressful time and seek help in an adaptive way; in turn, their partners would be able to recognize the distress and be available for support and assistance (e.g., Collins & Feeney, 2000; Collins, Guichard, Kane, & Feeney, 2004).

Evidence for this effective "dance" of dyadic support was obtained in a naturalistic experience-sampling study examining reciprocal dyadic support in which partners served as both recipients and providers (Davila & Kashy, 2009). In this study, daily attachment security was associated with the most adaptive support experiences – for providers and recipients. In contrast, insecurity was associated with maladaptive daily support processes. For example, attachment avoidance was associated with less support seeking, and attachment anxiety was associated with less support provision.

Partners' emotional or behavioral regulation plays a crucial role in protecting relationships in which one (or both) partner is insecurely attached (Lemay & Dudley, 2011; Simpson & Overall, 2014). For example, Simpson and Overall (2014) argued that partners' commitment and behavioral accommodation relieved anxiously attached individuals' fears and improved their threat-based reactions, producing secure feelings and more constructive emotions and behaviors. Additionally, they suggested that some partners of avoidantly attached individuals succeeded in regulating the defenses of the avoidant partners by "softening" their influence (i.e., by being sensitive to their partners' needs, validating their viewpoint, and acknowledging their efforts and good qualities). The avoidant individual, whose partner displayed more softening, exhibited less anger and withdrawal.

The effects of attachment styles on support processes are likely to be reflected not only in the subjective experience of the interacting partners or in their observable behavior (e.g., Campbell et al., 2001), but also under their skin – in hormonal or electrophysiological reactivity (e.g., Pietromonaco, DeBuse, & Powers, 2013; Robles & Kane, 2014; Stanton & Campbell, 2014; Zayas, Shoda, Mischel, Osterhout, & Takahashi, 2009). Attachment theory is a particularly appropriate framework for understanding actor and partner effects on physiological markers because one of the central functions of an attachment relationship is to regulate physiology (Bowlby, 1969; Diamond, 2001). As Robles and Kane (2014, p.516) recently noted, "attachment bonds function to maintain felt security by attenuating psychological and physiological stress reactivity (Diamond & Hicks, 2004), and by potentially serving as psychobiological regulators of felt security (Sbarra & Hazan, 2008)".

Hyperactivating and deactivating strategies can even be observed at the neural level (Stanton & Campbell, 2014). For example, in an ERP study, attachment insecurity was linked with N400 amplitude. More anxious women, who tend to use hyperactivating strategies, showed augmented N400 (i.e., more negative-going and longer-lasting) amplitude; whereas more avoidant women, who tend to use deactivating strategies, showed dampened (i.e., less negative-going and longer-lasting) amplitude (Zayas et al., 2009).

Indeed, a relatively new and important direction taken by adult attachment researchers has been the exploration of the biological underpinnings and correlates of attachment styles and patterns of stress reactivity, both in general and specifically within the context of dyadic interactions (Diamond, 2001; Diamond & Fagundes, 2008; Laurent & Powers, 2007; Powers, Pietromonaco, Gunlicks, & Sayer, 2006; Quirin, Pruessner, & Kuhl, 2008). Across studies, the main pattern emerging is that people with insecure attachment have heightened physiological reactivity to stress. This has been studied in greatest depth with Autonomic Nervous System (ANS) reactivity (e.g., Allen & Miga, 2010; Diamond & Fagundes, 2010; Diamond & Hicks, 2004, 2005; Diamond, Hicks, &

Otter-Henderson, 2011; Levenson, 2003; Porges, Doussard-Roosevelt, & Maiti, 1994).

Research on attachment and the ANS suggests that both attachment insecurity dimensions (i.e., anxiety and avoidance) are associated with heightened ANS reactivity to non-relationship and to relationship-relevant stressors (Allen & Miga, 2010; Brooks, Robles, & Dunkel Schetter, 2011; Diamond & Fagundes, 2010; notably, the results regarding non-relationship stressors are less consistent: see Robles & Kane, 2014). For example, *anxious* individuals show elevated blood pressure and heart rate in response to relationship conflict (Diamond & Fagundes, 2010; Feeney & Kirkpatrick, 1996; Gallo & Matthews, 2006; Roisman, 2007). Similar physiological patterns of reactivity were shown in *avoidant* individuals: contrary to their verbal reports of lower levels of distress, they show amplified blood pressure, heart rate, and electrodermal levels in response to relationship-relevant stressors (Carpenter & Kirkpatrick, 1996; Diamond & Fagundes, 2010; Feeney & Kirkpatrick, 1996; Kim, 2006).

However, the literature on attachment and physiology is still in its infancy, and is characterized by several important limitations (noted in recent reviews by Robles and Kane (2014) and Stanton & Campbell (2014)). First, most of the literature examining attachment and physiology within dyadic interactions involves studies in which partners discuss conflicts within their relationship (e.g., Wright & Loving, 2011; for exceptions, see Brooks et al., 2011; Meuwly et al., 2012; Robles, Brooks, Kane, & Schetter, 2013). Less is known about the physiological correlates of other types of exchanges. This is an important limitation, given that most interactions between romantic partners are not conflictual in nature (e.g., McGonagle, Kessler, & Schilling, 1992; Rafaeli, Cranford, Green, Shrout, & Bolger, 2008). In the current study we will focus on the cardiovascular arousal which accompanies the disclosure of a personal concern; such personal disclosure creates an opportunity for the partner to serve as a "safe haven" and/or "secure base", and may be important for understanding more frequent relationship and physiological processes among both secure and insecure individuals.

A second limitation of the existing literature is that most studies examining the physiological correlates of attachment styles in the context of dyadic interactions (conflictual or not) have not focused on the ANS, but rather on the hypothalamic–pituitary–adrenocortical axis (HPA; e.g., Brooks et al., 2011; see review by Pietromonaco et al., 2013). Although both systems are significantly involved in stress regulation, their functioning is different. For example, whereas ANS responses to challenge are observed in a matter of minutes and terminate quickly after the challenge ends, the response of cortisol (a hormone involved in HPA axis activity) to challenge is observed over longer-term periods (i.e., cortisol peaks are observed 20–40 min after the exposure to the challenge and terminate after more than an hour; Dickerson & Kemeny, 2004). As such, moment to moment changes in the physiological responses to attachment-related stressors may be better captured by examining the short-term fluctuations of ANS reactivity.

There are a number of autonomic measures that have been employed as markers of arousal, including HR or heart period, electrodermal responses, EMG tension in neck muscles, plasma catecholamine, and glucocorticoid levels. These are usually correlated, but often not extremely highly. There is at present no generally accepted "best" marker—they all index somewhat different arousal dimensions. However, most stress paradigms entail reciprocal parasympathetic withdrawal and sympathetic activation (Berntson et al., 1994). Consequently, the current study focuses on heart period (indexed using the inter-beat-interval; IBI) an index sensitive to both branches of the ANS (Berntson, Quigley, & Lozano, 2007). Heart period often yields stronger associations than alternative cardiac indices (e.g., HRV) with both self-reported and behavioral performance measures of stress (e.g., Tanosoto et al., 2015), and has been found to be tied to the quality of dyadic support (Kirsch & Lehman, 2014).

Another limitation in the attachment and physiology literature that the effects of the partner's attachment on the actor's physiology (i.e., partner effects) are usually neglected (for exceptions, see Beck, Pietromonaco, DeBuse, Powers, & Sayer, 2013; Ben-Naim, Hirschberger, Ein-Dor, & Mikulincer, 2013; Brooks et al., 2011). Dyadic approaches which take into account the effects of both actors' and partners' attachment on individuals' physiology are needed, as the partner's attachment style has been shown to play a role in both personal and relational outcomes (e.g., Brooks et al., 2011; Campbell et al., 2001).

In summary, as Stanton and Campbell's (2014) review of this emerging field notes, dyadic support has the capacity to lead to some beneficial psychological effects, even for those who are insecurely attached; in contrast, far less is known about the capacity for dyadic support to get under the skin for insecurely attached individuals. The few studies that have explored the physiological effects of support, suggest that insecure attachment disrupts the ability to gain much physiological relief from social support (e.g., Brooks et al., 2011; Ditzen et al., 2008; Meuwly et al., 2012). However, few studies have gone beyond the three limitations mentioned, to: (a) examine non-conflictual situations, (b) examine other systems beside the HPA, or (c) adopt a dyadic approach. We believe that attending to these limitations will have the potential to reveal the soothing effects of support on physiology even for insecurely attached individuals.

1.4. The current study

The goal of the present study is to test the cardiovascular reactivity that accompanies a dyadic support interaction in which partners alternate as support providers and recipients, and to determine whether individual differences in attachment anxiety and avoidance moderate this reactivity. The novelty in this study is in its use of a support-eliciting interaction (rather than a conflict discussion), in its focus on one cardiovascular index of ANS activation (rather than on indices of the HPA axis), and in its use of a dyadic perspective (allowing for the examination of both the effects of actor's and partner's attachment on one's reactivity).

Support is a multidimensional phenomenon that includes several distinct types of behaviors (Barry, Bunde, Brock, & Lawrence, 2009). One of them is *emotional support*, which involves the provision of reassurance, love, and affection (Cutrona & Russell, 1990). The current study focused on emotional support because it plays a central and crucial role in well-being and relationship satisfaction, compared to other forms of support (e.g., Chen & Feeley, 2012; Cutrona & Russell, 1990; Reinhardt, Boerner, & Horowitz, 2006). For example, emotional support has been found to have the strongest association with marital satisfaction compared to other types of spousal support (Xu & Burleson, 2004). Similarly, expressions of empathy and reassurance, as well as companionship (which are all sub-types of emotional support) was more consequential than practical support in reducing loneliness among married older adults in (Liu & Rook, 2013).

With its focus on emotional support, the current study was guided by the following hypotheses:

(1) Support has been related to lower physiological arousal during stressful situations (Thorsteinsson & James, 1999; Uchino, 2009). As such, we predict that the recipients' cardiovascular arousal will decrease over the dyadic interaction when the recipient receives support.
(2) Anxiously attached individuals have been found to be more preoccupied with, and reactive to, their partners' behaviors. For example, Campbell, Simpson, Boldry, and Kashy (2005)

showed that more anxiously attached individuals tend to be happier on days when they perceive greater support in their relationship. This pattern was also found with regard to physiological outcomes (e.g., Brooks et al., 2011; Stanton & Campbell, 2014). As such, we expect that the association between received emotional support and cardiovascular arousal will be stronger for those whose attachment anxiety is high. Specifically, we predict that anxiously attached recipients will have a steeper slope for the association between received support and cardiovascular arousal.

(3) Emotionally-laden intimate interactions have been found to be stressful for avoidantly attached individuals. For example, avoidant individuals perceive daily supportive events in their relationship as less positive (Campbell et al., 2005), a pattern also found with regard to physiological outcomes (e.g., Diamond, Hicks, & Otter-Henderson, 2006) As such, we expect that received emotional support will lead to less attenuation of cardiovascular arousal among individuals with avoidant attachment.

(4) Finally, the possibility that the provider's (and not only the recipient's) attachment anxiety and avoidance will also moderate the association between received support and cardiovascular arousal will be examined. However, since there is little existing research on partner effects of this sort (cf., Beck et al., 2013), this is an exploratory hypothesis.

2. Method

2.1. Participants

Both print and online flyers invited participants to a couples' study in exchange for roughly $100 per couple and inclusion in a raffle for a gift worth $200. Participants were 86 Israeli couples who have been cohabiting for a minimum of 6 months, and were at least 18 years old. Six couples (7%) dropped out during the study period. Among the remaining couples the mean age was 26.7 (SD = 3.9) for women and 29.3 (SD = 4.4) for men. All participants had completed high school, with an average of 2.5 years (SD = 2.3) of post-secondary education; most (61.6%) had also completed a Bachelor's degree. The average relationship duration was 4.6 years (SD = 2.9, range = 1–17 years). The average length of cohabitation was 3.0 years (SD = 2.5, range = 6 months–15 years). Fifty-six couples (70.0%) were married, and 21 (26.3%) were parents. Because the study involved ECG recordings, participants were screened for cardiac problems.

2.2. Procedure

This study is a part of a broader project investigating dyadic processes. Within it, dyads took part in 3 data collection components: (a) a preliminary background questionnaire to gather information about demographics, personality, and relational characteristics, (b) five weeks (35 days) of daily diaries at home, and (c) a lab visit involving a videotaped support dyadic interaction (see below) in which psychophysiological measures (e.g., respiration, heart rate) were obtained. The current study focused on the last component.

2.3. Measures

2.3.1. Attachment

A Hebrew version of the 36-item Experiences in Close Relationships-Revised (ECR-R) scale was used to asses individual differences in attachment (Brennan et al., 1998; Fraley, Waller, & Brennan, 2000). The ECR-R assesses two dimensions of attachment security: anxiety and avoidance. Participants were instructed to think about how they experienced their current romantic relationship, and to respond to each statement by indicating how much they agreed or disagreed with it. Items were rated on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). In the current sample the Cronbach alphas for attachment anxiety and avoidance were 0.85 and 0.90, respectively.

2.3.2. Support interaction

We adapted Pasch and Bradbury's (1998) Support Interaction Task, by videotaping couples having a 12 min conversation in which they each took a turn discussing a personal problem (any problem whose source is *not* the partner or the relationship). They were instructed to speak as they would at home. One person was randomly chosen to be the first support seeker. For half of the couples, this was the man, and for half, the woman. To rate the support provider's behavior during the interaction, we used an adaptation of the Social Support Interaction Coding System (SSICS, Bradbury & Pasch, 1992). Specifically, at each 45 s segment the support provider's behaviors were characterized as emotional support, instrumental support, other support, negative support, neutral, and/or off-task. To create general (person-level) scores, these categories were averaged across the entire interaction. Three clinical psychology graduate students participated in a coder training in which they memorized the description of the various support provision categories and then practice-coded a set of pilot tapes. A randomly selected 25% of the interactions were coded by pairs of raters. Inter-rater agreement was calculated using Cohen's kappa. The remaining interactions were coded by one rater. For the purpose of the present study, only the emotional support ratings were used. The inter-rater reliability of this category was high (Cohen's $k = 0.79$).

2.3.3. ECG

Prior to the interaction, three electrodes were positioned in modified lead II placement (i.e., two across the chest, below the ribs, and one near the collarbone) to record a continuous ECG signal. Heart rate was recorded at 1000 Hz with Biolab Acquisition Software and a Bionex 8-slot Chassis. Data from these recordings were cleaned and analyzed using Mindware HRV (3.0.17) software, which we used to compute inter-beat-intervals (IBI) at 45 s segments. For ten participants, the ECG signal proved problematic; these participants (and their partners) were removed from our analyses. Notably, a series of *t*-test revealed no difference in any of the other variables (i.e., attachment scores, emotional support) between the excluded participants and the remaining 70 couples.

3. Results

Because our data have a multilevel structure (segments nested within persons nested within couples), we used multilevel regression models with SAS PROC MIXED to test our hypotheses. Such models have two levels (a within-individual level and a between-individual level), take into account the non-independence of partners in a couple, and can accommodate non-balanced data (see Laurenceau & Bolger, 2012). In addition, since we were interested in the actor effects (e.g., the effect of subjects' own attachment anxiety) on their own outcome variable (i.e., IBI) as well as in the partner effects (e.g., the effect of partners' attachment anxiety) on the actor's outcome variable, we utilized the Actor–Partner Interdependence Model (APIM, Kenny, Kashy, & Cook, 2006) in all of our analyses.

To test our hypotheses that emotional support will be associated with a greater decrease in arousal (Hypothesis 1), but that this decrease will be qualified by the actors' attachment scores (Hypothesis 2) as well as by the partners' attachment scores

(Hypothesis 3), we ran a model in which the outcome was the actor's IBI, and Time (i.e., the segment number within the taped interaction) was the predictor. The Level-1 (i.e., segment-level within-individual) equation was:

$$\mathrm{IBI}_{ijt} = \beta_{0ij} + \beta_{1ij} * \mathrm{Time}_{ijt} + e_{ijt}$$

where IBI_{ijt} is the predicted outcome for subject i in couple j on segment t; β_{0ij} is the intercept of subject i in couple j; β_{1ij} is the time slope of subject i in couple j; and e_{ijt} is a residual component for this subject on the particular segment. Time_{ijt} was centered on the midpoint of the interaction, and first-order autoregressive structure was imposed on this within-person residual covariance matrix, to account for the autoregression between adjacent segments.

The level 2 *intercept* and *slope* equations were:

$$\begin{aligned}\beta_{0ij} = {} & \gamma_{00} + \gamma_{01} * \text{Actor's attachment anxiety}_{ij} + \gamma_{02} \\ & * \text{Actor's attachment avoidance}_{ij} + \gamma_{03} \\ & * \text{Partner's attachment anxiety}_{ij} + \gamma_{04} \\ & * \text{Partner's attachment avoidance}_{ij} + \gamma_{05} \\ & * \text{Emotional support}_{ij} + \gamma_{06} * \text{Actor's attachment anxiety}_{ij} \\ & * \text{Emotional support}_{ij} + \gamma_{07} \\ & * \text{Actor's attachment avoidance}_{ij} * \text{Emotional support}_{ij} \\ & + \gamma_{08} * \text{Partner's attachment anxiety}_{ij} * \text{Emotional support}_{ij} \\ & + \gamma_{09} * \text{Partner's attachment avoidance}_{ij} \\ & * \text{Emotional support}_{ij} + u_{0ij}\end{aligned}$$

$$\begin{aligned}\beta_{1ij} = {} & \gamma_{10} + \gamma_{11} * \text{Actor's attachment anxiety}_{ij} + \gamma_{12} \\ & * \text{Actor's attachment avoidance}_{ij} + \gamma_{13} \\ & * \text{Partner's attachment anxiety}_{ij} + \gamma_{14} \\ & * \text{Partner's attachment avoidance}_{ij} + \gamma_{15} \\ & * \text{Emotional support}_{ij} + \gamma_{16} * \text{Actor's attachment anxiety}_{ij} \\ & * \text{Emotional support}_{ij} + \gamma_{17} \\ & * \text{Actor's attachment avoidance}_{ij} * \text{Emotional support}_{ij} \\ & + \gamma_{18} * \text{Partner's attachment anxiety}_{ij} * \text{Emotional support}_{ij} \\ & + \gamma_{19} * \text{Partner's attachment avoidance}_{ij} \\ & * \text{Emotional support}_{ij}\end{aligned}$$

In these equations, the intercept and time slope of subject i in couple j were regressed on the actor's and partner's attachment anxiety and avoidance scores, partner's emotional support, as well as four 2-way interaction terms for emotional support X attachment (actor's or partner's; anxiety or avoidance)[1]. All Level 2 predictors were grand mean centered. The intercept equation also included a random effect (u_{0ij}) reflecting the residual deviation of the IBI for subject i in couple j from the sample's average IBI once all other predictors were entered. The slope equation did not include a random effect, as deviance tests indicated no advantage for the model treating Time as a random slope once all other predictors were entered ($\chi^2[2] = 5.1$, *n.s.*). Using two dummy codes (female, male) we estimated separate parameters for women and men (using the two-intercept/slopes model; see Bolger & Laurenceau, 2013; Kenny et al., 2006). Table 1 presents the results of this model separately for women and men. Gender differences were assessed by contrasting men's and women's effects.

Among men, a 3-way (time X actor's anxiety X emotional support) interaction was found to be significant. To explore this interaction, we estimated simple slopes for low (−1 SD), average, and high (+1 SD) levels of attachment anxiety and emotional support using Preacher, Curran, and Bauer's (2006) computational tool for probing interaction effects in MLM analyses. As can be seen in Table 2, the simple slopes were positive and significant (indicating reduced arousal as the interaction progressed) with two notable exceptions – high attachment anxiety along with low emotional support, as well as low attachment anxiety along with high emotional support. Fig. 1 (panel A) presents the increases in IBI which occurred over the course of the interaction for men with different attachment and support levels. As predicted, men with high attachment anxiety showed greater IBI increase (i.e., greater reduction in ANS arousal) during the interaction as a function of more emotional support receipt. Interestingly, men with low attachment anxiety showed less IBI increase as a function of more emotional support receipt.

An additional 3-way (time X actor's avoidance X emotional support) interaction was also found to be significant for men. As can be seen in Table 2, the simple slopes were positive and significant (indicating reduced arousal as the interaction progressed) with two notable exceptions – low attachment avoidance *along with* low, as well as average, emotional support. Fig. 1 (panel B) presents the increase in IBI which occurred over the course of the interaction for men with different attachment and support levels. As predicted, men with high attachment avoidance showed less IBI increase (i.e., less reduction in ANS arousal) during the interaction as a function of more emotional support receipt. In contrast, also as predicted, men with low attachment avoidance showed greater IBI increase as a function of more emotional support.

Among women, a 3-way (time X actor's avoidance X emotional support) interaction was found to be significant. As can be seen in Table 2, the simple slopes were positive and significant (indicating reduced arousal as the interaction progressed) with one notable exception – low attachment avoidance *along with* low emotional support. Fig. 1 (panel C) presents the increase in IBI which occurred over the course of the interaction for women with different attachment and support levels. As predicted, women with higher attachment avoidance showed less IBI increase (i.e., less reduction in ANS arousal) during the interaction as a function of more emotional support receipt. In contrast, also as predicted, women with low attachment avoidance showed greater IBI increase as a function of more emotional support.

Finally, an additional 3-way (time X partner's attachment anxiety X emotional support) interaction was also found to be significant for women. As can be seen in Table 2, the simple slopes were positive and significant (indicating reduced arousal as the interaction progressed) with one notable exception – high partner's attachment anxiety *along with* low emotional support. Fig. 1 (panel D) presents the increase in IBI which occurred over the course of the interaction for women coupled with partners of different attachment anxiety levels, who received varying support levels. Women coupled with (male) partners who had high attachment anxiety showed greater IBI increases (i.e., greater reduction in ANS arousal) during the interaction as a function of more emotional support receipt. Interestingly, women coupled with (male) partners with low attachment anxiety showed less IBI increase as a function of more emotional support receipt.

No significant gender differences were found regarding any of the estimates, apart from the 3-way (time X partner's anxiety X

[1] The extant work on observed social support behaviors (e.g., Sullivan et al., 2010) creates interaction-wide indices of support behaviors, and does not assume that the effects of a supportive speech turn (or, as we do it, of a 45 s segment) will be immediately evident. Additionally, we do not expect the moderation by attachment dimensions to necessarily occur at the segment-by-segment level. Instead, we would expect the greater soothing response of support on the cardiovascular arousal of anxiously attached individuals (or the aggravating effect of support on the arousal of avoidantly attached individuals) to be driven by some sort of cumulative effect of support. As such, we treated support as a Level-2 effect and opted to examine the linear change in arousal over the course of the entire interaction as well as the moderation of these changes by support quality and attachment scores.

Table 1
Results of multilevel model predicting IBI using support, time, and actor and partner attachment dimensions.

	Men		Women		Gender Diff
	Estimate (SE)	*d*	Estimate (SE)	*d*	
Intercept	825.02 (16.12)***		756.11 (11.79)***		68.91 ***
Time	4.09 (0.71)***	0.83	3.26 (0.62)***	0.80	0.83
Actor anxiety	−41.68 (25.88)	0.42	−16.69 (17.19)	0.25	−24.99
Actor avoidance	13.28 (33.70)	0.10	18.20 (22.48)	0.21	−4.92
Partner anxiety	−9.58 (22.22)	0.11	14.81 (19.89)	0.19	−24.39
Partner avoidance	16.23 (29.94)	0.14	−25.35 (25.98)	0.25	41.58
Support	−101.48 (54.85)	0.48	−59.92 (44.97)	0.34	−41.56
Time X Actor anxiety	−0.06 (1.14)	0.01	0.30 (0.91)	0.05	−0.37
Time X Actor avoidance	2.73 (1.48)	0.27	1.08 (1.18)	0.14	1.66
Time X Partner anxiety	−0.40 (0.98)	0.06	−1.11 (1.05)	0.16	0.72
Time X Partner avoidance anxiety	−1.66 (1.31)	0.18	−1.49 (1.37)	0.17	−0.17
Time X Support	1.65 (2.40)	0.10	3.44 (2.35)	0.23	−1.78
Actor anxiety X Support	105.42 (93.12)	0.29	−17.12 (76.07)	0.06	122.54
Actor avoidance X Support	−94.31 (135.16)	0.18	118.21 (77.04)	0.40	−212.51
Partner anxiety X Support	72.40 (83.33)	0.22	−94.95 (83.39)	0.29	167.36
Partner avoidance X Support	−127.15 (116.85)	0.28	78.00 (96.52)	0.21	−205.15
Time X Actor anxiety X Support	9.99 (4.09)*	0.35	7.28 (3.98)	0.28	2.71
Time X Actor avoidance X Support	−17.09 (5.93)**	0.42	−9.57 (4.03)*	0.37	−7.52
Time X Partner anxiety X Support	−3.69 (3.66)	0.15	11.63 (4.36)**	0.42	−15.32 **
Time X Partner avoidance X Support	6.15 (5.10)	0.17	−1.10 (5.06)	0.03	7.25

Note: Positive estimates denote higher IBI scores, which reflect reduced sympathetic arousal.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 2
Probing of significant three-way interactions found in Table 1.

		Attachment		
		Low	Average	High
Men				
Time X Actors' Attachment anxiety X Support				
Support	Low	5.74(1.34)***	3.64(0.99)***	1.54(1.83)
	Average	4.14(0.96)***	4.09(0.71)***	4.04(1.25)**
	High	2.54(1.41)	4.54(0.93)***	6.54(1.53)***
Time X Actors' Attachment Avoidance X Support				
Support	Low	−0.77(1.73)	3.64(0.99)***	8.05(1.38)***
	Average	2.45(1.26)	4.09(0.71)***	5.73(1)***
	High	5.71(1.68)***	4.54(0.93)***	3.41(1.67)**
Women				
Time X Actors' Attachment Avoidance X Support				
Support	Low	0.13(1.32)	2.333(0.94)*	4.52(1.55)**
	Average	2.61(0.86)**	3.26(0.62)***	3.9(1.02)***
	High	5.09(1.13)***	4.18(0.84)***	3.28(1.21)**
Time X Partners' Attachment Anxiety X Support				
Support	Low	5.56(1.39)***	2.33(0.94)*	−0.91(1.8)
	Average	4.1(0.9)***	3.26(0.62)***	2.41(1.11)*
	High	2.64(1.2)*	4.18(0.84)***	5.72(1.51)***

Note: Low, average, and high scores on the attachment dimensions as well as on support were determined using −1SD, 0SD, and +1SD for each variable.

emotional support) interaction effect, which was positive and significant for women, but negative and non significant for men.

4. Discussion

Many studies have reported that supportive behaviors either have no positive effect on well-being (Bolger, Foster, Vinokur, & Ng, 1996), or may even be detrimental to the recipient (Bolger & Amarel, 2007; Martire, Stephens, Druley, & Wojno, 2002). To understand this support paradox, various factors have been suggested as moderators of the effects of support (Bar-Kalifa & Rafaeli, 2013; Bolger & Amarel, 2007; Cohen & McKay, 1984; Cutrona & Russell, 1990; Pearlin & McCall, 1990; Rafaeli & Gleason, 2009). In the current study, we examined the effect of one such factor – namely, attachment style (Collins et al., 2011; Rini & Dunkel Schetter, 2010).

Whereas many studies have documented the *psychological* consequences of attachment in the context of dyadic support (e.g., Davila & Kashy, 2009; Waters & Cummings, 2003), few have examined its *physiological* consequences, and fewer still have explored ANS system consequences (see recent reviews by Robles and Kane (2014) and Stanton & Campbell (2014)). The current study addressed these lacunae by examining one index of ANS reactivity in the context of a supportive dyadic situation while considering the role of both recipients' and providers' attachment style. Below, we recap our major results.

4.1. Anxious attachment and support

We hypothesized that anxiously attached individuals would be more physiologically reactive to received emotional support; in other words, we expected the (negative) association between received emotional support and cardiovascular arousal to be stronger for individuals whose attachment anxiety is high. We found evidence for this hypothesis among men, but not among women. Specifically, highly anxious men showed greater IBI increases during the interaction as a function of more emotional support receipt.

Our results are consistent with prior research demonstrating that emotional support soothes the physiological stress responses of highly anxious individuals, and suggest that emotional support can help create some sense of calming even for anxiously attached recipients. One explanation for this soothing effect is that anxiously attached recipients, who typically have amplified responses to threat and danger (Ben-Naim et al., 2013; Diamond & Hicks, 2005), may view the emotional support provided by their partners as an indicator of safety, closeness, and caring, and thus feel less stressed. This possible mechanism is worthy of further research attention.

Surprisingly, and in contrast to our prediction, men with low attachment anxiety showed *lower* IBI increases (i.e., less reduction in cardiovascular arousal) during the interaction, the more emotional support they received. This paradoxical finding may be explained by the wider phenomenon of support's mixed blessings

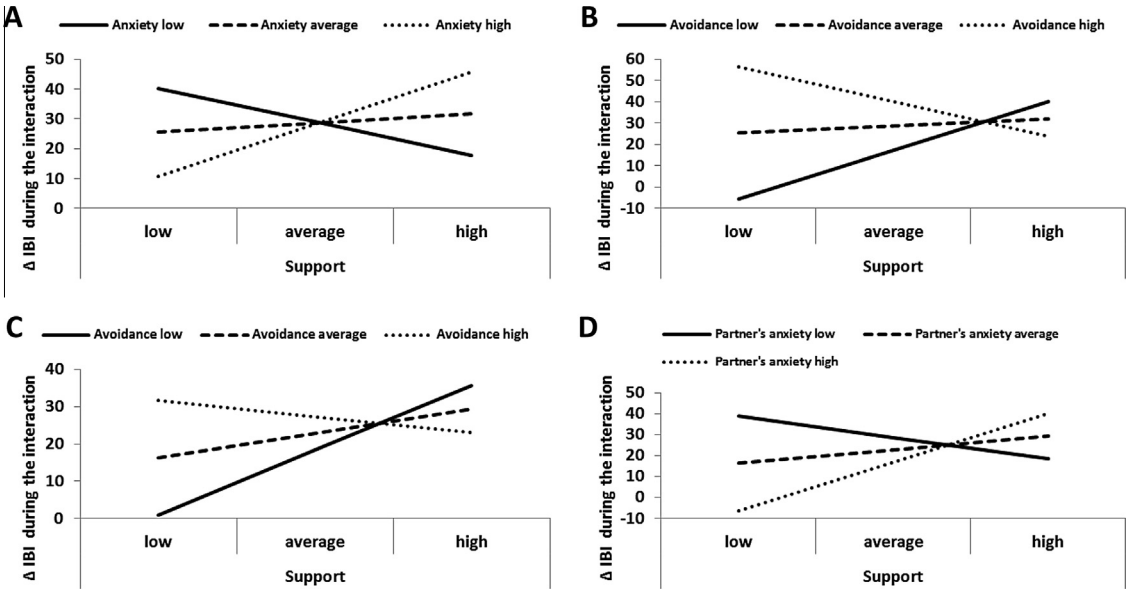

Fig. 1. Probing the significant three-way interactions presented in Table 1. *Note.* Panel A: Men's time X Actors' Attachment anxiety X Support interaction; Panel B: Men's time X Actors' Attachment Avoidance X Support interaction; Panel C: Women's time X Actors' Attachment Avoidance X Support interaction; Panel D: Women's time X Partners' Attachment Anxiety X Support interaction.

(c.f., McClure et al., 2014; Rafaeli & Gleason, 2009; Rini & Dunkel Schetter, 2010) – the finding that enacted support is often costly for the recipient. Men with less attachment anxiety may have showed less IBI increase because they felt inefficacious following the receipt of support, or felt indebted to their partners for it. Alternatively, men with low attachment anxiety may have allowed themselves to remain vulnerable and distressed for a larger part of the interaction because they tend to feel more confident that they will ultimately be able to regulate themselves and reduce the distress.

Our results echo recent findings by Girme, Overall, and Simpson (2013) who found that greater visible support was associated with benefits for highly distressed recipients, but with costs for non-distressed recipients. Importantly, the focus of Girme's study was on the subjective effect of support, whereas our current study revealed a similar pattern with objective measures that go "under the skin".

Interestingly, a recent study of the association between attachment and support revealed the opposite pattern of results. Specifically, whereas anxiously attached individuals did not seem to benefit from (perceived) support, securely attached individuals appeared to benefit from it (Stanton & Campbell, 2014). Notably, these results were obtained with perceived support (rather than received support, as in the current study). Putting these results together, we may conclude that anxiously attached individuals benefit psychologically from receiving social support when momentary outcomes (e.g., cardiovascular arousal) are examined, but may not be able to carry over these benefits into general perceptions of support availability (thus missing out on the health benefits that non-anxiously attached individuals draw from support). This possibility merits further research.

Notably, though we did not find evidence that emotional support soothes female recipients differentially depending on their own attachment anxiety, the gender contrast between men and women in this three-way interaction did not reach significance, and the women's interaction effect (though weaker) was in the same direction. Therefore, we are wary about over-emphasizing the null finding among women, as it may simply reflect a power issue.

When examining partner effects, we did find an intriguing gender difference. Specifically, women coupled with (male) partners who had high attachment anxiety showed greater reductions in ANS arousal the more emotional support they received. This was not the case for men coupled with (female) partners. One possibility for understanding this effect is that the greater physiological benefit observed among these partners of male anxious providers derives from a surprise value. As Davila and Kashy (2009) have shown, attachment anxiety is typically tied to poorer support provision and to more insensitive care-giving. Within the supportive interactions that occurred in the current study, participants (including anxiously attached ones) may have responded to the demand characteristics of the situation; when this resulted in surprisingly high levels of emotional support, its recipients might have drawn particular solace from it.

Why should this surprise effect work for female recipients only? It may reflect the finding that women are more sensitive to positive or negative qualities of their relationships (Bodie & Burleson, 2008; Carels & Baucom, 1999) and have more ability and motivation to process supportive messages (Burleson, 2009). It may also reflect the fact that women are socialized to be relationship-oriented (Eagly & Koenig, 2006). At the same time, whatever gender differences were found in the current study should be understood within the broader context of gender differences in the support literature. Within this broader literature, some studies suggest the existence of gender differences in support behaviors and in their perceptions (Badr, 2004; Donato & Parise, 2012), but others have failed to demonstrate gendered patterns in dyadic coping (Bodenmann, 2005; Bodenmann, Meuwly, Bradbury, Gmelch, & Ledermann, 2010; Verhofstadt, Buysse, & Ickes, 2007). The current study's findings provide an intriguing possibility for further understanding of gender differences in dyadic support, but clearly, serve as a reminder of the need for further research on the topic.

4.2. Avoidant attachment and support

We hypothesized that avoidantly attached individuals would be less physiologically reactive to received emotional support; in other words, we expected the (negative) association between received emotional support and cardiovascular arousal to be

weaker for individuals whose attachment avoidance is high. We found evidence for this hypothesis among both men and women. Specifically, highly avoidant individuals showed less IBI increase during the interaction as a function of more emotional support receipt. In contrast, those with low attachment avoidance showed greater IBI increase as a function of more emotional support.

Our results are consistent with prior research demonstrating that the physiological stress responses of avoidantly attached individuals are not soothed by higher received emotional support (Chen, Gilligan, Coups, & Contrada, 2005; Holt-Lunstad, Smith, & Uchino, 2008a). This finding – that greater support does not bring greater solace to avoidantly attached recipients – is also consistent with Davila and Kashy's finding (2009) that attachment avoidance is associated with less support seeking.

Why would recipients who are relatively avoidant not benefit from receiving emotional support? One possibility is that avoidantly attached individuals, who are generally mistrustful of partners' relationship goodwill, prefer to be independent and emotionally distant from these partners. This would make support receipt, especially of the emotional support, particularly unwelcome. It would also explain the finding that avoidantly attached individuals tend to feel less grateful even when perceiving their partners' behaviors as positive (Ben-Naim et al., 2013; Shaver & Mikulincer, 2008).

It is important to determine when it is that emotional support does exert a positive (calming) influence on avoidant individuals' physiological arousal. It may be that for avoidantly attached support recipients, emotional support is more costly than beneficial when it is visible. Visible support has been shown to increase the salience of impending stressors, convey the provider's low confidence in the recipient's coping capacity, and create a sense of indebtedness in the recipient (Bolger, Zuckerman, & Kessler, 2000; cf., Rafaeli & Gleason, 2009). In contrast, invisible (or non-directive) support appears to aid recipients without carrying these attendant costs. These general effects of visibility or invisibility may be particularly pronounced for avoidantly attached individuals (though see McClure et al., 2014). If that is the case, invisible support might prove particularly useful for such recipients.

4.3. Limitations and future directions

Our study is novel in its use of a support-eliciting interaction, its dyadic perspective, and its focus on cardiovascular arousal (one index of the ANS). There are, however, certain limitations to this study, as well as directions of future exploration that should be noted. The effect of the dyadic interaction on cardiovascular arousal we examined only for recipients. An important next step would be to examine the providers' physiological responses during dyadic support interactions. Evidence (of a non-physiological nature) for the benefits of support for the provider abounds. For example, providing support tends to bolster self-esteem for the provider over time (Krause & Shaw, 2000), to be rewarding for their well-being (Kleiboer, Kuijer, Hox, Schreurs, & Bensing, 2006), and to significantly reduce mortality for those providing emotional support to their spouse (Brown, Nesse, Vinokur, & Smith, 2003).

Our study responds to the recent call raised in the literature of the physiological effects of attachment, to include examination of both actor's and partner's effects (see Stanton & Campbell, 2014 for example). Indeed, in our analysis, we found a significant partner effect for women. It seems important to explore how the interplay between one's attachment and one's partner attachment affects the response to interpersonal behaviors. For example, a recent study found that couples characterized by avoidant husbands and anxious wives showed distinctive physiological and behavioral response during conflict (Beck et al., 2013).

In addition, the present study relied on IBI, a measure affected mainly by the two branches of the ANS, as a measure of arousal. This index allows us to track high time–frequency changes that are not detectable using slower HPA-axis (e.g., cortisol) or ANS-system (e.g., EDA) indices. Still, future research would benefit from triangulating the information so as to get a clearer picture of the sympathetic, parasympathetic, and hormonal responses to stress and support.

In the current study we selected the IBI as an index of cardiovascular arousal. There are number of autonomic measures that have been employed as markers of arousal, including heart rate, heart period, electrodermal responses, EMG tension in neck muscles, plasma catecholamine, and glucocorticoid levels. These are usually correlated, but often not extremely highly. There is at present no generally accepted "best" marker—they all index somewhat different arousal dimensions.

With regard to cardiac activity, there are autonomic markers which selectively index either the parasympathetic (e.g., heart rate variability; HRV) or the sympathetic (e.g., cardiac preejection period) branches of the ANS. Our index of choice, IBI – like other indices of heart rate or heart period – has the advantage of being sensitive to both branches. Indeed, the literature indicates that there is a relatively linear association between both parasympathetic and sympathetic activity on the one hand, and heart period on the other (Stern, Ray, & Quigley, 2001). This pattern has been found for a variety of mammalian species including humans (e.g., Berntson, Cacioppo, & Quigley, 1995; Parker, Celler, Potter, & McCloskey, 1984). Moreover, recent work (e.g., Cui, Morris, Harrist, Larzelere, & Criss, 2015) notes that more selective measures of cardiac activity (e.g., RSA reactivity, an index of HRV) are quite complex. For example, RSA suppression might be more adaptive under certain circumstances (e.g., high stress), even though RSA augmentation is more adaptive at baseline.

Indeed, the IBI index has been reported to have stronger association than HRV with both self-reported and behavioral performance measures of stress (e.g., Tanosoto et al., 2015). In sum, though the IBI index should be taken as one specific index of cardiovascular activity, and cannot distinguish between sympathetic and parasympathetic influence, it does provide a good linear summary of the two branches. Of course future studies could benefit from integrating a richer variety and more specific indices of the cardiovascular system (e.g., preejection period; HRV[2]) as well as other components of the ANS.

The current study focused only on emotional support, as it has been found to play the most central role in individuals' personal and relational well-being (e.g., Chen & Feeley, 2012; Xu & Burleson, 2004). However, as noted earlier, support is a multidimensional phenomenon that encompasses a variety of other supportive behaviors. A recent theory regarding the mechanisms linking social support to health (Thoits, 2011) posits that the consequences and significance of specific support types depend on the type of recipient–provider relationship. For example, *primary group*

[2] In the current study, preejection was not measured. However, respiratory sinus arrhythmia (RSA; an index of heart rate variability) was measured, and thus could be examined. When we reanalyzed our data using RSA as an outcome, we did not find that attachment anxiety or avoidance affect the reduction in the cardiovascular arousal over the dyadic interaction (i.e., no significant attachment X support X time interaction effect). However, we did find that whereas anxiously attached men showed higher average levels of HRV when they received more support ($b = 1.26$, SE = 0.59, $p < 0.05$), men with low attachment anxiety showed lower average levels of HRV when they received more support ($b = -0.96$, SE = 0.50, $p = 0.06$). In addition, we found that whereas avoidantly attached men showed lower average levels of HRV when they received more support ($b = -1.14$, SE = 0.67, $p = 0.09$), men with low attachment avoidance showed higher average levels of HRV when they received more support ($b = 1.43$, SE = 0.75, $p = 0.06$; complete results can be obtained upon request from the authors). This pattern of results echoes to some extent those obtained from our main analyses (using IBI as an outcome) among men (but not among women).

members (persons to whom individuals are emotionally tied; e.g., romantic partners) are more effective when providing emotionally sustaining behaviors (e.g., companionship, caring) whereas *secondary group members* (persons to whom individuals are more formally tied; e.g., coworkers) are more effective when providing active coping assistance (e.g., information, advice). As such, future studies may fruitfully examine the soothing effect of support while taking into account both other types of relationships (e.g., coworkers) and other types of support (e.g. instrumental).[3]

As noted earlier, most of the literature examining attachment and physiology within dyadic interactions involves studies in which partners discuss conflicts within their relationship. Two recent reviews of this literature (Robles & Kane, 2014; Stanton & Campbell, 2014) highlight the paucity of research on the physiological ramifications of attachment in normative situations. Inspired by these reviews our study focused on the normative process of supportive responses. Indeed, it seems that the reactions of either highly anxious or highly avoidant individuals to their partner's positive behaviors are different when the situations involve support-eliciting interactions or conflict-eliciting interactions. For example, in our study, men with high attachment anxiety showed greater reduction in cardiovascular arousal when receiving more support; in contrast, in Campbell and his colleagues' (2005) study, anxiously attached individuals perceived conflicts to be more negative in the long-term, regardless of their partners' positive behaviors. Similarly, in our study, individuals with high attachment avoidance showed lesser reduction in cardiovascular arousal when receiving more support; in contrast, in Simpson, Winterheld, Rholes, & Oriña's (2007) study, avoidantly attached individuals reacted more favorably to their partner's positive behaviors (instrumental support, in this case) when they tried to resolve a conflict in their relationships. To further clarify this differential pattern of reactions to support-eliciting vs. conflict-eliciting interactions, future studies should examine both types of interactions with the same couples.

Lab observational studies are limited in their external validity. The findings obtained here could be complemented by future studies using ambulatory physiological recordings and assessing the same questions (i.e., whether supportive behavior has differential calming effects on recipients who differ in their attachment styles) in the daily-life interactions of committed couples (e.g., Grewen, Girdler, Amico, & Light, 2005; Holt-Lunstad, Birmingham, & Light, 2008b; Holt-Lunstad, Uchino, Smith, Olson-Cerny, & Nealey-Moore, 2003; Saxbe & Repetti, 2010).

The current study focused on attachment as a moderator of the cardiovascular arousal effects of dyadic emotional support. Of course, future studies may benefit from considering other important variables which may moderate this moderating effect itself, such as relationship length, satisfaction, or levels of support. For example, a recent study found avoidant individuals (a) desire more closeness when they perceive their relationship to be of high quality (Slotter & Luchies, 2014); and (b) exhibit more positive responses when their partners provide high levels (compare to low-to-moderate levels) of support (Girme, Overall, Simpson, & Fletcher, 2015).

4.4. Summary

A growing body of research is beginning to uncover the physiological correlates of attachment processes. The current study attempts to explore the association between individual differences in attachment avoidance or anxiety on the one hand, and ANS reactivity to receiving support, on the other. It does so in a dyadic observation study which allows us to simultaneously examine actor and partner effects. Finally, it focuses on an index of cardiovascular arousal tapping both branches of the ANS system – a system which reacts quite rapidly, and is therefore uniquely suited to capture moment-to-moment changes in response to attachment-relevant events such as support. The findings of this study highlight the complex nature of effective support and the way in which the effects of support depend, to a large degree, on qualities of both the recipient and the provider.

[3] The support coding system used in the current study (i.e., SSICS), yielded ratings of instrumental support as well. When we examined the effects of this specific type of support on participants' cardiovascular arousal, we found it to yield null results. We see this as consistent with the often greater role played by emotional support vs. other types of support in the context of romantic relationships. (Complete results can be obtained upon request from the authors).

Acknowledgments

This research was conducted as part of the MA thesis requirements of the first author, and was supported by the Israel Science Foundation (Grant #615/10) to the third author.

References

Allen, J. P., & Miga, E. M. (2010). Attachment in adolescence: A move to the level of emotion regulation. *Journal of Social and Personal Relationships, 27*, 181–190.
Badr, H. (2004). Coping in marital dyads: A contextual perspective on the role of gender and health. *Personal Relationships, 11*, 197–211.
Bar-Kalifa, E., & Rafaeli, E. (2013). Disappointment's sting is greater than help's balm: Quasi-signal detection of daily support matching. *Journal of Family Psychology, 27*, 956–967.
Barry, R. A., Bunde, M., Brock, R. L., & Lawrence, E. (2009). Validity and utility of a multidimensional model of received support in intimate relationships. *Journal of Family Psychology, 23*, 48–57.
Beck, L. A., Pietromonaco, P. R., DeBuse, C. J., Powers, S. I., & Sayer, A. G. (2013). Spouses' attachment pairings predict neuroendocrine, behavioral, and psychological responses to marital conflict. *Journal of Personality and Social Psychology, 105*, 388–424.
Ben-Naim, S., Hirschberger, G., Ein-Dor, T., & Mikulincer, M. (2013). An experimental study of emotion regulation during relationship conflict interactions: The moderating role of attachment orientations. *Emotion, 13*, 506.
Berntson, G. G., Cacioppo, J. T., Binkley, P. F., Uchino, B. N., Quigley, K. S., & Fieldstone, A. (1994). Autonomic cardiac control. III. Psychological stress and cardiac response in autonomic space as revealed by pharmacological blockades. *Psychophysiology, 31*, 599–608.
Berntson, G. G., Cacioppo, J. T., & Quigley, K. S. (1995). The metrics of cardiac chronotropism: Biometric perspectives. *Psychophysiology, 32*, 162–171.
Berntson, G. G., Quigley, K. S., & Lozano, D. (2007). Cardiovascular psychophysiology. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (3rd ed., pp. 182–210). Cambridge, England: Cambridge University Press.
Bodenmann, G., Meuwly, N., Bradbury, T. N., Gmelch, S., & Ledermann, T. (2010). Stress, anger, and verbal aggression in intimate relationships: Moderating effects of individual and dyadic coping. *Journal of Social and Personal Relationships, 27*, 408–424.
Bodenmann, G. (2005). Dyadic coping and its significance for marital functioning. In T. A. Revenson, K. Kayser, & G. Bodenmann (Eds.), *Couples coping with stress: Emerging perspectives on dyadic coping* (pp. 33–50). Washington, DC: American Psychological Association.
Bodie, G. D., & Burleson, B. R. (2008). Explaining variations in the effects of supportive messages: A dual-process framework. *Communication Yearbook, 32*, 355–398.
Bolger, N., & Amarel, D. (2007). Effects of support visibility on adjustment to stress: Experimental evidence. *Journal of Personality and Social Psychology, 92*, 458–475.
Bolger, N., Foster, M., Vinokur, A. D., & Ng, R. (1996). Close relationships and adjustment to a life crisis: The case of breast cancer. *Journal of Personality and Social Psychology, 70*, 283–294.
Bolger, N., & Laurenceau, J. P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research*. New York: Guilford Press.
Bolger, N., Zuckerman, A., & Kessler, R. C. (2000). Invisible support and adjustment to stress. *Journal of Personality and Social Psychology, 79*, 953–961.
Bowlby, J. (1969). *Attachment*. New York: Basic Books.
Bowlby, J. (1973). *Attachment and loss: Separation, anxiety and anger*. New York: Basic Books.
Bowlby, J. (1980). *Attachment and loss: Sadness and depression*. New York: Basic Books.
Bowlby, J. (1982). *Attachment and loss: Attachment*. New York: Basic Books.
Bradbury, T. N., & Pasch, L. A. (1992). The social support interaction coding system. Unpublished coding manual, University of California, Los Angeles.
Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46–76). New York, NY: Guilford Press.

Brock, R. L., & Lawrence, E. (2009). Too much of a good thing: underprovision versus overprovision of partner support. *Journal of Family Psychology, 23*, 181–192.
Brooks, K. P., Robles, T. F., & Dunkel Schetter, C. (2011). Adult attachment and cortisol responses to discussions with a romantic partner. *Personal Relationships, 18*, 302–320.
Brown, S. L., Nesse, R. M., Vinokur, A. D., & Smith, D. M. (2003). Providing social support may be more beneficial than receiving it results from a prospective study of mortality. *Psychological Science, 14*, 320–327.
Burleson, B. R. (2009). Understanding the outcomes of supportive communication: A dual-process approach. *Journal of Social & Personal Relationships, 26*, 21–38.
Campbell, L., Simpson, J. A., Boldry, J., & Kashy, D. A. (2005). Perceptions of conflict and support in romantic relationships: the role of attachment anxiety. *Journal of Personality and Social Psychology, 88*, 510–531.
Campbell, L., Simpson, J. F., Kashy, D. A., & Rholes, W. S. (2001). Attachment orientations, dependence, and behavior in a stressful situation: An application of the actor–partner interdependence model. *Journal of Social and Personal Relationships, 18*, 821–843.
Carels, R. A., & Baucom, D. H. (1999). Support in marriage: Factors associated with on-line perceptions of support helpfulness. *Journal of Family Psychology, 13*, 131–144.
Carpenter, E. M., & Kirkpatrick, L. A. (1996). Attachment style and presence of a romantic partner as a moderators of psycho physiological responses to a stressful laboratory situation. *Personal Relationships, 3*, 351–367.
Cassidy, J., & Berlin, L. J. (1994). The insecure/ambivalent pattern of attachment: Theory and research. *Child Development, 65*, 971–981.
Cassidy, J., & Kobak, R. R. (1988). Avoidance and its relation to other defensive processes. In J. Belsky & T. Nezworski (Eds.), *Clinical implications of attachment* (pp. 300–323). Hillsdale, NJ: Erlbaum.
Chen, Y., & Feeley, T. H. (2012). Enacted support and well-being: A test of the mediating role of perceived control. *Communication Studies, 63*, 608–625.
Chen, Y. Y., Gilligan, S., Coups, E. J., & Contrada, R. J. (2005). Hostility and perceived social support: Interactive effects on cardiovascular reactivity to laboratory stressors. *Annals of Behavioral Medicine, 29*, 37–43.
Cohen, S., & McKay, G. (1984). Social support, stress and the buffering hypothesis: An empirical review and theoretical analysis. *Handbook of Psychology and Health, 4*, 253–267.
Cohen, S., & Wills, T. A. (1985). Stress, social support, and the -buffering hypothesis. *Psychological Bulletin, 98*, 310–357.
Collins, N. L., Dunkel Schetter, C., Lobel, M., & Scrimshaw, S. C. (1993). Social support in pregnancy: Psychosocial correlates of birth outcomes and postpartum depression. *Journal of Personality and Social Psychology, 65*, 1243–1258.
Collins, N. L., & Feeney, B. C. (2000). A safe haven: An attachment theory perspective on support-seeking and caregiving in adult romantic relationships. *Journal of Personality and Social psychology, 78*, 1053–1073.
Collins, N. L., Ford, M. B., & Feeney, B. C. (2011). An attachment-theory perspective on social support in close relationships. In L. M. Horowitz & S. Strack (Eds.), *Handbook of interpersonal psychology: Theory, research, assessment, and therapeutic interventions* (pp. 46–76). Hoboken, NJ: Wiley.
Collins, N. L., Ford, M. B., Guichard, A. C., & Feeney, B. C. (2006). Responding to need in intimate relationships: Normative processes and individual differences. In M. Mikulincer & G. Goodman (Eds.), *The dynamics of love: Attachment, caregiving, and sex*. New York: Guilford Press.
Collins, N. L., Ford, M. B., Guichard, A. C., Kane, H. S., & Feeney, B. C. (2010). Responding to the need in intimate relationships: Social support and caregiving processes in couples. In M. Mikulincer & P. R. Shaver (Eds.), *Prosocial motives, emotions, and behavior* (pp. 367–389). Washington, DC: American Psychological Association.
Collins, N. L., Guichard, A. C., Kane, H. S., & Feeney, B. C. (2004). Working models of attachment: New developments and emerging themes. In W. S. Rholes & J. A. Simpson (Eds.), *Adult attachment: Theory, research and clinical implications* (pp. 196–239). New York: Guilford Press.
Cui, L., Morris, A. S., Harrist, A. W., Larzelere, R. E., & Criss, M. M. (2015). Dynamic changes in parent affect and adolescent cardiac vagal regulation: A real-time analysis. *Journal of Family Psychology*. Advance online publication.
Cutrona, C. E., Russell, D. W., & Gardner, K. A. (2005). The relationship enhancement model of social support. In T. A. Revenson, K. Kayser, & G. Bodenmann (Eds.), *Couples coping with stress* (pp. 3–23). Washington, DC: American Psychological Association.
Cutrona, C. E., & Russell, D. W. (1990). Type of social support and specific stress: Toward a theory of optimal matching. In B. R. Sarason, I. G. Sarason, & G. R. Pierce (Eds.), *Social support: An interactional view* (pp. 319–366). New York: Wiley.
Cutrona, C. E., Shaffer, P. A., Wesner, K. A., & Gardner, K. A. (2007). Optimally matching support and perceived spousal sensitivity. *Journal of Family Psychology, 21*, 754–758.
Davila, J., & Kashy, A. K. (2009). Secure base processes in couples: Daily associations between support experiences and attachment security. *Journal of Family Psychology, 23*, 76–88.
Diamond, L. M. (2001). Contributions of psychophysiology to research on adult attachment: Review and recommendations. *Personality and Social Psychology Review, 5*, 276–295.
Diamond, L. M., & Fagundes, Ch. P. (2008). Development perspectives on links between attachment and affect regulation over the lifespan. *Advances in Child Behavior and Development, 36*, 83–134.
Diamond, L. M., & Fagundes, Ch. P. (2010). Psychobiological research on attachment. *Journal of Social and Personal Relationships, 27*, 218–225.
Diamond, L. M., & Hicks, A. M. (2005). Attachment style, current relationship security, and negative emotions: The mediating role of physiological regulation. *Journal of Social and Personal Relationships, 22*, 499–518.
Diamond, L. M., Hicks, A. M., & Otter-Henderson, K. (2006). Physiological evidence for repressive coping among avoidantly attached adults. *Journal of Social and Personal Relationships, 23*, 205–229.
Diamond, L. M., Hicks, A. M., & Otter-Henderson, K. D. (2011). Individual differences in vagal regulation moderate associations between daily affect and daily couple interactions. *Personality and Psychology Bulletin, 37*, 731–744.
Diamond, L. M., & Hicks, A. M. (2004). Psychobiological perspectives on attachment: Implications for health over the lifespan. In J. A. Simpson & W. S. Rholes (Eds.), *Adult attachment: New directions and emerging issues* (pp. 240–263). New York: Guilford Press.
Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130*, 355–391.
Ditzen, B., Schmidt, S., Strauss, B., Nater, U. M., Ehlert, U., & Heinrichs, M. (2008). Adult attachment and social support interact to reduce psychological but not cortisol responses to stress. *Journal of Psychosomatic Research, 64*, 479–486.
Donato, S., & Parise, M. (2012). The role of enacted and perceived dyadic coping for young couples' satisfaction. In B. Molinelli & V. Grimaldo (Eds.), *Handbook of the psychology of coping: New research* (pp. 261–278). Hauppauge, NY: Nova Science Publisher.
Downey, G., Freitas, A. L., Michaelis, B., & Khouri, H. (1998). The self-fulfilling prophecy in close relationships: Rejection sensitivity and rejection by romantic partners. *Journal of Personality and Social Psychology, 75*, 545–560.
Eagly, A. H., & Koenig, A. M. (2006). Social role theory of sex differences and similarities: Implication for prosocial behavior. In K. Dindia & D. J. Canary (Eds.), *Sex differences and similarities in communication* (2nd ed., pp. 161–177). Mahwah, NJ: Lawrence Erlbaum.
Feeney, B. C., & Kirkpatrick, L. A. (1996). Effects of adult attachment and presence of romantic partners on physiological responses to stress. *Journal of Personality and Social Psychology, 70*, 255–270.
Fraley, R. C., & Shaver, P. R. (2000). Adult romantic attachment: Theoretical developments, emerging controversies, and unanswered questions. *Review of General Psychology, 4*, 132–154.
Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). An item-response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology, 78*, 350–365.
Gable, S. L., Gosnell, C. L., Maisel, N. C., & Strachman, A. (2012). Safely testing the alarm: Close others' responses to personal positive events. *Journal of Personality and Social Psychology, 103*, 963–981.
Gallo, L. C., & Matthews, K. A. (2006). Adolescents' attachment orientation influences ambulatory blood pressure responses to everyday social interactions. *Psychosomatic Medicine, 68*, 253–261.
Girme, Y. U., Overall, N. C., & Simpson, J. A. (2013). When visibility matters short-term versus long-term costs and benefits of visible and invisible support. *Personality and Social Psychology Bulletin, 39*, 1441–1454.
Girme, Y. U., Overall, N. C., Simpson, J. A., & Fletcher, G. J. (2015). "All or nothing": Attachment avoidance and the curvilinear effects of partner support. *Journal of Personality and Social Psychology, 108*, 450–475.
Grewen, K. M., Girdler, S. S., Amico, J., & Light, K. C. (2005). Effects of partner support on resting oxytocin, cortisol, norepinephrine, and blood pressure before and after warm partner contact. *Psychosomatic Medicine, 67*, 531–538.
Gruenewald, T. L., & Seeman, T. E. (2010). Social support and physical health: links and mechanisms. In *Handbook of behavioral medicine* (pp. 225–236). New York: Springer.
Hazan, C., & Shaver, P. R. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology, 52*, 511–524.
Hobfoll, S. E. (2009). Social support: The movie. *Journal of Social and Personal Relationships, 26*, 93–101.
Holt-Lunstad, J., Birmingham, W. A., & Light, K. C. (2008b). Influence of a "warm touch" support enhancement intervention among married couples on ambulatory blood pressure, oxytocin, alpha amylase, and cortisol. *Psychosomatic Medicine, 70*, 976–985.
Holt-Lunstad, J., Smith, T. W., & Uchino, B. N. (2008a). Can hostility interfere with the health benefits of giving and receiving social support? The impact of cynical hostility on cardiovascular reactivity during social support interactions among friends. *Annals of Behavioral Medicine, 35*, 319–330.
Holt-Lunstad, J., Uchino, B. N., Smith, T. W., Olson-Cerny, C., & Nealey-Moore, J. B. (2003). Social relationships and ambulatory blood pressure: Structural and qualitative predictors of cardiovascular function during everyday social interactions. *Health Psychology, 22*, 388–397.
Howland, M., & Simpson, J. A. (2010). Getting in under the radar: A dyadic view of invisible support. *Psychological Science, 21*, 1878–1885.
Kenny, D. A., Kashy, D., & Cook, W. L. (2006). *Dyadic data analysis*. Guilford Press.
Kim, Y. (2006). Gender, attachment, and relationship duration on cardiovascular reactivity to stress in a laboratory study of dating couples. *Personal Relationships, 13*, 103–114.
Kirsch, J. A., & Lehman, B. J. (2014). Comparing visible and invisible social support: Non-evaluative support buffers cardiovascular responses to stress. *Stress and Health*. Advanced online publication.
Kleiboer, A. M., Kuijer, R. G., Hox, J. J., Schreurs, K. M., & Bensing, J. M. (2006). Receiving and providing support in couples dealing with multiple sclerosis: A diary study using an equity perspective. *Personal Relationships, 13*, 485–501.

Kobak, R. R., & Sceery, A. (1988). Attachment in late adolescence: Working models, affect regulation, and representations of self and others. *Child Development, 59*, 135–146.
Krause, N., & Shaw, B. A. (2000). Giving social support to others, socioeconomic status, and changes in self-esteem in late life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 55*, 323–333.
Laurenceau, J.-P., & Bolger, N. (2012). Analyzing diary and intensive longitudinal data from dyads. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life* (pp. 407–422). New York, NY: Guilford Press.
Laurent, H., & Powers, S. (2007). Emotion regulation in emerging adult couples: Temperament, attachment, and HPA response to conflict. *Biological Psychology, 76*, 61–71.
Lemay, E. P., Jr., & Dudley, K. L. (2011). Caution: Fragile! Regulating the interpersonal security of chronically insecure partners. *Journal of Personality and Social Psychology, 100*, 681–702.
Levenson, R. W. (2003). Blood, sweat, and fears: The autonomic architecture of emotion. *Annals New York Academy of Sciences, 1000*, 348–366.
Liu, B. S., & Rook, K. S. (2013). Emotional and social loneliness in later life Associations with positive versus negative social exchanges. *Journal of Social and Personal Relationships, 30*, 813–832.
Martire, L. M., Stephens, M. A. P., Druley, J. A., & Wojno, W. C. (2002). Negative reactions to received spousal care: Predictors and consequences of miscarried support. *Health Psychology, 21*, 167–176.
McClure, M. J., Xu, J. H., Craw, J. P., Lane, S. P., Bolger, N., & Shrout, P. E. (2014). Understanding the costs of support transactions in daily life. *Journal of Personality, 82*, 563–574.
McGonagle, K. A., Kessler, R. C., & Schilling, E. A. (1992). The frequency and determinants of marital disagreements in a community sample. *Journal of Social and Personal Relationships, 9*, 507–524.
Meuwly, N., Bodenmann, G., Germann, J., Bradbury, T. N., Ditzen, B., & Heinrichs, M. (2012). Dyadic coping, insecure attachment, and cortisol stress recovery following experimentally induced stress. *Journal of Family Psychology, 26*, 937–947.
Mikulincer, M., & Shaver, P. R. (2003). The attachment behavioral system in adulthood: Activation, psychodynamics, and interpersonal processes. *Advances in Experimental Social Psychology, 35*, 53–152.
Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and Change*. New York, NY: Guilford.
Mikulincer, M., & Shaver, P. R. (2008). An attachment perspective on bereavement. In M. Stroebe, R. O. Hansson, H. A. W. Schut, & W. Stroebe (Eds.), *Handbook of bereavement research and practice: 21st century perspectives* (pp. 87–110). Washington, DC: American Psychological Association.
Parker, P., Celler, B. G., Potter, E. K., & McCloskey, D. I. (1984). Vagal stimulation and cardiac slowing. *Journal of the Autonomic Nervous System, 11*, 226–231.
Pasch, L. A., & Bradbury, T. N. (1998). Social support, conflict, and the development of marital dysfunction. *Journal of Consulting and Clinical Psychology, 66*, 219–230.
Pearlin, L. I., & McCall, M. E. (1990). Occupational stress and marital support: A description of microprocesses. In J. Eckenrode & S. Gore (Eds.), *Stress between work and family* (pp. 39–60). New York: Plenum Press.
Pietromonaco, P. R., DeBuse, C. J., & Powers, S. I. (2013). Does attachment get under the skin? Adult romantic attachment and cortisol responses to stress. *Association for Psychological Science, 22*, 63–68.
Porges, S. W., Doussard-Roosevelt, J. A., & Maiti, A. K. (1994). Vagal tone and the physiological regulation of emotion. *Monographs of the Society for Research in Child Development, 59*, 167–186.
Powers, S. I., Pietromonaco, P. R., Gunlicks, M., & Sayer, A. (2006). Dating Couples' attachment styles and patterns of cortisol reactivity and recovery in response to a relationship conflict. *Journal of Personality and Social Psychology, 90*, 613–628.
Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437–448.
Quirin, M., Pruessner, J. C., & Kuhl, J. (2008). HPA system regulation and adult attachment anxiety: Individual differences in reactive and awakening cortisol. *Psychoneuroendocrinology, 33*, 581–590.
Rafaeli, E., Cranford, J. A., Green, A. S., Shrout, P. E., & Bolger, N. (2008). The good and bad of relationships: How social hindrance and social support affect relationship feelings in daily life. *Personality and Social Psychology Bulletin, 34*, 1703–1718.
Rafaeli, E., & Gleason, M. E. J. (2009). Skilled support within intimate relationships. *Journal of Family Theory & Review, 1*, 20–37.
Reinhardt, J. P., Boerner, K., & Horowitz, A. (2006). Good to have but not to use: Differential impact of perceived and received support on well-being. *Journal of Social and Personal Relationships, 23*, 117–129.
Rini, C., & Dunkel Schetter, C. (2010). The effectiveness of support attempts in intimate relationships. In K. T. Sullivan & J. Davila (Eds.), *Support processes in intimate relationships* (pp. 26–67). New York, NY: Oxford University Press.
Robles, T. F., Brooks, K. P., Kane, H. S., & Schetter, C. D. (2013). Attachment, skin deep? Relationships between adult attachment and skin barrier recovery. *International Journal of Psychophysiology, 88*, 241–252.
Robles, T. F., & Kane, H. S. (2014). The attachment system and physiology in adulthood: Normative processes, individual differences, and implications for health. *Journal of Personality, 82*, 515–527.
Roisman, G. I. (2007). The psychophysiology of adult attachment relationships: Autonomic reactivity in marital and premarital interactions. *Developmental Psychology, 43*, 39–53.
Saxbe, D., & Repetti, R. L. (2010). For better or worse? Coregulation of couples' cortisol levels and mood states. *Journal of Personality and Social Psychology, 98*, 92–103.
Sbarra, D. A., & Hazan, C. (2008). Coregulation, dysregulation, self-regulation: An integrative analysis and empirical agenda for understanding adult attachment, separation, loss, and recovery. *Personality and Social Psychology Review, 12*, 141–167.
Shaver, P. R., & Mikulincer, M. (2008). Adult attachment and cognitive and affective reactions to positive and negative events. *Social and Personality Psychology Compass, 2*, 1844–1865.
Simpson, J. A., & Overall, N. C. (2014). Partner buffering of attachment insecurity. *Current Directions in Psychological Science, 23*, 54–59.
Simpson, J. A., Rholes, W. S., & Phillips, D. (1996). Conflict in close relationships: An attachment perspective. *Journal of Personality and Social Psychology, 71*, 899–914.
Simpson, J. A., Winterheld, H. A., Rholes, W. S., & Oriña, M. M. (2007). Working models of attachment and reactions to different forms of caregiving from romantic partners. *Journal of Personality and Social Psychology, 93*, 466–477.
Slotter, E. B., & Luchies, L. B. (2014). Relationship quality promotes the desire for closeness among distressed avoidantly attached individuals. *Personal Relationships, 21*, 22–34.
Stanton, S. C., & Campbell, L. (2014a). Psychological and physiological predictors of health in romantic relationships: An attachment perspective. *Journal of Personality, 82*, 528–538.
Stanton, S. C., & Campbell, L. (2014b). Perceived social support moderates the link between attachment anxiety and health outcomes. *PloS One, 9*, e95358.
Stern, R. M., Ray, W. J., & Quigley, K. S. (2001). *Psychophysiological recording* (2nd ed.). New York: Oxford University Press.
Sullivan, K. T., Pasch, L. A., Johnson, M. D., & Bradbury, T. N. (2010). Social support, problem solving, and the longitudinal course of newlywed marriage. *Journal of Personality and Social Psychology, 98*, 631–644.
Tanosoto, T., Bendixen, K. H., Arima, T., Hansen, J., Terkelsen, A. J., & Svensson, P. (2015). Effects of the Paced Auditory Serial Addition Task (PASAT) with different rates on autonomic nervous system responses and self-reported levels of stress. *Journal of Oral Rehabilitation*. Advance online publication.
Taylor, S. E. (2007). Social support. In H. S. Friedman & R. C. Silver (Eds.), *Foundations of health psychology* (pp. 145–171). New York: Oxford University Press.
Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior, 52*, 145–161.
Thorsteinsson, E. B., & James, J. E. (1999). A meta-analysis of the effects of experimental manipulations of social support during laboratory stress. *Psychology and Health, 14*, 869–886.
Uchino, B. N. (2009). Understanding the links between social support and physical health: A life-span perspective with emphasis on the separability of perceived and received support. *Perspectives on Psychological Science, 4*, 236–255.
Verhofstadt, L. L., Buysse, A., & Ickes, W. (2007). Social support in couples: An examination of gender differences using self-report and observational methods. *Sex Roles, 57*, 267–282.
Verhofstadt, L. L., Buysse, A., Ickes, W., Davis, M., & Devoldre, I. (2008). Support provision in marriage: The role of emotional similarity and empathic accuracy. *Emotion, 8*, 792–802.
Waters, E., & Cummings, E. M. (2003). A secure base from which to explore close relationships. *Child Development, 71*, 164–172.
Wright, B. L., & Loving, T. J. (2011). Health implications of conflict in close relationships. *Social and Personality Psychology Compass, 5*, 552–562.
Xu, Y., & Burleson, B. R. (2004). The association of experienced spousal support with marital satisfaction: Evaluating the moderating effects of sex, ethnic culture, and type of support. *The Journal of Family Communication, 4*, 123–145.
Zayas, V., Shoda, Y., Mischel, W., Osterhout, L., & Takahashi, M. (2009). Neural responses to partner rejection cues. *Psychological Science, 20*, 813–821.