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Mindfulness during romantic conflict moderates the impact of negative partner behaviors on cortisol responses

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ABSTRACT

This study was designed to test whether romantic partners' mindfulness—present moment, nonjudgmental awareness—during a conflict discussion could buffer the effects of negative partner behaviors on neuroendocrine stress responses. Heterosexual couples ($n = 88$ dyads) provided 5 saliva samples for cortisol assay during a laboratory session involving a conflict discussion task. Conflict behaviors were coded by outside observers using the System for Coding Interactions in Dyads, and partners rated their mindfulness during the task using the Toronto Mindfulness Scale. Interactions tested using multilevel modeling revealed that participants with higher levels of mindfulness during the conflict showed either quicker cortisol recovery or an absence of slowed recovery in the presence of more negative partner behaviors. Whereas the attitudinal component of mindfulness (curiosity) moderated effects of negative partner engagement in the conflict (i.e., attempts to control, coerciveness, negativity and conflict), the attentional component of mindfulness (decentering) moderated the effect of partner disengagement (i.e., withdrawal). These findings lend support to the idea that mindfulness during a stressful interaction can mitigate the physiological impacts of negative behaviors.

Although close interpersonal relationships are known to confer a host of benefits, conflict in these relationships can compromise partners' well-being at both subjective and physiological levels (e.g., Cramer, 2002; Kiecolt-Glaser et al., 2005). In particular, conflict involving aggressive or withdrawn behaviors and high levels of negative affect appears harmful (e.g., Gottman and Levenson, 1992; Kiecolt-Glaser et al., 1998; Robles and Kiecolt-Glaser, 2003). One way of regulating stress, including stress within close relationships might be found in mindfulness, often defined as present-centered attention characterized by nonjudgmental openness. Despite promising indications that mindfulness training can help couples better negotiate conflict, little is known about how it may do so (i.e., which aspects of mindfulness in an actual conflict situation can buffer against which negative behaviors). Furthermore, most previous research has been limited to psychological outcomes, leaving open questions about possible impacts on neuroendocrine physiology. The current study aims to address these gaps by investigating romantic partners' state mindfulness during conflict as a moderator of conflict behavior effects on hypothalamic–pituitary–adrenal (HPA) axis responses to conflict stress.

A likely path by which destructive conflict disrupts couples' functioning is activation of the HPA axis, often measured by salivary cortisol. There is broad agreement that conflict behaviors involving negative engagement (i.e., hostile or aggressive behaviors) or disengagement (i.e., withdrawal) result in dysregulated cortisol responses, though the direction of these effects varies across studies. For example, studies have associated negative interactions with both partners' lack of a cortisol response to conflict and elevated cortisol responses (Fehm-Wolfsdorf et al., 1999; Heffner et al., 2006; Kiecolt-Glaser et al., 1997). A more consistent marker of HPA regulation may be the dynamics—how long it takes partners to react and recover—rather than average level of response. Indeed, research has related more negative and/or less positive conflict behaviors to impairments in partners' post-stress recovery (Robles et al., 2006). Given the harmful mental health implications of such extended cortisol responses (Burke et al., 2005), this work underlines the importance of identifying factors that could help couples engage more constructively in conflict and/or mitigate harmful impacts of negative behaviors when they occur.

Mindfulness has often been conceptualized as an intrapersonal phenomenon, yet it is increasingly being applied in relationship contexts to enhance interpersonal functioning. Several studies of a mindfulness-based relationship enhancement program have shown improvements in relationship satisfaction and subjective well-being, which in turn appear related to changes in the way partners approach conflict (Carson et al., 2004; Gambrel and Piercy, 2015a, 2015b). In particular, these studies found increases in partners' acceptance of one another, as well as in their perspective-taking, conflict communication, and resolution skills. Based on this and other research highlighting mindfulness effects on couples' emotion recognition and regulation (Kemeny et al., 2012;

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Wachs and Cordova, 2007), it is likely that mindfulness helps not only by changing the actual behaviors partners use during conflict, but also by enhancing skills that allow them to understand and withstand negative partner behaviors with greater equanimity. This literature provides a foundation for hypothesizing mindfulness-related benefits in couples' conflict situations; however, it suffers from notable gaps in the areas of physiological effects and the role of state mindfulness during the conflict itself.

Mindfulness has often been conceptualized as a broad dispositional capacity—a trait-like construct that can be cultivated through training—but it may also be important to distinguish ways that mindfulness manifests in specific situations. Based on the few studies examining the latter phenomenon, there is evidence that state mindfulness exerts unique effects on well-being that cannot be explained by trait mindfulness (Brown & Ryan, 2003; Jislin-Goldberg, Tanay, & Bernstein, 2012), and ongoing work within the current sample validates this point more particularly in the context of romantic conflict (Laurent et al., under review). It may further be useful to distinguish effects of different aspects of mindfulness; researchers have proposed that a mindful state involves (1) "the intentional self-regulation of attention to facilitate greater awareness of bodily sensations, thoughts, and emotions" and (2) "a specific quality of attention characterized by endeavoring to connect with each object in one's awareness …with curiosity, acceptance, and openness to experience" (see Lau et al., 2006). This work revealed both common and distinct psychological correlates of these attentional ("decentering") vs. attitudinal ("curiosity") components of mindfulness, but there is as yet no information about how these aspects of state mindfulness might shape physiology during acute stress.

Training in mindfulness has been shown to impact HPA reactivity to a standardized psychosocial stress task (Creswell et al., 2014). To our knowledge, only two papers (analyses conducted within the present study sample) have addressed mindfulness effects on HPA axis responses to romantic conflict. One paper showed that trait mindfulness related to better regulated cortisol responses for both men and women (as indexed by relations with mental health; Laurent et al., 2013a). The other paper highlighted an indirect path from trait mindfulness to cortisol levels during conflict via partners' romantic attachment (Hertz et al., 2015). However, these analyses did not address conflict behaviors, nor—like the bulk of mindfulness research to date—the potential role of state mindfulness during the conflict stressor. One study that did examine mindfulness during couple's conflict revealed an association with better conflict communication (i.e., less verbal aggression, negativity and conflict; Barnes et al., 2007). While such direct paths from mindfulness to conflict behaviors are plausible, relatively small effects in this study leave open the possibility that mindfulness may also influence how an individual perceives and responds to partner conflict behaviors (i.e., mindfulness may act as a moderator of partner behavior effects).

There is some evidence that mindfulness buffers against potentially harmful effects of stressful situations, including both reminders of and exposure to stressors. One study showed better physical and psychological health outcomes following expressive writing about traumatic stress for participants higher in mindfulness (Poon and Danoff-Burg, 2011), and another demonstrated attenuated effects of unavoidable distressing events on psychological health in more mindful individuals (Bergomi et al., 2013). As of yet, this mindfulness-as-buffer lens has not been applied to acute interpersonal stress.

The current study draws together these different strands of research to shed light on the mechanisms by which mindfulness may impact couples' neuroendocrine regulation. Specifically, we set out to test state mindfulness during romantic conflict as a moderator of the effects of negative partner behaviors on cortisol responses. To better specify the source of such effects, we considered different aspects of both mindfulness (i.e., attentional decentering from inner experience and attitudinal curiosity about the unfolding of such experience) and conflict behavior (i.e., attempts to control, coerciveness, negativity and conflict, verbal aggression, and withdrawal). Based on the research reviewed above, we hypothesized that mindfulness during conflict would buffer against the impacts of negative partner behaviors, resulting in quicker cortisol recovery for both men and women.

Method

Participants

Healthy heterosexual couples ($n = 114$) were recruited through an online student research participant pool and community flyers to participate in a 2-part study of romantic relationships. All procedures were approved by the university Institutional Review Board, and all participants gave informed consent. To be eligible, participants had to be at least 18 years old and in a romantic relationship for at least 2 months. Table 1 offers further demographic and psychological health information about the sample. The current study is based on the subset of participants ($n = 88$ couples) for whom complete behavior coding data were available (excluded couples did not have codeable conflict data, either because they did not complete the second study session or because of technical problems with the audiovisual recording). A comparison of these participants with those not included in the final sample revealed no significant differences on demographic and study variables.

Procedure

Couples completed questionnaire measures of trait-like constructs (none of which were used in the current study) during an initial hour-long lab session. During the second session, scheduled approximately one week later and lasting 1.75 h, couples completed the conflict discussion task and responded to questionnaires assessing their state directly after the conflict (including mindfulness). Except for during the conflict discussion, partners completed questionnaires in separate rooms.

To minimize extraneous sources of salivary cortisol variability, all sessions began at the same time (16:00) and participants were

Table 1
Sample descriptives.

Continuous variables	*M*	*SD*
Age	21.31	6.11
Relationship length (years)	2.22	4.84
Time spent together per week (hours)	58.50	40.12
Relationship satisfaction (Dyadic Adjustment Scale total)	106.31	19.41
Depressive symptoms (Center for Epidemiologic Studies Depression total)	12.05	8.74
Anxiety symptoms (Beck Anxiety Inventory total)	8.36	9.04
Categorical variables		**Percent**
Race		
White		83.8
Black		2.6
Asian		1.3
Native American		3.9
Other		8.4
Ethnicity		
Latino/a		10.5
Relationship status		
Casual/non-exclusive dating		7.0
Exclusive dating		59.6
Living together		20.2
Engaged		3.5
Married		9.6
Education		
College student		86.8
Post-baccalaureate		4.0
Graduate student/other		9.2

instructed not to consume more than one alcoholic drink within 24 h of the session, not to smoke or use non-prescription drugs the day of the session, not to exercise vigorously or brush teeth within 3 h of the session, and not to eat or drink within 1 h of the session. Following a set of initial questions to determine compliance with these conditions, the first saliva sample was collected (entry sample). This and all subsequent samples were collected via passive drool, and their interpretation is based on the roughly 20-minute lag between peak HPA response and measurement in salivary cortisol (Schlotz et al., 2008).

Next, participants were given a vivid description of the conflict task—prior to this, they only knew they would engage in a recorded interaction, not that the interaction would involve conflict—and were individually asked to nominate a topic of unresolved conflict in the relationship. One of the conflict topics (i.e., the one nominated by the male or the female partner) was selected by coin toss for later discussion. Twenty minutes after receiving a description of the conflict task, the second saliva sample was collected (anticipatory stress sample). Before the conflict discussion, participants were instructed using both written material and an audio-guided exercise to approach the conflict task in one of three ways: by attending mindfully to whatever arose (mindfulness condition), by taking the perspective of their partner (PT condition), or by focusing on their own thoughts and feelings about the issue (control condition). Couples were sequentially assigned to conditions (i.e., couple 1 to mindfulness, couple 2 to PT, couple 3 to control). Because condition did not consistently influence state mindfulness (effect found for male decentering only), and controlling for it did not change the effects described below, it was not included in final models.

After being informed which topic had been chosen, partners were brought together and given 15 min to discuss and attempt to resolve the chosen issue. Following the discussion, partners were again escorted to separate rooms to complete questionnaires. Ten minutes after the discussion had concluded, the third saliva sample was collected (conflict stress sample). The fourth and fifth samples were collected 15 and 30 min after the conflict stress sample to index recovery. All samples were immediately frozen (−20 °C) until shipment on dry ice to the Johns Hopkins Center for Interdisciplinary Salivary Bioscience.

Measures

State mindfulness

The Toronto Mindfulness Scale (TMS; Lau et al., 2006) assesses mindfulness during a specified time period—in this investigation, participants were asked immediately following the conflict to rate their experience during the preceding discussion on a scale from 0 (not at all) to 4 (very much). Six items measured curiosity (example: “I remained curious about the nature of each experience as it arose,” subscale $\alpha = 0.88$), and seven items tapped decentering (example: “I was aware of my thoughts and feelings without over-identifying them,” subscale $\alpha = 0.69$).

Conflict behaviors

The System for Coding Interactions in Dyads (SCID) was used to assess partner behaviors during the conflict discussion (Malik and Lindahl, 2004). This coding scheme was developed to measure couples' affective and communicative functioning and has been validated for use with couples with varying levels of adjustment (from violent/distressed to satisfied) and ethnic groups. Individual behavior codes reflecting increasingly severe forms of negative engagement in the conflict (scales 1–4 below), as well as disengagement (scale 5), were selected for the current study: 1. *Attempts to control* refers to commands or demands to change the partner's thoughts, feelings, and actions (whether or not this attempt succeeds); 2. *Coerciveness* refers to threatening or manipulative statements and/or using a threatening tone or body language with the partner (but not direct aggression toward the partner); 3. *Negativity and conflict* refers to a partner's display of anger, frustration, and tension and incorporates both how the partner behaves and his/her use of conflictual, sarcastic, or angry (but not aggressive) statements; 4. *Verbal aggression* refers to the use of hostile and aggressive or demeaning remarks toward the partner; 5. *Withdrawal* refers to the degree to which the partner removes him/herself from the interaction or disengages from the interaction through body language, tone of voice, and attitude.

Each of these domains was rated by trained coders using a Likert-type scale from 1 (very low) to 5 (high). Codes were global ratings based on behavior throughout the 15-minute interaction. All videos were rated by two coders, and differences in ratings >1 were recoded until adequate agreement was reached. When ratings differed by <1, an average of the two ratings was used in final analyses. Inter-rater reliabilities, based on original independent ratings of a subset of the sample ($n = 35$), were good to excellent: intra-class correlation (ICC) = 0.91 for attempts to control, 0.78 for coerciveness, 0.91 for negativity and conflict, 0.93 for verbal aggression, and 0.94 for withdrawal. A natural log transformation was adequate to correct positive skew for attempts to control, negativity and conflict, and withdrawal. Coerciveness and verbal aggression were still highly skewed following transformation; therefore, these variables were dichotomized to indicate presence vs. absence of the behavior.

Cortisol

The saliva samples were analyzed with the commercially available Salivary Cortisol Enzyme Immunoassay (Salimetrics, State College, PA) without modification to the manufacturer's recommended protocol. The test volume was 25 μl, and range of sensitivity from 0.007 to 3.0 μg/dl. The intra-assay coefficient of variation was on average <5%, and the inter-assay coefficient of variation was on average <10%. Fig. 1 shows average male and female cortisol values at each sample. Cortisol scores were natural log-transformed prior to analysis to correct positive skew.

Analytic strategy

Growth curve modeling in HLM was used to test effects on men's and women's cortisol trajectories. This approach separates variability into within- and between-couple levels while accounting for the dependency of repeated physiology measures within partners. Level 1 modeled both partners' cortisol trajectories (designated using dummy codes), and Level 2 modeled between-couple differences in these trajectories as a function of predictive variables (i.e., state mindfulness during conflict, partner conflict behavior, and their interaction). Three stress physiology parameters were estimated: (1) an intercept corresponding to the estimated cortisol level at the conflict stress sample, (2) a linear term depicting recovery slope of the cortisol trajectory at that sample, and (3) a quadratic term describing the steepness of the entire response

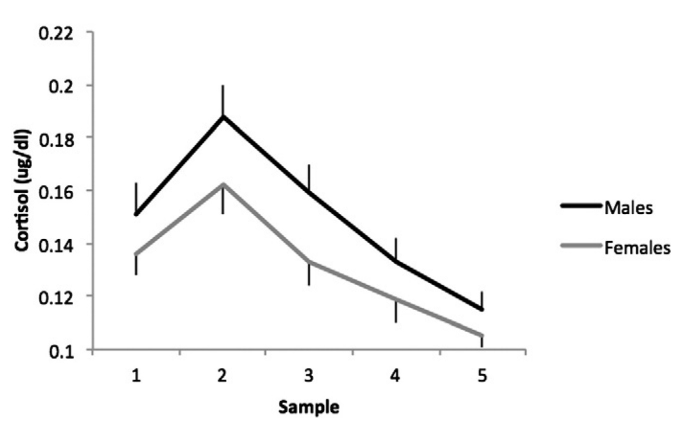

Fig. 1. Men's and women's observed cortisol values. *Note*. Raw (untransformed) cortisol values shown; bars represent standard errors.

Table 2
Descriptives and correlations among men's and women's continuous mindfulness and behavior scores during conflict.

Variable	*M*	*SD*	Range	1	2	3	4	5
1. TMS curiosity	2.10	0.87	0–4	0.26*	0.62*	−0.21	−0.30*	−0.12
2. TMS decentering	1.91	0.64	0–3.57	0.59*	0.24*	−0.20	−0.23*	−0.11
3. SCID attempts to control	1.58	1.11	1–5	−0.12	−0.07	0.29*	0.70*	0.62*
4. SCID negativity & conflict	1.59	0.97	1–5	−0.19	−0.28*	0.63*	0.49*	0.55*
5. SCID withdrawal	1.58	0.96	1–5	−0.11	−0.16	0.43*	0.54*	0.59*

Note. Men's scores above the diagonal; women's scores below the diagonal. SCID scores were log-transformed to correct for skew—raw scores shown above for descriptive purposes.
* $p < 0.05$.

trajectory (with a negative coefficient/deceleration indicating expected reactivity followed by recovery, and a positive coefficient/acceleration indicating an atypical decrease followed by an increase). Whereas the intercept reflects a partner's level of physiological stress, the linear and quadratic terms reflect the dynamics of his/her response trajectory. For illustration, the two-level equation testing curiosity-moderated effects of partner coerciveness on cortisol is shown below:

Level 1: Cortisol = male partner [$\beta_{M0} + \beta_{M1}(\text{time}) + \beta_{M2}(\text{time}^2) + \text{error}$]
+ female partner [$\beta_{F0} + \beta_{F1}(\text{time}) + \beta_{F2}(\text{time}^2) + \text{error}$].

Level 2: $\beta_{M0} = \gamma_{M00} + \gamma_{M01}(\text{male TMS curiosity}) + \gamma_{M02}(\text{female SCID coerciveness}) + \gamma_{M03}(\text{male TMS curiosity} \times \text{female SCID coerciveness}) + \text{error}$
(similar equations used to predict β_{M1}–β_{M2} and β_{F0}–β_{F2}).

In these models, β_{M0} and β_{F0} represent individual male and female partner cortisol levels, β_{M1} and β_{F1} represent their instantaneous recovery slopes, and β_{M2} and β_{F2} represent the steepness of their overall response curves. At the group level, the γ coefficients represent sample-wide means for these trajectory terms ($\gamma_{M00}/\gamma_{F00}$, $\gamma_{M10}/\gamma_{F10}$, and $\gamma_{M20}/\gamma_{F20}$), as well as hypothesized mindfulness ($\gamma_{M01}/\gamma_{F01}$, $\gamma_{M11}/\gamma_{F11}$, and $\gamma_{M21}/\gamma_{F21}$), partner conflict behavior ($\gamma_{M02}/\gamma_{F02}$, $\gamma_{M12}/\gamma_{F12}$, and $\gamma_{M22}/\gamma_{F22}$), and mindfulness × partner conflict behavior ($\gamma_{M03}/\gamma_{F03}$, $\gamma_{M13}/\gamma_{F13}$, and $\gamma_{M23}/\gamma_{F23}$) effects on cortisol trajectories.

Results

Table 2 shows descriptive statistics and zero-order correlations among men's and women's mindfulness and behavior scores. The baseline HLM model of partners' cortisol trajectories confirmed significant reactivity/recovery curves for both male (quadratic $\gamma_{M20} = -0.048$, $p < 0.001$) and female (quadratic $\gamma_{F20} = -0.031$, $p = 0.001$) partners. Negative linear terms ($\gamma_{M10} = -0.077$, $p < 0.001$ for males; $\gamma_{F10} = -0.084$, $p < 0.001$ for females) revealed that, on average, participants were beginning to recover from an anticipatory cortisol peak at the time of the first post-conflict sample. At the same time, significant between-couple variability in all trajectory terms, $\chi^2(87) = 175.25$–1603.50, all p's < 0.001, suggested individual differences in cortisol responses that could be explained by adding predictors at Level 2. Extraneous influences on cortisol—i.e., medication use (including oral contraceptives), age, menstrual phase, sleep the night before, exercise habits, body mass index, and typical caffeine, alcohol, and nicotine consumption—were tested, and those found to relate to men's (allergy medication, typical nicotine consumption) or women's (allergy and asthma medications) cortisol were included as controls in further analyses.[1]

Attempts to control

The first set of explanatory models tested mindfulness (curiosity and decentering) during the conflict as a moderator of effects of partner controlling behaviors. The interaction of curiosity × partner attempts to control predicted females' cortisol linear terms and males' cortisol quadratic terms (see Table 3, panel A). Region of significance tests were used to further decompose effects; for this and all interaction effects, boundaries of the region of significance (i.e., values of the mindfulness moderator at which the behavior focal predictor begins to have a significant effect) are reported to better interpret the effect. For females, partner attempts to control predicted slower cortisol recovery (more positive linear) at lower levels of curiosity (≤−0.82, or 20th percentile), but faster cortisol recovery at very high levels of curiosity (≥1.98, or 99th percentile; see Fig. 2a). For males, partner attempts to control predicted a more dynamic cortisol reactivity/recovery curve (more negative quadratic) at higher levels of curiosity (≥−0.26, or 44th percentile, *ns* effects at lower levels of male curiosity; see Fig. 2b). No effects for decentering were found.

Coerciveness

The next set of models examined mindfulness as a moderator of partner coerciveness effects. The interaction of curiosity × partner coerciveness predicted females' cortisol linear terms (see Table 3, panel B). Region of significance testing revealed that partner coerciveness predicted slower cortisol recovery (more positive linear) at lower levels of female curiosity (≤−0.58, or 27th percentile), but faster cortisol recovery at higher levels of curiosity (≥0.91, or 82nd percentile; see Fig. 3).

Negativity and conflict

Similarly to the above, the interaction of curiosity × partner negativity and conflict predicted females' cortisol linear terms (Table 3, panel C). Again, partner negative behavior predicted slower cortisol recovery (more positive linear) at lower levels of female curiosity (≤−0.12, or 52nd percentile; see Fig. 4), but not at higher levels.

Verbal aggression

No significant moderated effects of verbal aggression were found.

For all of the negatively engaged behaviors reported above, there were no significant effects of decentering, and males did not show any moderated effects of partner behaviors.

Withdrawal

The final set of models tested mindfulness as a moderator of partner withdrawal effects. The interaction of decentering × partner withdrawal predicted males' cortisol linear terms (see Table 3, panel D). According to region of significance testing, partner withdrawal predicted slower cortisol recovery (more positive linear) at lower levels of male decentering (≤−0.073, or 46th percentile, *ns* effects at higher levels of

[1] For males, allergy medication use predicted a more negative linear term ($\gamma = -0.22$, $p = 0.010$) and a more positive quadratic term ($\gamma = 0.16$, $p = 0.009$), and typical number of cigarettes smoked per day predicted a more positive linear term ($\gamma = 0.009$, $p = 0.041$). For females, allergy medication use predicted a lower intercept ($\gamma = -0.57$, $p = 0.015$), and asthma medication use predicted a higher intercept ($\gamma = 1.20$, $p = 0.001$) and a more negative quadratic term ($\gamma = -0.13$, $p = 0.016$). Explanatory variable effects reported below were unchanged by the inclusion of control variables.

Table 3
Mindfulness × partner behavior effects on cortisol trajectories.

Predictor	Female partner			Male partner		
	Intercept γ, p	Linear γ, p	Quadratic γ, p	Intercept γ, p	Linear γ, p	Quadratic γ, p
A. Partner attempts to control	**0.12**, **0.020**	−0.002, 0.88	−0.007, 0.35	**0.15**, **0.015**	0.023, 0.087	**−0.026**, **0.017**
Curiosity	**0.15**, **0.021**	0.003, 0.81	−0.014, 0.12	0.021, 0.71	0.028, 0.073	0.004, 0.67
Curiosity × P attempts to control	0.064, 0.36	**−0.039**, **0.025**	−0.002, 0.84	0.046, 0.35	−0.006, 0.65	**−0.022**, **0.013**
B. Partner coerciveness	0.24, 0.37	−0.017, 0.76	−0.001, 0.96	0.14, 0.51	**0.13**, **0.005**	−0.010, 0.76
Curiosity	0.099, 0.14	0.018, 0.16	−0.012, 0.21	0.014, 0.80	0.027, 0.082	0.005, 0.63
Curiosity × P coerciveness	0.14, 0.45	**−0.17**, **<0.001**	0.022, 0.23	−0.012, 0.94	−0.013, 0.74	−0.009, 0.76
C. Partner negativity and conflict	**0.14**, **0.040**	0.021, 0.12	−0.004, 0.66	−0.010, 0.88	0.015, 0.28	0.016, 0.13
Curiosity	**0.14**, **0.025**	0.007, 0.60	−0.011, 0.21	0.005, 0.93	0.023, 0.13	0.009, 0.43
Curiosity × P negativity/conflict	0.063, 0.34	**−0.033**, **0.040**	0.003, 0.71	−0.013, 0.79	0.006, 0.64	−0.006, 0.48
D. Partner withdrawal	0.029, 0.63	0.006, 0.70	0.003, 0.73	**0.16**, **0.006**	0.022, 0.077	**−0.024**, **0.021**
Decentering	0.031, 0.58	0.006, 0.71	−0.009, 0.28	0.029, 0.63	0.011, 0.48	0.006, 0.62
Decentering × P withdrawal	−0.006, 0.88	−0.003, 0.79	0.003, 0.48	0.063, 0.22	**−0.025**, **0.022**	−0.008, 0.38

Note. Significant effects ($p < 0.05$) highlighted in bold. Interaction effects outlined in boxes.

decentering; see Fig. 5). No effects involving curiosity were found, and females did not show any moderated effects of partner withdrawal.

Post hoc comparisons

The above models suggested a pattern of stronger effects for curiosity (as opposed to decentering) and for females (as opposed to males). To better assess whether these apparent differences represented true differences in effect sizes, a series of Wald tests were run comparing the size of TMS × SCID coefficients for the effects reported above. Differences between state mindfulness components favoring curiosity were significant in all cases, $\chi^2(2) = 6.24–9.75$, p's between 0.008 and 0.043. Sex differences in effects were more variable; whereas females showed a stronger mindfulness-moderated effect for coerciveness, $\chi^2(2) = 15.97$, $p = 0.0006$, other differences did not reach the threshold for significance, $\chi^2(2) = 5.10–5.66$, p's between 0.057 and 0.076. Thus, although a greater number of significant mindfulness-moderated effects were detected for female partners, we cannot confidently conclude that these effects were stronger overall.

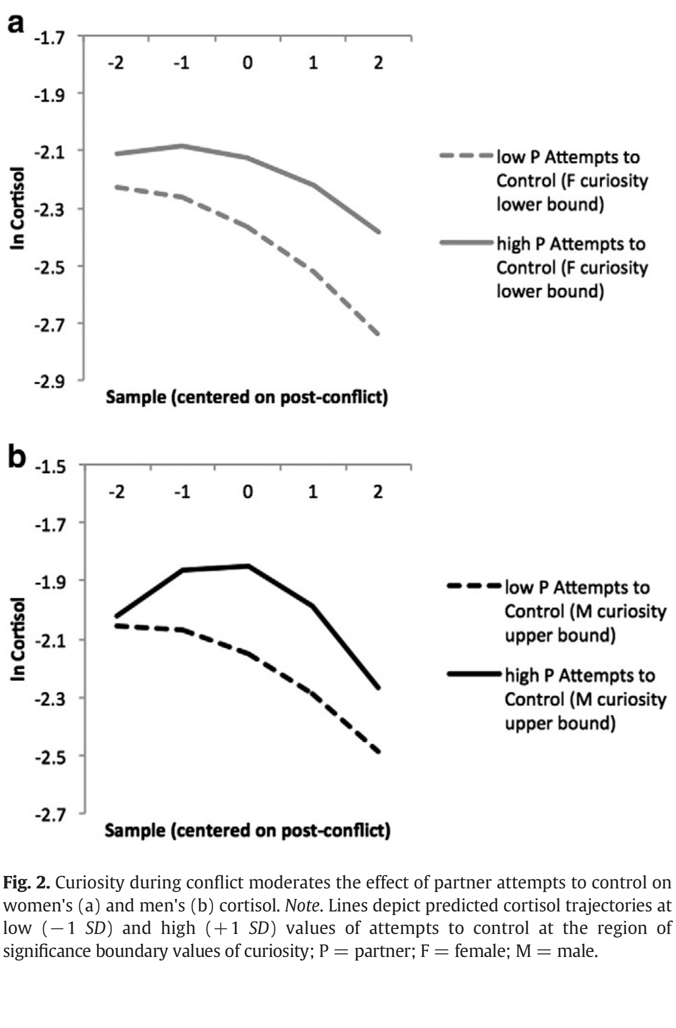

Fig. 2. Curiosity during conflict moderates the effect of partner attempts to control on women's (a) and men's (b) cortisol. *Note.* Lines depict predicted cortisol trajectories at low (−1 *SD*) and high (+1 *SD*) values of attempts to control at the region of significance boundary values of curiosity; P = partner; F = female; M = male.

Summary

Taken together, the above models point to a regulating impact of state mindfulness during conflict—especially curiosity—on cortisol dynamics associated with partner negative behaviors, which included both negative engagement (attempts to control, coerciveness, negativity and conflict) and disengagement (withdrawal).

Discussion

This study sheds much-needed light on the ways that mindfulness during conflict can help romantic partners regulate neuroendocrine stress responses. Overall, state mindfulness during a conflict discussion appeared to enhance HPA regulation in the presence of partner negative behaviors, though effects varied to some extent depending on the behavior in question. This work helps to provide an understanding of when and how mindfulness may benefit couples at the physiological level, while validating the importance of the attitude taken toward stressful experiences for self-regulation.

In cases of both partner negative engagement (i.e., through coercive, controlling, or angry and hostile behaviors) and disengagement

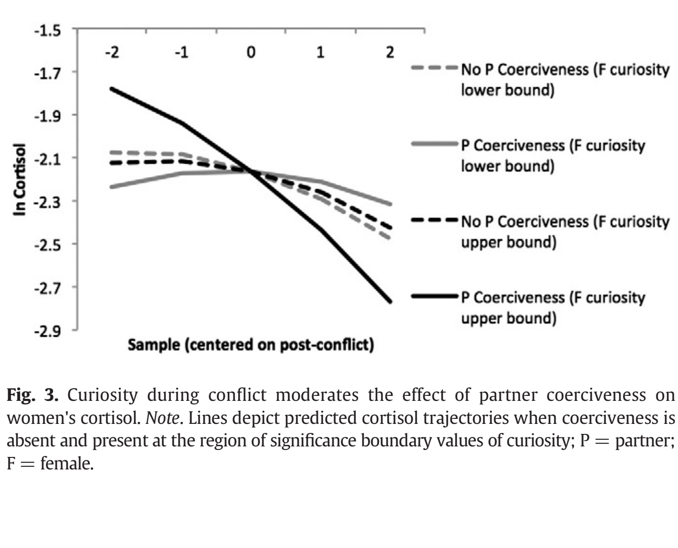

Fig. 3. Curiosity during conflict moderates the effect of partner coerciveness on women's cortisol. *Note.* Lines depict predicted cortisol trajectories when coerciveness is absent and present at the region of significance boundary values of curiosity; P = partner; F = female.

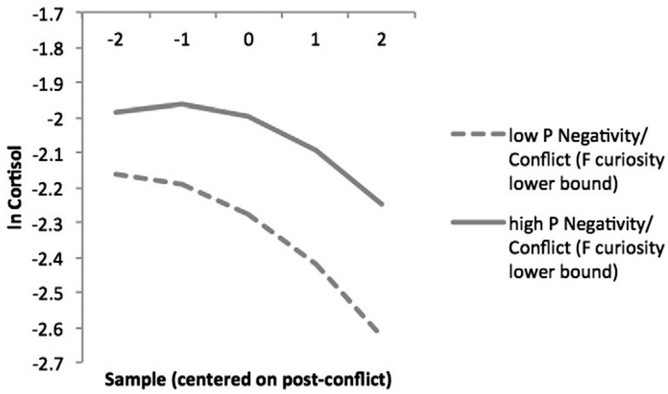

Fig. 4. Curiosity during conflict moderates the effect of partner negativity and conflict on women's cortisol. *Note*. Lines depict predicted cortisol trajectories at low (−1 *SD*) and high (+1 *SD*) values of negativity and conflict at the region of significance boundary value of curiosity; P = partner; F = female.

(through withdrawal), we found that partners reporting a more mindful stance during the conflict showed quicker cortisol recovery, or at least failed to show the impaired recovery associated with that behavior. An open and accepting approach may allow partners to better maintain equanimity in the face of negativity instead of getting caught up in trying to “fix” their partner, an agenda that could interfere with stress recovery. This would be consistent with previous findings at the subjective level suggesting that mindfulness helps partners to regulate their own emotional responses and more fully accept one another, resulting in less negative fallout from conflict when it arises. In fact, we found through follow-up correlational analyses that partners' mindfulness during conflict related to greater use of adaptive emotion regulation strategies (i.e., reappraisal) and empathy in the couple relationship (r's = 0.16–0.25, $p < 0.05$). Further experimental research manipulating state mindfulness (through a stronger manipulation than that used in the current study) or empathy/emotion regulation would help to disentangle the direction of effects; for now, we can conclude that men and women who are able to be mindful during romantic conflict are likely more motivated to understand and/or skilled at regulating emotional states with their partner.

A closer look at the nature of moderated effects suggests mindfulness may have differential impacts for different types of partner behaviors. For less severe forms of partner negativity (attempts to control, coerciveness), high levels of mindful curiosity during conflict actually allowed for faster cortisol recovery—evidenced by more negative cortisol slopes or sharper overall reactivity/recovery curves—at higher levels of these behaviors. It may be that mindfulness allows the partner to remain more (physiologically) engaged during constructive conflict

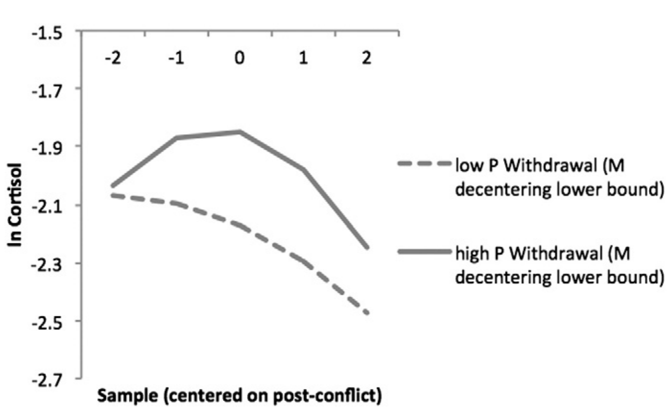

Fig. 5. Decentering during conflict moderates the effect of partner withdrawal on men's cortisol. *Note*. Lines depict predicted cortisol trajectories at low (−1 *SD*) and high (+1 *SD*) values of withdrawal at the region of significance boundary value of decentering; P = partner; M = female.

discussions, and to disengage more quickly from those that become unconstructive. For more severe forms of negotiation-interfering behaviors (negativity and conflict, withdrawal), mindfulness simply prevented the cortisol nonrecovery that typically accompanied such behaviors. This may speak to the limits of mindfulness as a tool for self-regulation in more intensely negative emotional situations. Consistent with the latter idea, we found no moderated effects of partner verbal aggression, the most severe form of negative engagement in this behavior coding scheme. While acknowledging that mindfulness shows promise in helping couples manage their responses to conflict, these findings suggest that mindfulness alone may not be sufficient to reverse the impact of highly destructive conflict tactics.

It is interesting that all mindfulness × partner behavior effects applied to cortisol recovery dynamics, and not to cortisol levels. This is consistent with the notion that mindfulness does not necessarily dampen the intensity of negative experiences (and may even heighten it); rather, the power of this approach lies in the ability to “unstick” from emotional experiences without ongoing reactivity. Negative partner behaviors, on the other hand, did show positive main effect associations with cortisol levels, suggesting that such behaviors can set an overall threat level for the interaction and an associated level of HPA arousal. There was also a positive main effect association between women's curiosity and cortisol levels; this represented the one point of convergence between the current findings and those detected previously for trait mindfulness (Laurent et al., 2013a, 2013b). Consistent with a small but significant correlation between curiosity and dispositional mindfulness in this sample ($r = 0.16$), such limited convergence confirms that state and trait mindfulness are not the same thing, and each may help to explain different phenomena.

Overall, this study revealed stronger effects of curiosity about unfolding experience than decentering from that experience during the conflict. This highlights the importance of the attitudinal component of mindfulness, which may allow partners to remain connected to their own and their partners' emotions in a constructive way during conflict. By contrast, decentering may have diminished partners' connection to the conflict, resulting in more limited effects on cortisol responses. At the same time, and for men only, we found an effect of decentering in the context of partner withdrawal. It may be that compensating for partner disengagement by distancing from what is happening helps, at least in the context of relatively healthy relationships represented in this sample, to maintain a sense of equilibrium and/or to empathize with the partner's perspective. This finding should be followed up with research that explores the psychological mechanisms involved, and why this process may be important for men's HPA regulation.

Beyond illuminating mindfulness-related psychobiological processes at the theoretical level, this work has practical implications for interventions aimed at couples. When working with distressed couples, it may be advantageous to recommend different strategies depending on the nature of conflict behavior patterns (e.g., curiosity for women in relationships characterized by moderate levels of negative partner behaviors, but not more extreme aggression; decentering for men with partners who tend to withdraw from conflict).

Limitations of this study should be kept in mind when interpreting these findings. The sample comprised young, relatively well-adjusted couples, and generalizability to older or more distressed couples remains to be demonstrated. While the assessment of different facets of state mindfulness and conflict behaviors was more nuanced than many previous studies in this domain, it was not exhaustive. In future studies, it may be fruitful to investigate impacts of the ability to describe internal experiences and/or of supportive partner behaviors, each of which we have previously found to influence males' cortisol (Laurent et al., 2013a; Laurent et al., 2013b). The assessment of physiological stress was restricted to cortisol, which represents only one branch of the stress response system. Research that considers mindfulness-moderated effects on autonomic and immune/inflammatory responses would help to build a more complete picture of how these skills may aid in stress regulation. Finally, as noted above, the present paper examines a subset of questions from a larger study that has investigated other aspects of mindfulness-stress associations (see Hertz et al., 2015; Laurent et al., 2013a; Laurent et al., 2015). Inevitably, the possibility of type I error across these investigations increases as different sets of effects are tested, and replication of these findings in other study samples will be important.

The present findings take a critical step toward defining how mindfulness qualities work to shape hormone–behavior relationships in high-stakes relationship contexts. By highlighting modifiable psychological characteristics underlying physiological regulation, this research can inform efforts to foster well-being in the face of everyday adversity.

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