Psychoneuroendocrinology 62 (2015) 121–128

Contents lists available at ScienceDirect

Psychoneuroendocrinology

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

Cortisol covariation within parents of young children: Moderation by relationship aggression

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ARTICLE INFO

Article history:
Received 11 May 2015
Received in revised form 6 July 2015
Accepted 5 August 2015

Keywords:
HPA axis
Cortisol
Covariation
Intimate partner aggression
Pregnancy
Moderation by relationship aggression

ABSTRACT

Covariation in diurnal cortisol has been observed in several studies of cohabiting couples. In two such studies (Liu et al., 2013; Saxbe and Repetti, 2010), relationship distress was associated with stronger within-couple correlations, suggesting that couples' physiological linkage with each other may indicate problematic dyadic functioning. Although intimate partner aggression has been associated with dysregulation in women's diurnal cortisol, it has not yet been tested as a moderator of within-couple covariation.

This study reports on a diverse sample of 122 parents who sampled salivary cortisol on matched days for two years following the birth of an infant. Partners showed strong positive cortisol covariation. In couples with higher levels of partner-perpetrated aggression reported by women at one year postpartum, both women and men had a flatter diurnal decrease in cortisol and stronger correlations with partners' cortisol sampled at the same timepoints. In other words, relationship aggression was linked both with indices of suboptimal cortisol rhythms in both members of the couples and with stronger within-couple covariation coefficients. These results persisted when relationship satisfaction and demographic covariates were included in the model. During some of the sampling days, some women were pregnant with a subsequent child, but pregnancy did not significantly moderate cortisol levels or within-couple covariation.

The findings suggest that couples experiencing relationship aggression have both suboptimal neuroendocrine profiles and stronger covariation. Cortisol covariation is an understudied phenomenon with potential implications for couples' relationship functioning and physical health.

A growing literature has described the phenomenon of cortisol covariation, also called synchrony, concordance, and coregulation, within families. For example, positive associations between mothers' and children's cortisol levels have been reported in a variety of studies (Granger et al., 1998; Hibel et al., 2009; Papp et al., 2009). Although the literature examining covariation with couples is small, studies have consistently reported positive correlations between partners' cortisol levels, both in the laboratory (e.g., Laws et al., 2015; Saxbe et al., 2014) and in momentary studies conducted over several days (Saxbe and Repetti, 2010; Liu et al., 2013; Papp et al., 2013). The implications of cortisol covariation are complex (Timmons et al., 2015). Within parent-child dyads, covariation might facilitate children's self-regulatory capabilities (Feldman, 2007), and it has been associated with greater physical proximity and behavioral sensitivity (e.g., Hibel et al., 2015; Ruttle et al., 2011). However, the couples' literature has more frequently found stronger covariation among distressed couples (Levenson and Gottman, 1983).

Of the three published studies examining couples' cortisol synchrony in daily life, two (Liu et al., 2013; Saxbe and Repetti, 2010)

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http://dx.doi.org/10.1016/j.psyneuen.2015.08.006
0306-4530/

found relationship distress to be associated with stronger within-couple covariation. These results suggest that, while some degree of within-couple physiological linkage may be normative, high covariation may indicate poor relationship functioning. The theory of negative affect reciprocity (Levenson and Gottman, 1983) suggests that couples with more closely linked patterns of cortisol may be more susceptible to each others' distress or arousal levels. These couples may have more aversive interactions and fail to buffer each others' elevations in stress. Although aggressive and/or conflictual couple behavior has never been tested as a moderator of physiological covariation within couples, aggression reflects negative affective reciprocity processes and might be accompanied by heightened covariation. Relatedly, Hibel et al. (2009) found stronger mother-infant covariation in cortisol in families reporting domestic violence, suggesting that physiological linkage may appear in other dyads within households high in aggression and aversive conflict.

Intimate partner violence or aggression includes physical, sexual, or psychological abuse by a current or former partner or spouse (World Health Organization, 2013), and can range from physically aggressive behaviors such as slapping, kicking and punching to coercive control (e.g., restricting a partner's activities), sexual coercion, and emotional abuse. Relationship aggression has serious mental and physical health consequences for victims, including not just bodily injury, but also increased risk of depression, PTSD, and stress-related health problems (Watkins et al., 2014). Relationship aggression during early parenthood may be particularly problematic, given that it has been associated with risks to young children as well as to adults (O'Campo et al., 2010).

The hypothalamic pituitary adrenal axis, which releases the stress hormone cortisol and is associated with metabolic and immune functioning, may be one pathway through which chronic stressors such as relationship aggression contribute to physical health risks. Typically, cortisol levels peak within the first hour after waking and drop across the day before reaching a nadir at night. Flattened diurnal rhythms of cortisol, in which cortisol levels fail to show this typical morning rise or diurnal decline, appear to indicate poor adaptation to chronic stress (Sephton et al., 2000) and have also been linked with relationship distress in women (Adam and Gunnar, 2001; Saxbe et al., 2008). Being a target or victim of partner aggression or violence has been associated with markers of a flattened diurnal HPA axis rhythm in women (Kim et al., 2015; Pico-Alfonso et al., 2004).

Despite findings that women's diurnal cortisol rhythms may be associated with relationship aggression and other forms of relationship dysfunction, less is known about how relationship aggression affects males' health or the covariation of cortisol within couples. Kim et al. (2015) examined intimate partner violence (IPV) within couples, but did not find a significant effect of IPV on males' cortisol. However, males' perpetration was not tested as a predictor of males' cortisol. The current paper will be the first to examine males' perpetration of relationship aggression in conjunction with their HPA axis rhythms. Males at risk for aggressive and antisocial behavior appear to show lower levels of basal cortisol and dampened cortisol reactivity (e.g., Böhnke et al., 2010), but little is known about the relationship between men's aggressive behavior and the diurnal rhythm of cortisol. The current paper will also be the first to examine whether intimate partner aggression affects within-couple HPA axis covariation.

The current study is the first to test cortisol linkage and aggression within couples who sampled cortisol both during and after pregnancy. Although important life stages, pregnancy and early parenthood have been understudied within the couples' neuroendocrine literature. Consistent with the literature on non-pregnant women, studies of psychosocial variables and women's cortisol during pregnancy have found psychological distress and stressful life events to be linked with flatter cortisol slopes (Kivlighan et al., 2008; O'Connor et al., 2014; Obel et al., 2005). Moreover, preliminary studies have reported hormonal covariation within pregnant couples (Edelstein et al., 2015; Storey et al., 2000). However, more research is needed, as pregnancy-related hormonal changes might affect women's HPA axis patterns and couples' covariation during the prenatal and postpartum periods (Sandman et al., 2006).

The current study reports on a diverse sample of 122 couples who provided cortisol samples on 242 matched days during early parenthood. A multilevel model was used to assess within-couple covariation in cortisol and the impact of intimate partner aggression on both covariation and individual diurnal slopes of cortisol. We tested three hypotheses. First, consistent with other studies, we expected diurnal cortisol slopes in couples to be synchronized or to covary, and second, we expected higher aggression reported by women to be associated with stronger within-couple cortisol covariation. Third, consistent with previous work (Kim et al., 2015), we hypothesized that these reports of intimate partner aggression would be associated with a flatter diurnal slope of cortisol. Since all couples were parenting at least one infant and some were pregnant with a subsequent child, we included women's pregnancy and breastfeeding status as covariates in all analyses.

2. Methods

2.1. Participants

Data from this study came from the Lake County, Illinois site of the Child Community Health Network (CCHN). The data are part of a large community-based participatory research network funded by Eunice Kennedy Shriver National Institute for Child Health and Human Development (NICHD). All study procedures followed Declaration of Helsinki procedures and were carried out with the adequate understanding and written consent of the subjects. Recruitment, eligibility, and demographic characteristics for the larger five-site CCHN study are described in other papers (Ramey et al., 2014; Dunkel Schetter et al., 2013). To summarize, biological mothers were recruited at the birth of their first, second, or third child (referred to as the "index child" for study purposes) and followed at multiple time-points over the first two years postpartum. If mothers became pregnant again at any point during these two years, they were followed through this subsequent pregnancy and at one month postpartum. Eligibility criteria included that mothers were between 18 and 40 years of age, and self-identified as African–American, White, or Latina. Mothers who had delivered preterm infants were oversampled. Fathers were also invited to participate in the study with mothers' consent, but fathers' cortisol was only collected at one of the five CCHN sites (Lake County, IL).

CCHN study visits involving cortisol collection occurred when index children were approximately 6, 12, and 24 months of age. Mothers who became pregnant within a 2–3 year period after birth were interviewed in second and third trimester of their subsequent pregnancies and then 1 month after the birth. At each of these times, they were asked to do a day of saliva sampling within a week of the study interview. As such, there were six possible cortisol sampling days in total, spread out over approximately two to four years, with three of these possible days occurring during pregnancy or the early postpartum period of a subsequent birth.

Although mothers and fathers were not required to sample saliva on the same day, for this study, only matched days were used due the focus on within-couple covariation. In other words, fathers and mothers needed to sample cortisol on the same day in order for that day of data to be included in analyses. Our final model included 242 matched days from 122 couples. Compared to the 237 couples in Lake County who participated in the larger CCHN study and contributed cortisol on sampling days, this sample of 122