Journal of Family Psychology

Cortisol Linkage, Stress, and Perceived Partner Responsiveness Across the Transition to Parenthood

Marianne Richter, Georgia Kouri, Nathalie Meuwly, Nadine Messerli-Bürgy, and Dominik Schoebi

Online First Publication, November 6, 2025. https://dx.doi.org/10.1037/fam0001419

CITATION

Richter, M., Kouri, G., Meuwly, N., Messerli-Bürgy, N., & Schoebi, D. (2025). Cortisol linkage, stress, and perceived partner responsiveness across the transition to parenthood. *Journal of Family Psychology*. Advance online publication. https://dx.doi.org/10.1037/fam0001419

AMERICAN PSYCHOLOGICAL ASSOCIATION

Journal of Family Psychology

© 2025 American Psychological Association
ISSN: 0893-3200

https://doi.org/10.1037/fam0001419

Cortisol Linkage, Stress, and Perceived Partner Responsiveness Across the Transition to Parenthood

Marianne Richter[1], Georgia Kouri[2], Nathalie Meuwly[1], Nadine Messerli-Bürgy[3], and Dominik Schoebi[1]

[1] Department of Psychology, University of Fribourg

[2] Cognitive and Affective Regulation Laboratory, Institute of Psychology, University of Lausanne

[3] Family and Development Research Centre, Institute of Psychology, University of Lausanne

Within a relationship, stress might be shared and co-regulated between the partners at the physiological level, through cortisol linkage. Cortisol is sensitive to social inputs, and cortisol linkage may reflect stress-related dynamics in a couple or positive relational processes, such as marital distress or shared moments. For many couples, the transition to parenthood is accompanied by acute or chronic stressors that can impact the relationship. Concurrently, having a supportive and responsive partner becomes an important resource to adapt to the manifold changes. These relational processes may also play a role with respect to cortisol linkage. The current article reports a study that examined changes of cortisol linkage across the transition to parenthood, and whether high levels of psychological stress and perceived partner responsiveness were associated with stronger cortisol linkage. We used data from a longitudinal study of 120 couples ($N = 240$) who transitioned to parenthood. Participants collected saliva samples and completed an ecological momentary assessment over three consecutive days, during pregnancy, at 6 months and at 18 months postpartum. Cortisol linkage among partners was significant and positive, increased in strength from pregnancy to 6 months postpartum, and remained stable from 6 months to 18 months postpartum. Within-couples, higher levels of psychological stress were associated with a stronger linkage between partners, while higher perceived partner responsiveness was associated with a weaker cortisol linkage. These findings provide further evidence of cortisol linkage during the transition to parenthood, and its associations with positive and negative relational processes.

Keywords: cortisol linkage, romantic relationships, psychological stress, perceived partner responsiveness, transition to parenthood

Supplemental materials: https://doi.org/10.1037/fam0001419.supp

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

The transition to parenthood (TTP) can be a stressful period for couples (Saxbe et al., 2018). Although the birth of a first child is broadly regarded as a positive event and life changing for the parents and their relationship, this transition may also exert considerable stress for both partners (Cowan & Cowan, 1995). Within a relationship, partners are attuned to each other's emotions and moods, which serves to maintain a certain homeostasis and promotes change (Butler, 2011; Sbarra & Hazan, 2008). A growing body of research suggests that stress is shared, leading to covariation of stress markers at the physiological level, such as cortisol (Butler, 2011; Levenson & Gottman, 1983). While this physiological linkage is documented in the literature, it remains less clear to what

Stephen A. Erath served as action editor.

Marianne Richter https://orcid.org/0000-0001-7942-2481
Georgia Kouri https://orcid.org/0009-0002-3079-3569
Nathalie Meuwly https://orcid.org/0000-0002-0694-6919
Nadine Messerli-Bürgy https://orcid.org/0000-0001-8619-5950
Dominik Schoebi https://orcid.org/0000-0003-3991-2712

Part of the data and of original findings were part of a doctoral dissertation completed by Richter (2022) and were presented at the following conferences: Conference of the International Society for Research on Emotions (2024), 11th European society of Family relations (2023), 17th Conference of the Swiss Psychological Society (2022), and International Association for Relationship Research Virtual Conference (2022). The study was not preregistered. Materials and analysis code are available by emailing the corresponding author, Marianne Richter, at marianne.richter@unifr.ch. The authors have no conflicts of interest to disclose.

This project has received funding from the Swiss National Science Foundation (Grant 100014_175620). Because this research was funded in whole, or in part, by the Swiss National Science Foundation (100014_175620) awarded to Dominik Schoebi, for the purpose of open access, the author has applied a CC BY public copyright license to any author accepted manuscript version arising from this submission.

Marianne Richter played a lead role in conceptualization, formal analysis, methodology, writing–original draft, and writing–review and editing and an equal role in investigation. Georgia Kouri played a supporting role in writing–original draft and writing–review and editing and an equal role in investigation. Nathalie Meuwly played a supporting role in formal analysis and writing–review and editing. Nadine Messerli-Bürgy played a supporting role in methodology, supervision, writing–original draft, and writing–review and editing. Dominik Schoebi played a lead role in funding acquisition, project administration, supervision, and validation and a supporting role in conceptualization, formal analysis, methodology, writing–original draft, and writing–review and editing.

Correspondence concerning this article should be addressed to Marianne Richter, Department of Psychology, University of Fribourg, Rue de Faucigny 2, 1700 Fribourg, Switzerland. Email: marianne.richter@unifr.ch

extent associations between partners' momentary cortisol levels are reflections of adaptive or maladaptive relational processes, common stressors, or rather emerge in specific contexts (Timmons et al., 2015).

TTP is accompanied by a range of positive as well as negative relational experiences. Unique moments of joy and positive emotions were found to have a beneficial effect on relationship outcomes and relational adjustment. Conversely, an increase in responsibilities and changes leads to elevated stress levels in parents, potentially compromising the intimate relationship (e.g., Kluwer, 2010). These relational experiences could contribute to cortisol linkage between partners. Indeed, stronger cortisol linkage has been associated with negative relationship processes, such as hostility, marital dissatisfaction or negative mood (Liu et al., 2013; Saxbe & Repetti, 2010; Schneiderman et al., 2014), or psychological stress (Braren et al., 2020). It is therefore possible that cortisol linkage increases in strength when a couple becomes parents, as a function of the challenges and stress they face during this new situation. In addition, with the birth of the first child, partners may become more dependent on each other, needing more attention and support from each (Dooley et al., 2018). This could further strengthen the physiological linkage between them. Perceiving a partner to be responsive to one's needs promotes reciprocal responsiveness and fosters emotional closeness and connectedness (Arican-Dinc & Gable, 2023; Reis & Gable, 2015), which has been shown to be associated with stronger physiological linkage (Papp et al., 2013; Timmons et al., 2015, 2023). Consequently, both stress and perceived partner responsiveness (PPR) may strengthen cortisol linkage between partners.

The present study investigates cortisol linkage between partners and examines whether the strength of cortisol associations between partners increases across TTP. Furthermore, we test whether cortisol linkage increases as a function of psychological stress and PPR.

Cortisol Linkage in Romantic Relationships

Romantic relationships are among the closest social bonds that individuals form in life and intimate partners are often highly interdependent in their daily goals and emotions (Schoebi & Randall, 2015). They engage in frequent daily interactions, care for each other, coordinate their tasks and activities, and include the partner in their plans and goals (Reis, 2020). As a result, their mental and physical states become highly contingent (Pauly et al., 2021; Saxbe & Repetti, 2010).

Covariation of mental and physiological states emerges from the mutual and bidirectional influence of the two partners' states, which can be stable or changing over time (Butler, 2011). For instance, in close relationships, emotions are transmitted or reciprocated between partners, thereby altering their emotional states over time (Butler, 2011). Presumably, this process, which has been described in the literature using various labels, such as coregulation, synchrony, covariation or linkage, serves the maintenance of homeostasis in the relationship and the promotion of adaptation (Butler, 2011; Sbarra & Hazan, 2008). The same process might also be reflected in the linkage of physiological states between partners (Levenson & Gottman, 1983; Saxbe & Repetti, 2010). In the present study, we examine synchrony, or concurrent covariation of momentary cortisol, which refers to the within-couple between-partner covariance around an assumed stable level (Butler, 2011). Sbarra and Hazan (2008) have discussed how partners up- or down-regulate each other and pointed to the possibility of increased levels of stress when there is a lack of synchrony between them. Partners' psychological and physiological stress become shared with their significant other through a reciprocal feedback process (Butler, 2011), and it can reflect dysregulation dynamic, such as when partners reciprocate negative affect (Levenson & Gottman, 1983), and find themselves entrapped in reciprocal cycles of negativity (Butler, 2011). Conversely, partners' synchrony may also contribute to stability in the relationship (Butler, 2011). Physiological linkage may therefore point to important processes at the core of relationship functioning (Meyer & Sledge, 2020).

Several studies have investigated within-relationship associations of the hypothalamic–pituitary–adrenal axis activity, as the end product of the axis activity, cortisol output, is considered an objective marker of stress (Laws et al., 2015; Saxbe & Repetti, 2010). Cortisol levels are specifically reactive to threat, challenges and also social cues (Saxbe & Repetti, 2010), and examining cortisol variation allows for the assessment of objective stress related to relationship processes (Meyer & Sledge, 2020). Evidence suggests that romantic partners' diurnal cortisol rhythms are interconnected (Pauly et al., 2021; Saxbe & Repetti, 2010; Timmons et al., 2015). On the one hand, studies have investigated cortisol output and linkage in diurnal rhythms in response to specific situations, such as conflict between partners in interaction paradigms (Khaled et al., 2021). On the other hand, studies in more naturalistic settings make it possible to track cortisol changes across hours and days in real-life situations, and to study its correlates in couples' daily lives (Braren et al., 2020, 2021; Saxbe & Repetti, 2010). These studies provide insight into the everyday interpersonal processes that may contribute to associations of diurnal cortisol fluctuations between two romantic partners. But clear and consistent evidence for cortisol linkage that points to specific relational processes and relationship functioning is sparse. Periods in which relationships face major challenges that require adaptation, such as TTP, may offer a unique window to study relational correlates of cortisol linkage.

Transition to Parenthood and Cortisol Linkage

The birth of a first child is a major life event that brings new challenges and changes for the parents and their relationship (Edelstein et al., 2015). This transition is often associated with sleep disruptions and psychosocial stress, and an increased risk to develop psychological and physical health problems (Saxbe et al., 2018). After birth, conflicts and anxiety become more common, and in some couples, relationship satisfaction declines (Figueiredo et al., 2008; Lawrence et al., 2007). Moreover, after the birth of the child, when both partners experience stress more often, it becomes more likely that a stress experience of one partner crosses over to and affects the other partner (Cowan & Cowan, 1995). These profound changes in the relationship might also be observed at the physiological level, through cortisol linkage.

To date, many studies document prenatal cortisol linkage between partners, using either data from blood samples (Berg & Wynne-Edwards, 2002; Storey et al., 2000) or salivary cortisol (Berg & Wynne-Edwards, 2002; Braren et al., 2020; Edelstein et al., 2015; Khaled et al., 2021). At postpartum, one study found limited evidence for cortisol linkage between mothers and fathers, based on blood samples (Berg & Wynne-Edwards, 2002) but another study found evidence for cortisol linkage 2 years after the birth of an

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

infant, using salivary cortisol (Saxbe et al., 2015). Findings on associations between relational processes and cortisol linkage remain inconclusive. Several studies reported that stronger cortisol linkage was associated with poorer relationship functioning, lower marital satisfaction and relationship distress (Laws et al., 2015; Saxbe & Repetti, 2010), more spousal strain and disagreement (Liu et al., 2013), and increased maternal stress during pregnancy (Braren et al., 2020). Yet, some results pointed to an association of cortisol linkage with positive or neutral relationship processes, such as more time spent together (Khaled et al., 2021; Papp et al., 2013; Saxbe & Repetti, 2010) or less negativity in conflicts during pregnancy (Khaled et al., 2021). Based on the available evidence, we would expect that the changes in relationship dynamics and increasing stress between pregnancy and early parenthood will go along with a stronger linkage between partners' cortisol levels (Braren et al., 2020).

Moderators of Cortisol Linkage Across the Transition to Parenthood

During TTP, both positive and negative relational processes are at stake (Kluwer, 2010; Lawrence et al., 2007). Expectant parents may be more susceptible to be closely associated in their physiological responses, and multiple processes might contribute to physiological linkage. Two types of processes might be particularly salient during TTP: psychological stress and partner responsiveness.

Expectant parents experience increased psychological stress when faced with the challenges of this transition (Saxbe et al., 2018). Changes in both roles and routines may increase psychological and relationship distress, which has been linked with higher cortisol levels across the day (Hughes et al., 2020). A negative affect reciprocity perspective might suggest that mutually high levels of psychological stress in partners may be accompanied by similar patterns in their physiological states and reflect a reciprocal loop of negativity (Levenson & Gottman, 1983). Consequently, elevated psychological stress in both partners may contribute to a robust cortisol linkage. Braren et al. (2020), for example, found that at pregnancy, cortisol linkage was increased when maternal psychological stress was higher. We therefore expect that higher levels of psychological stress in the partners may contribute to a stronger cortisol linkage between them during TTP.

The strain induced by expecting birth and becoming a parent may prompt individuals to seek comfort and support from a partner (Dooley et al., 2018), and it requires responsiveness to a partner's disclosures of needs and concerns to convey a sense of feeling understood, cared for and validated by the partner (Reis & Gable, 2015). Perceiving a partner's responsiveness motivates reciprocation of attention and care, promotes perceptions of support when facing stressful events or chronic stress (Smallen et al., 2022; ter Kuile et al., 2017), and enhances closeness between partners via interpersonal emotion regulation (Arican-Dinc & Gable, 2023). Because relationship distress has been associated with stronger cortisol linkage, it could be expected that high PPR, reflecting healthy relationship functioning and support, would weaken cortisol linkage, at least when couples are exposed to stressors. Yet, we found no empirical research suggesting associations between PPR and cortisol linkage, whereas evidence exists for linkage in electrodermal activity when individuals reported feeling emotionally close and connected to their partner (Timmons et al., 2023) or when partners scored higher on empathy traits (Chatel-Goldman et al., 2014). This dovetails with conclusions from a review by Timmons et al. (2015), that pointed to emotional connectedness being associated with cortisol linkage between partners. Therefore, to the extent that PPR fosters closeness between partners, it may also translate into stronger cortisol linkage between partners.

The Present Study

The present study aims to enhance our understanding of cortisol linkage between intimate partners during TTP. To this end, we assessed within-dyad associations in momentary cortisol levels between partners in 120 couples across TTP, and we examined psychological stress and PPR as potential moderators of cortisol linkage. We expected positive associations between partners' moment-to-moment cortisol basal levels during pregnancy and at 6 and 18 months after birth (Hypothesis 1). Moreover, we expected that the strength of these associations between partners would increase from pregnancy to 18 months after birth (Hypothesis 2), and we expected this increase to occur as a function of parents' psychological stress levels (Hypothesis 3). Because perceiving the partner as responsive enhances closeness between partners, we expected that higher levels of PPR in parents would also be associated with stronger cortisol linkage between partners (Hypothesis 4).

Method

Participants

Inclusion criteria comprised being over 18 years old, living together, speaking fluently either French or German and expecting a first child together. Couples were recruited through gynecologists, midwives and hospitals, flyers, mailing lists, prenatal courses, and word-of-mouth. Each couple received 800 Swiss Francs (approximately $900) for participation in all parts of the study.

Data from 120 heterosexual couples expecting their first child together ($N = 240$) and having participated in the entire study were used. Mean age for women was 31.6 years old ($SD = 3.7$) and 33.2 years old ($SD = 4.1$) for men. At the time of recruitment, couples reported to be in a relationship on average for 6.7 years ($SD = 3.6$), and all couples lived in Switzerland. Participants reported a relatively high level of education, with 65.6% having a university degree, 11.9% completed another degree of advanced education, 10.3% completed an apprenticeship, 5.6% were students at a higher education institution, and 6.7% completed high school. On average, 70.9% participants reported being employed, 9.6% of which in an executive function, 10.9% reported being self-employed and 8.6% were not employed.

Procedure

We report below how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. The present study is part of a longitudinal project on TTP, that started in April 2019 and ended in June 2023. Couples completed assessments at three time points: during the second or third trimester of pregnancy (T1), at 6 months (T2), and 18 months postpartum (T3). The sample size for our analyses was determined by including only couples having completed all time points, as we aimed to examine change in couples' cortisol linkage across time. Therefore, we excluded data

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

from 29 couples ($N = 58$ participants) that took part only in two time points, yielding a final sample of 120 couples ($N = 240$). The study was approved by the cantonal ethics committee under the title "Affect regulation, stress response and responsiveness—the impact of challenging conditions on intimate relationships and well-being." This study was not preregistered.

After providing informed consent, all participants were asked to complete an online questionnaire at T1, T2, and T3, which included questions related to both partner's demographics, their relationship and physical and psychological health. Moreover, at each time point, participants were instructed to complete a 7-days ecological momentary assessment, four times a day. In parallel, they were asked to collect saliva samples on three consecutive working days, at four times a day. The duration of sampling is in line with recommendations in the literature that at least a 2-day sampling is required to obtain reliable cortisol measurements (Saxbe, 2008). The research assistant answered all questions about the study and the measures and was available by phone if questions arose later. Once the assessment week was completed, participants sent back the material via a pre-paid courier package.

Measures

Salivary Cortisol Measures

Saliva was sampled at three time of assessment (T1, T2, and T3), and within each time point, during three consecutive days with awakening ($M = 7{:}15$ a.m.), at 30 min after awakening ($M = 7{:}49$ a.m.), before lunch ($M = 12{:}32$ p.m.), and before dinner ($M = 19{:}08$ p.m.), using Salivettes (Salivette Cortisol; Sarstedt, Nümbrecht, Germany). Each participant could therefore provide a maximum of 12 cortisol samples within each time of assessment and a maximum of 36 cortisol samples over the three times of assessment. To control for sampling time and influencing factors, participants were instructed not to eat or drink, not to smoke or brush their teeth or to do sport an hour before collecting the saliva samples. Cotton swabs were stored in a plastic bottle assigned to each participant, using the Medication Event Monitoring System (AARDEX group Ltd.). Participants kept saliva samples in their fridge and sent them back to the lab. All samples were stored at −30 °C in the lab freezer until shipment to the Dresden Lab Service (Dresden, Germany) for analysis. The lab used a commercial chemiluminescence immunoassay and the intra- and interassay coefficients for cortisol were both below 7%. Participants provided 97.7% out of 12 scheduled samples within the 3 days of assessments at T1, 96.2% at T2, and 94.6% at T3.

Covariates

Participants completed a short protocol at each point of saliva sampling and provided information about drink and food intake, smoking, brushing teeth, and physical activity within an hour before saliva sampling (Nicolson, 2008), to reduce the potential influence of these factors. In addition, regular medicine intake, working hours (if participants had night shift) and breastfeeding was assessed at T2 and T3. We also controlled for a second pregnancy (weeks stage) during later assessment points, because several couples reported expecting a second child at the T3 assessment. Finally, data collection (T1 and T2) during the COVID-19 pandemic lockdown was coded as "lockdown condition."

PPR

Momentary assessments of perceived partner responsiveness parallel to the cortisol sampling on these 3 days were used. At each prompt (at 8:00 a.m., noon, 6:00 p.m., and 9:30 p.m.), participants reported with three items whether they perceived their partner to be understanding, validating, and caring, using a 10-point scale ranging from 0 (*not at all*) to 10 (*extremely*). A mean score of the three items was created for the data analyses. Because PPR varied between persons, and within persons across days, both an aggregate score reflecting participants' average PPR, and the daily average were used in the analyses. On average, scores of perceived partner responsiveness over the 3 days of assessment were high for both women ($M = 8.37$; $SD = 1.59$) and men ($M = 8.18$; $SD = 1.65$). Internal consistency was high for both women (within: $\omega = .873$; between: $\omega = .977$) and for men (within: $\omega = .859$; between: $\omega = .986$) across the three times of evaluation.

Psychological Stress

We assessed psychological stress with the Perceived Stress Scale (Cohen et al., 1983). Participants completed the questionnaire at each time point (T1, T2, and T3). The scale included five items reflecting individuals' appraisals of stressful life situations, using a scale from 0 (*never*) to 4 (*very often*). A total score was obtained by summing the answers (ranging from 0 to 20), with higher scores indicating stronger perceptions of stress. Both women and men had relatively low average scores (women: $M = 7.58$; $SD = 4.00$; men: $M = 6.60$; $SD = 3.77$). Internal consistency was high for women ($\alpha = .848$) and for men ($\alpha = .842$) across the three times of evaluation.

Statistical Analyses

To analyze the data, we used a multilevel modeling approach, to accommodate for multiple sources of nonindependence due to repeated measures data across days and within dyads (Bolger & Laurenceau, 2013). The analyses used ML estimation to accommodate missing data and variation in time intervals between repeated measures (Hruschka et al., 2005; Nicolson, 2008). We used a four-level model to account for all time of measurements. Therefore, repeated measures of individuals' diurnal cortisol levels were nested within days, days were nested within time of assessments across the transition of parenthood, which were nested within dyads. Main analyses were performed with the R package nlme (Pinheiro et al., 2018).

Each participant had cortisol data from four sampling time points per day, for three consecutive days, at T1, T2, and T3, which represents a maximum of 36 samples per participant. Cortisol varied within the three assessment time points (i.e., TTP assessments). We created a partner cortisol variable to use as a predictor variable, which we centered at the daily mean of the participant, such that it reflects variation of the partner's cortisol values around his or her mean cortisol level on a particular day, within an assessment time point (T1, T2, and T3). We used this variable to estimate cortisol linkage between partners. This operationalization has been used in prior studies examining cortisol using multilevel modeling (Adam et al., 2006; Saxbe & Repetti, 2010).

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

Outliers in cortisol data can bias results, therefore all the values smaller or larger than 4 *SD* from the mean cortisol and mean time of collection were dropped (Nicolson, 2008). In addition, because the cortisol awakening response is sensitive to time, values were excluded if the time lag between the first and the second samples was smaller than 15 min or larger than 60 min. Overall, there were 2.77% outliers removed from the data. Because the distribution of cortisol data were skewed, cortisol values were log-transformed prior to statistical analysis (Nicolson, 2008), adding a constant of 1 to the cortisol values before transformation to prevent negative values (West, 2022). To prevent biased results due to unequal variances in men's or women's cortisol values at different assessment time points, and to enhance comparability of estimates across partners and time, we performed a *z*-transformation for men and for women at each assessment time point (resulting in standardized data with a mean of 0 and a standard deviation of 1 for men and women at each assessment time point).

Hypothesis 1 predicted cortisol associations between partners. We estimated separate intercepts for male and female participants, along with the partner's diurnal cortisol variables as predictors. In Equation 1, Cortisol_{ij} represents the cortisol values of each participant i at sampling time j. The estimates β_{0i} and β_{1i} represent the mean level of cortisol for female and male, when all other parameters are held constant. The predictors wCortp_{ijklm} and mCortp_{ijklm} represent women's and men's partner cortisol value on day k of assessment time l of couple m, and the coefficients for these parameters capture cortisol linkage between the male and the female partners. It is important to note that these two parameters represent unstandardized estimates of the same linkage. The parameter for r_{tm} represents the within-couple residual variance at time t in couple m.

$$\text{Cortisol}_{it} = \beta_{0i} + \beta_{1i} + \text{wCortp}_{ijklm} + \text{mCortp}_{ijklm} + r_{tm}. \quad (1)$$

Hypothesis 2 predicted that the associations of cortisol between partners would be stronger from pregnancy to 18 months after birth, and Hypothesis 3 predicted that variation of psychological stress across the three measurement times would predict cortisol linkage between partners. Similarly, Hypothesis 4 predicted that high levels of perceived partner responsiveness would be associated with a stronger cortisol linkage.

Thus, for Hypothesis 2, we extended Equation 1 and included two indicators *t1t2* and *t2t3* to reflect the time lag from T1 to T2 as well as the time lag from T2 to T3. This variable reflected the number of months between each time point. We included two interaction terms, between cortisol levels and *each of the time indicators*. Coefficients for these interaction terms captured whether cortisol associations would grow stronger between T1 and T2, and then between T2 and T3, respectively.

Next, to test Hypotheses 3 and 4, we extended Model 1 by adding the psychological stress and perceived partner responsiveness variables of both partners, centered at the person mean. These variables captured variability in a person's psychological stress experience and perceived partner responsiveness across the three TTP assessments. To examine associations with cortisol linkage, we added interaction terms of these variables with the partner cortisol variables. To specifically examine effects of perceived partner responsiveness on a particular day, we added daily perceived partner responsiveness to the model, centered at the participant's mean of perceived partner responsiveness ratings across the 3 days of sampling in a particular assessment period. This variable reflects daily variation in perceptions of partner responsiveness across the 3 days of assessment time and within each TTP assessment time. Again, interaction terms with partner cortisol were added.

Transparency and Openness

Materials and analysis code for this study are available by emailing the corresponding author.

Results

Descriptive Statistics

The mean and standard deviation of psychological stress and perceived partner responsiveness across days and times of assessment are presented in Table 1 and the corresponding values of cortisol values across sampling time, days, and time of assessment are presented in Table 2. The correlation matrix between the main variables is shown in Table 3.

The time lag between T1 and T2 was on average of 7.70 months ($SD = 1.35$). and the average for the time lag between T2 and T3 was of 11.44 months ($SD = 1.31$). There were no significant differences in psychological stress between men and women at T1, paired-samples $t(118) = 1.915$, $p = .058$ and T2, paired-samples $t(113) = 1.407$, $p = .162$. At T3, there was a significant difference between men and women, paired-samples $t(109) = 2.696$, $p = .008$. There were significant differences in cortisol levels between men and women at T1, paired-samples $t(117) = 11.472$, $p < .001$, and at T2,

Table 1

Mean and Standard Deviation of Perceived Partner Responsiveness and Psychological Stress for Women and Men, Across 3 Days of Assessment, at Pregnancy, 6 Months Postpartum, and 18 Months Postpartum

	Pregnancy				6 months postpartum				18 months postpartum			
	Women		Men		Women		Men		Women		Men	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Perceived partner responsiveness	8.69	1.16	8.41	1.39	8.15	1.45	8.09	1.47	8.23	1.34	7.97	1.55
Day 1	8.79	1.39	8.43	1.49	8.24	1.67	8.10	1.69	8.35	1.40	8.01	1.68
Day 2	8.78	1.33	8.42	1.61	8.10	1.71	8.14	1.73	8.23	1.62	8.09	1.66
Day 3	8.61	1.48	8.48	1.54	8.34	1.58	8.03	1.77	8.19	1.52	7.96	1.72
Psychological stress	6.86	3.39	6.17	3.27	8.00	4.24	7.32	4.13	7.97	4.45	6.53	3.93

Note. $N = 240$. Psychological stress scores range from 0 to 20.

Table 2

Mean and Standard Deviation of Cortisol Values for Women and Men, Across 3 Days of Assessment, at Pregnancy, 6 Months Postpartum, and 18 Months Postpartum

	Pregnancy				6 months postpartum				18 months postpartum			
	Women		Men		Women		Men		Women		Men	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Cortisol Day 1												
Awakening	10.01	4.00	7.93	3.87	7.22	4.02	8.26	4.22	7.52	3.67	7.30	4.13
Awakening + 30 min	13.42	4.34	10.57	4.59	8.62	5.46	9.21	5.27	8.95	5.12	9.74	5.42
Before lunch	5.92	2.59	2.83	1.76	2.29	1.35	3.06	2.09	2.82	1.84	2.78	2.44
Before dinner	2.73	1.30	1.29	1.67	0.94	0.89	0.96	0.87	1.16	1.19	1.10	2.01
Cortisol Day 2												
Awakening	9.80	3.76	7.51	3.53	6.83	3.91	7.87	4.04	7.46	3.94	7.29	4.11
Awakening + 30 min	12.44	4.46	10.23	5.09	7.75	4.81	8.61	5.19	8.46	5.02	9.06	5.41
Before lunch	5.98	2.13	2.89	2.08	2.30	1.45	2.46	1.63	2.69	1.88	2.84	2.34
Before dinner	2.92	2.02	0.98	0.76	1.04	2.00	0.86	0.65	1.38	1.48	1.28	2.07
Cortisol Day 3												
Awakening	10.07	3.82	7.84	3.49	7.02	4.13	7.99	4.37	7.17	3.59	7.83	4.28
Awakening + 30 min	11.78	3.83	9.63	4.28	7.87	4.69	9.32	5.26	8.96	5.31	8.94	5.30
Before lunch	6.13	2.28	2.55	1.77	2.23	1.71	2.66	2.17	4.01	2.10	2.96	2.67
Before dinner	2.88	1.20	1.18	1.50	1.09	1.76	0.93	1.26	1.27	1.02	1.26	1.45

Note. $N = 240$. Data presented are raw cortisol values (i.e., not log-transformed).

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

paired-samples $t(120) = -2.813$, $p = .006$, but not at T3, paired-samples $t(120) = -.941$, $p = .348$. Regarding perceived partner responsiveness, there were significant differences between men and women at T1, paired-samples $t(115) = 2.361$, $p = .020$, but not at T2, paired-samples $t(110) = .988$, $p = .235$, and at T3, paired-samples $t(115) = 1.502$, $p = .136$.

Couples' Cortisol Linkage and Associations Across the Transition to Parenthood

We predicted that men's and women's cortisol levels would be positively associated with each other across the three points (Hypothesis 1). The results suggest that cortisol levels of men and women were associated across momentary measurements (when using women's cortisol as dependent variable: $b = .352$, $p < .001$; when using men's cortisol as dependent variable: $b = .319$, $p < .001$; these unstandardized coefficients reflect the same dyadic association, but differ slightly due to differences in within-subject variances between the two partners). In this analysis, we controlled for time of sampling, breastfeeding and weeks of pregnancy at T1 and at T3 (potential confounding variables having nightshift, being in lockdown, taking medicine, exercising, smoking, eating or drinking and brushing teeth were not significant and were therefore not included in the final model). The full results including the coefficients for significant confounders can be found in the Supplemental Materials.

Next, we tested whether the strength of the linkage between men's and women's cortisol levels increased across TTP, from pregnancy to 6 months postpartum to 18 months postpartum (Hypothesis 2). As shown in Table 4, the data suggest that from pregnancy to 6 months

Table 3

Correlation Matrix for Psychological Stress and Perceived Partner Responsiveness, at Pregnancy, 6, and 18 Months After Birth for Men and Women

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. PSS T1 women	—											
2. PSS T1 men	.371**	—										
3. PSS T2 women	.399**	.470**	—									
4. PSS T2 men	.193*	.057	.013	—								
5. PSS T3 women	.149	.271**	.076	.472**	—							
6. PSS T3 men	.141	.242*	.197*	.534**	.598**	—						
7. PPR T1 women	−.160	−.053	−.046	−.289**	−.340**	−.275**	—					
8. PPR T1 men	−.164	−.071	−.086	−.446**	−.413**	−.416**	.455**	—				
9. PPR T2 women	−.154	−.211*	−.043	−.063	−.200*	−.206*	.562**	.234*	—			
10. PPR T2 men	−.192*	−.248**	−.044	−.367**	−.466**	−.413**	.460**	.724**	.498**	—		
11. PPR T3 women	−.135	−.105	.039	−.124	−.330**	−.204*	.656**	.342**	.474**	.427**	—	
12. PPR T3 men	−.165	−.150	−.021	−.365**	−.535**	−.535**	.409**	.696**	.425**	.817**	.466**	—

Note. PSS = Perceived Stress Scale; PPR = perceived partner responsiveness; T1 = pregnancy; T2 = 6 months after birth; T3 = 18 months after birth.
* $p < .05$. ** $p < .01$.

Table 4
Cortisol Linkage and Changes From Pregnancy to 6 Months Postpartum and From 6 to 18 Months Postpartum

	Cortisol				
			95% CI		
Predictor	*b*	*SE*	*LL*	*UL*	*p*
Intercept women	.642	.017	.601	.675	**<.001**
Intercept men	.642	.012	.618	.666	**<.001**
Women's partner cortisol	.342	.003	.335	.348	**<.001**
Men's partner cortisol	.360	.003	.353	.366	**<.001**
Pr-6pp W	–.028	.002	–.033	–.023	**<.001**
6pp-18pp W	.001	.002	–.002	.004	.347
Pr-6pp M	–.005	.002	–.008	–.001	**.007**
6pp-18pp M	.001	.001	–.002	.003	.584
Women's partner cortisol × Pr-6pp	.009	.001	.008	.010	**<.001**
Women's partner cortisol × 6pp-18pp	.001	.001	–.001	.001	.458
Men's partner cortisol × Pr-6pp	.002	.001	.002	.003	**<.001**
Men's partner cortisol × 6pp-18pp	.001	.001	–.001	.001	.688

Note. Significant values appear in bold. M = men; W = women; Pr-6pp = time indicator between pregnancy and 6 months after birth in months; 6pp-18pp = time indicator between 6 and 18 months after birth in months; *LL* = lower limit; *UL* = upper limit; CI = confidence interval; *SE* = standard error.

after birth, a moderate yet statistically significant increase in cortisol linkage occurred (when using women's cortisol as dependent variable: $b = .002$, $p < .001$; when using men's cortisol as dependent variable: $b = .009$, $p < .001$). We found no significant difference in the strength of cortisol linkage from 6 months to 18 months after birth.

Couples' Cortisol Associations and Psychological Stress

Our Hypothesis 3 proposed that the strength of the linkage between partners' cortisol levels would be stronger at higher psychological stress of the partners. The results confirmed an association of women's psychological stress and stronger cortisol linkage when using women's cortisol as dependent variable ($b = .003$, $p < .001$) but not men's psychological stress and cortisol linkage when using men's cortisol as dependent variable ($b = .001$, $p = .186$).

Couples' Cortisol Linkage and Perceived Partner Responsiveness

Finally, we expected that higher levels of perceived partner responsiveness would be associated with a stronger cortisol linkage between partners (Hypothesis 4). For this hypothesis, we examined perceived responsiveness as generalized reports at the three assessment times and also at the daily level. Contradicting our hypothesis, women and men's generalized reports of perceived responsiveness at the three assessment times were associated with a weaker linkage (women's perceptions of partner responsiveness: $b = –.018$, $p < .001$; men's perceptions of partner responsiveness: $b = –.006$, $p = .046$). At the daily level, results also suggested that higher levels of men's momentary perceptions of partner responsiveness were associated with weaker, not stronger cortisol linkage, using men's cortisol as dependent variable ($b = –.005$, $p = .026$). Women's momentary perceptions of partner responsiveness were not significantly associated with cortisol linkage when using women's cortisol as dependent variable ($b = –.001$, $p = .936$). The results are presented in Table 5.

Discussion

The aim of this study was to examine cortisol linkage between partners across TTP and its associations with stress and perceived

Table 5
Moderations Effects of Psychological Stress and Perceived Partner Responsiveness on Cortisol Linkage

	Cortisol				
			95% CI		
Predictor	*b*	*SE*	*LL*	*UL*	*p*
Intercept women	.754	.011	.733	.774	**<.001**
Intercept men	.656	.010	.638	.675	**<.001**
Women's partner cortisol	.316	.003	.310	.321	**<.001**
Men's partner cortisol	.352	.003	.347	.358	**<.001**
PSS W	–.007	.003	–.012	–.001	**.022**
PSS M	–.001	.003	–.007	.004	.613
Women's partner cortisol × PSS W	.003	.001	.002	.004	**<.001**
Men's partner cortisol × PSS M	.001	.001	–.001	.003	.186
Perceived partner responsiveness W	.035	.022	.015	.056	**<.001**
Perceived partner responsiveness M	–.002	.009	–.020	.016	.825
Women's partner cortisol × PPR W	–.018	.003	–.023	–.012	**<.001**
Men's partner cortisol × PPR M	–.006	.003	–.012	–.001	**.046**
PPR daily W	–.001	.002	–.004	.003	.853
PPR daily M	.001	.002	–.003	.005	.749
Women's partner cortisol × PPR daily W	–.001	.002	–.004	.004	.936
Men's partner cortisol × PPR daily M	–.005	.002	–.010	–.001	**.026**

Note. Significant values appear in bold. M = men; W = women; PSS = Perceived Stress Scale; PPR daily = perceived partner responsiveness centered at the daily level; PPR = perceived partner responsiveness centered at the time of assessment level; *LL* = lower limit; *UL* = upper limit; CI = confidence interval; SE = standard error.

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

partner responsiveness. To this end, we investigated whether the time during TTP, psychological stress and perceived partner responsiveness were associated with the strength of partners' cortisol linkage. To our knowledge, this is the first study that used a longitudinal design to assess the course of cortisol linkage with diurnal cortisol rhythms over time between new parents, extending beyond previous work by Laws et al. (2015) who used a longitudinal approach to examine cortisol convergence in newlywed couples. The longitudinal design also allowed us to test within-subject moderators of cortisol linkage. Prior studies investigated cortisol linkage at pregnancy (Braren et al., 2020, 2021; Edelstein et al., 2015; Khaled et al., 2021) and one study examined cortisol associations between the two partners, for 2 years following the birth of their first, second, or third child (Saxbe et al., 2015).

We expected that the two partners' cortisol levels were positively associated (Hypothesis 1), and that the strength of this association increased across TTP (Hypothesis 2). The analyses confirmed that partners' cortisol levels were positively associated. At 6 months after birth, cortisol linkage was stronger than during pregnancy but did not change any further between 6 months and 18 months after birth. We also expected that cortisol linkage would be stronger at higher psychological stress levels of the partners (Hypothesis 3), and at higher levels of perceived partner responsiveness (Hypothesis 4). Hypothesis 3 was partially confirmed, with analyses suggesting a stronger cortisol linkage when women's psychological stress was higher, but men's psychological stress was not significantly related to cortisol linkage. The data did not confirm Hypothesis 4, as we found that perceived partner responsiveness was associated with a weaker cortisol linkage rather than the predicted stronger linkage.

Cortisol Linkage Across the Transition to Parenthood

The findings of our first hypothesis confirmed the results of prior studies, showing a cortisol linkage between partners overall (Laws et al., 2015; Liu et al., 2013; Saxbe & Repetti, 2010; Saxbe et al., 2015), and also during pregnancy (Braren et al., 2020; Khaled et al., 2021). The current results indicated that, across TTP, partners moment-to-moment fluctuations in cortisol output covaried.

Testing associations of cortisol linkage and time across TTP partially confirmed Hypothesis 2. Cortisol linkage was stronger at 6 months postpartum than at pregnancy, and it remained constant between 6 and 18 months after birth. It seems plausible to assume that changes between pregnancy and 6 months after birth are more marked, both at a physiological level (for the mother in particular; e.g., Berg & Wynne-Edwards, 2002) and with respect to stressors and demands for adjustment, than the phase following the first 6 months after birth. Indeed, the first months after the birth of a child are often particularly demanding for parents and they need to adjust to these changes. For instance, new parents experience the negative effects of sleep deprivation (Medina et al., 2009) and face the manifold challenges of developing parenting and co-parenting skills (Christopher et al., 2015; Paley & Hajal, 2022). Although parents may then develop a routine adapting to their role as new parents, they continue to face these challenges and have to negotiate and reorganize many aspects of their relationship (Curran et al., 2006), and adapt to getting back to work after their maternity leave (Staehelin et al., 2007). Parenthood beyond 6 months is therefore likely to remain demanding, but likely not at a level that is above and beyond that of the first months of parenthood. Partners may also spend more time together as parents than before the birth of the child, which was found to be associated with stronger linkage between partners (Saxbe & Repetti, 2010).

It therefore appears to be less TTP per se that is associated with an increase in cortisol linkage, but rather early parenthood more broadly, as compared to pregnancy. Conversely, it may also be that factors related to pregnancy, such as hormonal changes and psychological factors associated with the expected, render pregnancy a period of particularly restricted cortisol linkage.

Psychological Stress Moderating Cortisol Linkage

Testing Hypothesis 3 revealed that higher levels of psychological stress in women were associated with stronger cortisol linkage. This was not confirmed for men's psychological stress. These findings are broadly in line with findings from a study assessing similar processes during pregnancy (Braren et al., 2020). The authors found stronger cortisol linkage when maternal psychological stress was high, and no associations between paternal psychological stress and cortisol linkage. The authors argued that during pregnancy and after birth, mothers become more vigilant to environmental cues, presumably to protect their child (Braren et al., 2020). Mothers might therefore be more sensitive and more reactive to stressors at this particular time, and this may translate into heightened cortisol (Braren et al., 2020). Further insight into this possibility would require research linking parents' stress and coping responses to cortisol linkage. For example, men tend to use more denial or avoidance coping strategies than women (Baldwin et al., 2018), and their stress might affect the relational level less readily.

Perceived Partner Responsiveness Moderating Cortisol Linkage

In contrast to our expectations, we found that perceived partner responsiveness was associated with weaker cortisol linkage. Specifically, at the assessment time level, perceived responsiveness of both partners was negatively associated with linkage, and at the daily level, cortisol linkage was lower when men reported high perceived responsiveness. Our expectation was based on the assumption that partners feel emotionally closer and are therefore more susceptible to a partner when they perceive the partner to be highly responsive. This could promote interpersonal regulation (Arican-Dinc & Gable, 2023) and at the physiological level, stronger cortisol linkage, given that stronger physiological linkage has been associated with closeness and connectedness (Chatel-Goldman et al., 2014; Papp et al., 2013; Timmons et al., 2023). Our data do not support this assumption.

Which processes could explain these unexpected results? The significant negative association between within-subject change in perceived partner responsiveness and dyadic cortisol linkage indicates that cortisol linkage between partners is weaker at assessment times at which partners perceive their partner to be more responsive, than at times when they see their partner as less responsive. This can reflect a pattern where perceived partner responsiveness decreases in a relationship and in parallel, cortisol linkage increases, which could be expected in the case of increased relational distress, based on prior findings (Liu et al., 2013). Insofar as diminished partner responsiveness characterizes distressed relationships, these results support the assumption that cortisol linkage is strengthened by relationship distress (Timmons et al., 2015). The potential of

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

experiencing partner responsiveness to enhance self-regulation capacities could offer an alternative or complementary answer. Perceived partner responsiveness is an invaluable resource for individuals, enhancing their perceptions of control and reducing their reactivity to daily stressors (e.g., Alonso-Ferres et al., 2020; Slatcher & Schoebi, 2017). Therefore, while fostering connection between individuals, it has the potential to facilitate affect regulation, reduce parents' vulnerability to stress, and to promote autonomy and independence (Feeney, 2007). If a within-subject association between perceived partner responsiveness and cortisol linkage can be replicated, then examining reactivity to daily stressors, self-regulation and autonomy as mediators could offer insight into the mechanisms underlying the current pattern of results.

Our findings on possible moderators of cortisol linkage could indicate that higher levels of stress may contribute to cortisol linkage between partners, while perceiving high partner responsiveness may reduce cortisol linkage. It is important to consider that in daily life, stress and partner responsiveness are not necessarily independent experiences but often go hand in hand. If stress and responsiveness counteract each other with respect to cortisol linkage, then it might be promising to examine interactions between the two in future work.

We operationalized cortisol linkage as concurrent daily covariation, which could stem from one partner's influence, mutual influence, or external factors affecting both partners. Refining analyses to consider in-phase linkage (which might point to increasing influence of one partner) and antiphase linkage (which might suggest turn-taking dynamics) could provide further insight into interactional dynamics (Reed et al., 2013). Also, Timmons et al. (2015) underlined the importance of physiological linkage in specific contexts. This might mean that it could be more challenging to identify consistent patterns of associations between linkage and psychological or interpersonal processes during TTP, given that it is a period in which such processes are particularly prone to change (Cowan & Cowan, 1995). In the present study, we measured cortisol linkage and associations at pregnancy, 6 months, and 18 months postpartum, which represent a wide time span to observe modifications in relationship processes and putative changes in cortisol linkage patterns. Partners are prone to experience heightened psychological stress (Saxbe et al., 2018) and may therefore be more sensitive to their partner's behaviors.

Strengths and Limitations

To our knowledge, this study is the first to assess cortisol linkage in a longitudinal design across TTP, using three different times of assessment up to 18 months after birth. Expecting the first child involves many changes for partners at the social, psychological, and physiological levels. The longitudinal design we used allowed to frame a broader picture of the potential biological changes in couples, their cortisol linkage and the interpersonal processes occurring between partners over this time. Moreover, we assessed couples across three consecutive days at each time point, which allowed us to capture the variability in cortisol changes between partners as well as to model diurnal cortisol rhythms and linkage between partners.

Nevertheless, important limitations of this study must be taken into consideration when interpreting the results. First, we operationalized cortisol linkage as a concurrent covariation of cortisol levels. The use of a cross-lagged analyses over short time spans could help identifying specific directionality of the linkage processes. In addition, assessing linkage across several days may contribute to a greater understanding of daily dynamics between partners. However, it may be more intricated to find associations with specific relational processes. Instead, focusing on linkage between narrower time points (e.g., social support or conflict interactions) may allow a better identification of relational mechanisms, through physiological recovery, for example (Powers et al., 2006). Alternatively, focusing on in-phase and antiphase linkage could also bring another perspective on the topic of physiological linkage and relationship processes (Reed et al., 2013). Moreover, because saliva samples were self-collected, we had limited control over the sampling time and adherence to the protocol. To increase the control over saliva sampling time was controlled by Medication Event Monitoring System caps. Specifically, we expected that new parents may have had more difficulties to strictly follow the protocol with a newborn. Generalizability is also limited as couples of the present study showed higher than average income and education and were relatively highly satisfied with their relationships. Combining financial strain with the arrival of an infant may considerably heighten the distress of couples in their daily life and may be measured at the physiological level too and therefore potentially result in other findings. In addition, it is important to consider that women's hormonal regulation of glucocorticoid steroid hormone is dependent on the preparation to the birth, which may affect cortisol secretion, and thus may not provide a precise picture of the role of physiological linkage in relationships. When controlling for weeks of pregnancy, we found that pregnancy stages were significantly and positively predicting cortisol.

Conclusion

The present study sheds light on cortisol linkage between partners in a challenging, yet normative period for couples. Although cortisol linkage has been defined as a regulatory and mutual process, in which partners aim to maintain a relatively stable system (Butler, 2011), it remains unclear how relationships may be a regulator of physiological activity. The current results provide further evidence for cortisol associations between partners and highlight how cortisol linkage changes from pregnancy to 6 months, and from 6 to 18 months postbirth. The challenges and stress new parents experience in their daily life appear to shape the emotional and physiological dynamics of the couple. Our findings also provide further evidence on the moderation effects of relational and psychological processes. In line with the previous studies, psychological stress was associated with stronger linkage. Moreover, perceived partner responsiveness did not contribute to strengthening cortisol linkage but instead was negatively associated with linkage. These findings point to the possibility that in a particularly sensitive period of transformation in the partnership, cortisol linkage is susceptible to vary as a function of self-regulatory and interpersonal processes.

References

Adam, E. K., Hawkley, L. C., Kudielka, B. M., & Cacioppo, J. T. (2006). Day-to-day dynamics of experience—Cortisol associations in a population-based sample of older adults. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(45), 17058–17063. https://doi.org/10.1073/pnas.0605053103

Alonso-Ferres, M., Imami, L., & Slatcher, R. B. (2020). Untangling the effects of partner responsiveness on health and well-being: The role of perceived control. *Journal of Social and Personal Relationships*, *37*(4), 1150–1171. https://doi.org/10.1177/0265407519884726

Arican-Dinc, B., & Gable, S. L. (2023). Responsiveness in romantic partners' interactions. *Current Opinion in Psychology*, *53*, Article 101652. https://doi.org/10.1016/j.copsyc.2023.101652

Baldwin, S., Malone, M., Sandall, J., & Bick, D. (2018). Mental health and wellbeing during the transition to fatherhood: A systematic review of first time fathers' experiences. *JBI Database of Systematic Reviews and Implementation Reports*, *16*(11), 2118–2191. https://doi.org/10.11124/JBISRIR-2017-003773

Berg, S. J., & Wynne-Edwards, K. E. (2002). Salivary hormone concentrations in mothers and fathers becoming parents are not correlated. *Hormones and Behavior*, *42*(4), 424–436. https://doi.org/10.1006/hbeh.2002.1841

Bolger, N., & Laurenceau, J.-P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research*. The Guildford Press.

Braren, S. H., Brandes-Aitken, A., Ribner, A., Perry, R. E., Blair, C., & the New Fathers and Mothers Study Team. (2020). Maternal psychological stress moderates diurnal cortisol linkage in expectant fathers and mothers during late pregnancy. *Psychoneuroendocrinology*, *111*, Article 104474. https://doi.org/10.1016/j.psyneuen.2019.104474

Braren, S. H., Perry, R. E., Ribner, A., Brandes-Aitken, A., Brito, N., Blair, C., & the New Fathers and Mothers Study Team. (2021). Prenatal mother–father cortisol linkage predicts infant executive functions at 24 months. *Developmental Psychobiology*, *63*(7), Article e22151. https://doi.org/10.1002/dev.22151

Butler, E. A. (2011). Temporal interpersonal emotion systems: The "TIES" that form relationships. *Personality and Social Psychology Review*, *15*(4), 367–393. https://doi.org/10.1177/1088868311411164

Chatel-Goldman, J., Congedo, M., Jutten, C., & Schwartz, J.-L. (2014). Touch increases autonomic coupling between romantic partners. *Frontiers in Behavioral Neuroscience*, *8*, Article 95. https://doi.org/10.3389/fnbeh.2014.00095

Christopher, C., Umemura, T., Mann, T., Jacobvitz, D., & Hazen, N. (2015). Marital quality over the transition to parenthood as a predictor of coparenting. *Journal of Child and Family Studies*, *24*(12), 3636–3651. https://doi.org/10.1007/s10826-015-0172-0

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 385–396. https://doi.org/10.2307/2136404

Cowan, C. P., & Cowan, P. A. (1995). Interventions to ease the transition to parenthood: Why they are needed and what they can do. *Family Relations*, *44*(4), 412–423. https://doi.org/10.2307/584997

Curran, M., Hazen, N., Jacobvitz, D., & Sasaki, T. (2006). How representations of the parental marriage predict marital emotional attunement during the transition to parenthood. *Journal of Family Psychology*, *20*(3), 477–484. https://doi.org/10.1037/0893-3200.20.3.477

Dooley, M. K., Sweeny, K., Howell, J. L., & Reynolds, C. A. (2018). Perceptions of romantic partners' responsiveness during a period of stressful uncertainty. *Journal of Personality and Social Psychology*, *115*(4), 677–687. https://doi.org/10.1037/pspi0000134

Edelstein, R. S., Wardecker, B. M., Chopik, W. J., Moors, A. C., Shipman, E. L., & Lin, N. J. (2015). Prenatal hormones in first-time expectant parents: Longitudinal changes and within-couple correlations. *American Journal of Human Biology*, *27*(3), 317–325. https://doi.org/10.1002/ajhb.22670

Feeney, B. C. (2007). The dependency paradox in close relationships: Accepting dependence promotes independence. *Journal of Personality and Social Psychology*, *92*(2), 268–285. https://doi.org/10.1037/0022-3514.92.2.268

Figueiredo, B., Field, T., Diego, M., Hernandez-Reif, M., Deeds, O., & Ascencio, A. (2008). Partner relationships during the transition to parenthood. *Journal of Reproductive and Infant Psychology*, *26*(2), 99–107. https://doi.org/10.1080/02646830701873057

Hruschka, D. J., Kohrt, B. A., & Worthman, C. M. (2005). Estimating between- and within-individual variation in cortisol levels using multilevel models. *Psychoneuroendocrinology*, *30*(7), 698–714. https://doi.org/10.1016/j.psyneuen.2005.03.002

Hughes, C., Devine, R. T., Foley, S., Ribner, A. D., Mesman, J., & Blair, C. (2020). Couples becoming parents: Trajectories for psychological distress and buffering effects of social support. *Journal of Affective Disorders*, *265*, 372–380. https://doi.org/10.1016/j.jad.2020.01.133

Khaled, M., Corner, G. W., Morris, A., Havaldar, S., Luo, E., & Saxbe, D. E. (2021). Physiological linkage in pregnancy: Couples' cortisol, negative conflict behavior, and postpartum depression. *Biological Psychology*, *161*, Article 108075. https://doi.org/10.1016/j.biopsycho.2021.108075

Kluwer, E. S. (2010). From partnership to parenthood: A review of marital change across the transition to parenthood. *Journal of Family Theory and Review*, *2*(2), 105–125. https://doi.org/10.1111/j.1756-2589.2010.00045.x

Lawrence, E., Nylen, K., & Cobb, R. J. (2007). Prenatal expectations and marital satisfaction over the transition to parenthood. *Journal of Family Psychology*, *21*(2), 155–164. https://doi.org/10.1037/0893-3200.21.2.155

Laws, H. B., Sayer, A. G., Pietromonaco, P. R., & Powers, S. I. (2015). Longitudinal changes in spouses' HPA responses: Convergence in cortisol patterns during the early years of marriage. *Health Psychology*, *34*(11), 1076–1089. https://doi.org/10.1037/hea0000235

Levenson, R. W., & Gottman, J. M. (1983). Marital interaction: Physiological linkage and affective exchange. *Journal of Personality and Social Psychology*, *45*(3), 587–597. https://doi.org/10.1037/0022-3514.45.3.587

Liu, S., Rovine, M. J., Cousino Klein, L., & Almeida, D. M. (2013). Synchrony of diurnal cortisol pattern in couples. *Journal of Family Psychology*, *27*(4), 579–588. https://doi.org/10.1037/a0033735

Medina, A. M., Lederhos, C. L., & Lillis, T. A. (2009). Sleep disruption and decline in marital satisfaction across the transition to parenthood. *Families, Systems and Health*, *27*(2), 153–160. https://doi.org/10.1037/a0015762

Meyer, D., & Sledge, R. (2020). The potential role of cortisol as a biomarker of physiological interdependence in romantic couples: A systematic review. *Psychoneuroendocrinology*, *121*, Article 104834. https://doi.org/10.1016/j.psyneuen.2020.104834

Nicolson, N. A. (2008). Measurement of cortisol. In L. J. Luecken & L. C. Gallo (Eds.), *Handbook of physiological research methods in health psychology* (pp. 37–74). SAGE Publications. https://doi.org/10.4135/9781412976244.n3

Paley, B., & Hajal, N. J. (2022). Conceptualizing emotion regulation and coregulation as family-level phenomena. *Clinical Child and Family Psychology Review*, *25*(1), 19–43. https://doi.org/10.1007/s10567-022-00378-4

Papp, L. M., Pendry, P., Simon, C. D., & Adam, E. K. (2013). Spouses' cortisol associations and moderators: Testing physiological synchrony and connectedness in everyday life. *Family Process*, *52*(2), 284–298. https://doi.org/10.1111/j.1545-5300.2012.01413.x

Pauly, T., Gerstorf, D., Ashe, M. C., Madden, K. M., & Hoppmann, C. A. (2021). You're under my skin: Long-term relationship and health correlates of cortisol synchrony in older couples. *Journal of Family Psychology*, *35*(1), 69–79. https://doi.org/10.1037/fam0000809

Pinheiro, J., Bates, D., Debroy, S., Sarkar, D., & Team, R. C. (2018). *nlme: Linear and nonlinear mixed effects models* [Logiciel]. https://cran.r-project.org/package=nlme

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*(4), 613–628. https://doi.org/10.1037/0022-3514.90.4.613

Reed, R. G., Randall, A. K., Post, J. H., & Butler, E. A. (2013). Partner influence and in-phase versus anti-phase physiological linkage in romantic couples. *International Journal of Psychophysiology*, *88*(3), 309–316. https://doi.org/10.1016/j.ijpsycho.2012.08.009

Reis, H. T. (2020). Relational motives. In P. A. M. Van Lange, E. T. Higgins, & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 240–262). The Guildford Press.

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.

Reis, H. T., & Gable, S. L. (2015). Responsiveness. *Current Opinion in Psychology*, *1*, 67–71. https://doi.org/10.1016/j.copsyc.2015.01.001

Richter, M. (2022). *Perceptions of responsiveness and rejection from a romantic partner: Implications for individuals and relationship functioning* [Doctoral thesis, Université de Fribourg]. https://folia.unifr.ch/unifr/search/documents?

Saxbe, D. E. (2008). A field (researcher's) guide to cortisol: Tracking HPA axis functioning in everyday life. *Health Psychology Review*, *2*(2), 163–190. https://doi.org/10.1080/17437190802530812

Saxbe, D. E., Adam, E. K., Schetter, C. D., Guardino, C. M., Simon, C., McKinney, C. O., Shalowitz, M. U., & the Eunice Kennedy Shriver National Institute for Child Health and Human Development Community Child Health Network. (2015). Cortisol covariation within parents of young children: Moderation by relationship aggression. *Psychoneuroendocrinology*, *62*, 121–128. https://doi.org/10.1016/j.psyneuen.2015.08.006

Saxbe, D. E., & Repetti, R. L. (2010). For better or worse? Coregulation of couples' cortisol levels and mood states. *Journal of Personality and Social Psychology*, *98*(1), 92–103. https://doi.org/10.1037/a0016959

Saxbe, D. E., Rossin-Slater, M., & Goldenberg, D. (2018). The transition to parenthood as a critical window for adult health. *American Psychologist*, *73*(9), 1190–1200. https://doi.org/10.1037/amp0000376

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*(2), 141–167. https://doi.org/10.1177/1088868308315702

Schneiderman, I., Kanat-Maymon, Y., Zagoory-Sharon, O., & Feldman, R. (2014). Mutual influences between partners' hormones shape conflict dialog and relationship duration at the initiation of romantic love. *Social Neuroscience*, *9*(4), 337–351. https://doi.org/10.1080/17470919.2014.893925

Schoebi, D., & Randall, A. K. (2015). Emotional dynamics in intimate relationships. *Emotion Review*, *7*(4), 342–348. https://doi.org/10.1177/1754073915590620

Slatcher, R. B., & Schoebi, D. (2017). Protective processes underlying the links between marital quality and physical health. *Current Opinion in Psychology*, *13*, 148–152. https://doi.org/10.1016/j.copsyc.2016.09.002

Smallen, D., Eller, J., Rholes, W. S., & Simpson, J. A. (2022). Perceptions of partner responsiveness across the transition to parenthood. *Journal of Family Psychology*, *36*(4), 618–629. https://doi.org/10.1037/fam0000907

Staehelin, K., Bertea, P. C., & Stutz, E. Z. (2007). Length of maternity leave and health of mother and child—A review. *International Journal of Public Health*, *52*(4), 202–209. https://doi.org/10.1007/s00038-007-5122-1

Storey, A. E., Walsh, C. J., Quinton, R. L., & Wynne-Edwards, K. E. (2000). Hormonal correlates of paternal responsiveness in new and expectant fathers. *Evolution and Human Behavior*, *21*(2), 79–95. https://doi.org/10.1016/S1090-5138(99)00042-2

ter Kuile, H., Kluwer, E. S., Finkenauer, C., & van der Lippe, T. (2017). Predicting adaptation to parenthood: The role of responsiveness, gratitude, and trust. *Personal Relationships*, *24*(3), 663–682. https://doi.org/10.1111/pere.12202

Timmons, A. C., Han, S. C., Chaspari, T., Kim, Y., Narayanan, S., Duong, J. B., Simo Fiallo, N., & Margolin, G. (2023). Relationship satisfaction, feelings of closeness and annoyance, and linkage in electrodermal activity. *Emotion*, *23*(7), 1815–1828. https://doi.org/10.1037/emo0001201

Timmons, A. C., Margolin, G., & Saxbe, D. E. (2015). Physiological linkage in couples and its implications for individual and interpersonal functioning: A literature review. *Journal of Family Psychology*, *29*(5), 720–731. https://doi.org/10.1037/fam0000115

West, R. M. (2022). Best practice in statistics: The use of log transformation. *Annals of Clinical Biochemistry*, *59*(3), 162–165. https://doi.org/10.1177/00045632211050531

Received October 4, 2024
Revision received August 28, 2025
Accepted September 14, 2025 ■

This document is copyrighted by the American Psychological Association or one of its allied publishers.
This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.
All rights, including for text and data mining, AI training, and similar technologies, are reserved.