Positive Couple Interactions and Daily Cortisol: On the Stress-Protecting Role of Intimacy

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Objective: To determine whether intimacy might be associated with reduced daily salivary cortisol levels in couples, thereby adding to the epidemiologic literature on reduced health burden in happy couples. **Methods:** A total of 51 dual-earner couples reported time spent on intimacy, stated their current affect quality, and provided saliva samples for cortisol estimation approximately every 3 hours in a 1-week time-sampling assessment. In addition, participants provided data on chronic problems of work organization. **Results:** Multilevel analyses revealed that intimacy was significantly associated with reduced daily salivary cortisol levels. There was an interaction effect of intimacy with chronic problems of work organization in terms of their relationship with cortisol levels, suggesting a buffering effect of intimacy on work-related elevated cortisol levels. Above this, the association between intimacy and cortisol was mediated by positive affect. Intimacy and affect together explained 7% of daily salivary cortisol variance. **Conclusions:** Our results are in line with previous studies on the effect of intimacy on cortisol stress responses in the laboratory as well as with epidemiologic data on health beneficial effects of happy marital relationships. **Key words:** intimacy, salivary cortisol, marital interaction, work problems, affect, momentary assessment.

HPA axis = hypothalamic-pituitary-adrenal axis; **AUC** = area under the individual response curve.

INTRODUCTION

Close relationships and most prominently marriage are associated with health and longevity (1–3). This effect seems to depend, to some extent, on relationship characteristics such as marital quality, with individuals in unhappy relationships facing the same health burden as singles (4). One mechanism behind this finding may be that unhappy relationships are characterized by a higher frequency of negative couple interactions, which stimulate psychophysiological stress systems such as the hypothalamic-pituitary-adrenal (HPA) axis and act as repeated stressors that ultimately increase health risk (5,6). Support for this notion comes from experimental work showing increased endocrine stress reactivity in response to social conflicts in the laboratory in unhappy couples as compared with happy couples (7,8). Moreover, there is epidemiological evidence demonstrating an association between chronic changes in endocrine stress systems and morbidity and mortality (9, as also reviewed in 10).

In comparison to the extensive literature on negative couple interactions, the effects of positive couple interactions are less well studied. This is surprising given that positive couple interactions might represent one mechanism involved in the health protective effects of happy relationships. In addition to the relatively extensive research suggesting that social support provided by the partner might reduce psychophysiological stress responses (11–14), one might assume a direct buffering effect of physical intimacy against negative effects from stress on health. Positive tactile contact was associated with reduced stress-responsive neuroendocrine systems in humans and nonhuman mammals (15–17). The findings that physical contact between romantic partners lowered salivary cortisol and heart rate responses to psychosocial stress in the laboratory (13) and that warm partner contact (10-minute period of hand holding while viewing a romantic video) decreased blood pressure reactivity to a public speaking task (18) are evidence in support of the proposed mechanism. In the present study, we therefore assumed that couples who reported higher levels of intimacy would display lower levels of daily cortisol secretion.

In addition to the main effect on cortisol secretion, and in accordance with research on the beneficial effects of social support on health outcomes (19), intimacy might reduce couples' endocrine reactivity to potentially adverse effects in the face of chronic stressors, in other words, exert a buffering effect (20). Many young and middle-aged couples must juggle the demands of work and family and this is particularly difficult when problems arise from the way in which work is organized at the workplace (21). Work organizational problems are pervasive but mostly minor chronic stressors that supposedly result in small affective and endocrine reactions over the course of the day with possible health significance due to an accumulation of their effects over time (10). We argue that the daily negative affective and endocrine consequences of these stressors are reduced in couples who engage in intimate activities. Hence, we expect this couple-specific protective factor to moderate the association between chronic stressors and cortisol secretion.

Past research suggested several mechanisms by which intimacy in close relationships might reduce daily cortisol secretion. Physical contact might reduce cortisol secretion by activating central nervous neural systems that link touch and reduced stress responses. These are, for instance, the endogenous opioid system originating in the arcuate nucleus of the hypothalamus (22,23), the serotonin system (24,25), and in particular, the hypothalamic neuropeptide system with oxytocin and vasopressin (26–29). As suggested by the large database on mood disorders and neuroendocrine functioning (30,31), intimacy might also reduce cortisol secretion through increased positive and reduced negative affect (32–35). In line with this, Steptoe and colleagues reported that positive daily

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affect (represented through aggregated momentary assessment data) accelerated diastolic blood pressure recovery to psychosocial stress in the laboratory and was also related to reduced morning cortisol (33) and aggregated cortisol levels during the day (34). To further explore this pathway, we examined whether affect quality might mediate the proposed relationship between intimacy and daily cortisol secretion or whether affective and endocrine responses to intimacy might act relatively independently of one another.

We investigated how positive physical contact in couples, namely intimacy, might relate to cortisol secretion outside the laboratory in couples' everyday environments. We focused on three main research questions: 1) Are higher levels of intimacy associated with lower levels of cortisol? 2) Does intimacy attenuate the cortisol response to chronic problems of work organization? 3) Is intimacy linked with cortisol secretion through affect quality?

METHODS

Participants

The sample is composed of 51 German dual-earner couples from the Berlin metropolitan area. Instead of a monetary reimbursement, participants received feedback on their time use and participated in a raffle to win a spa weekend with their family.

Participants were on average 37 years old (standard deviation (SD) = 4.9) and had two children (range = 1–4). The majority of the sample was married (84%); the remainder was cohabiting. The sample was highly educated (90% university degree; 10% other vocational training after 13 years of schooling). For both women and men, average weekly work-hours ranged from 20 to 40 according to their work contracts. Fifty-eight percent of the men and 32% of the women earned >2000 Euros of gross monthly income (approximately US $2600). Of the original 53 couples who participated in the study, one couple had to be excluded from the sample due to missing data on everyday activity reports. Another couple did not provide information on chronic problems of work organization and was also excluded, resulting in 51 couples for statistical analyses.

Procedure

At the beginning of the study, participants were asked to complete an Internet questionnaire including sociodemographic characteristics. On an individually scheduled evening, participants were introduced to the use of the study materials: a Psion series 3a pocket computer and saliva sampling devices (Salivette, Sarstedt, Rommelsdorf, Germany). Afterwards, participants completed a practice questionnaire and received a paper summary containing all instructions and a cell phone number that they could call if they had further questions during the study. The time-sampling phase started the next morning and covered 6 consecutive days (always including 4 weekdays and both weekend days). On each day, participants were asked to complete six alarm-prompted questionnaires that were separated by approximately 3 hours. Each measurement point comprised affect ratings, reports of activities from the time of the previous beep, and saliva samples for cortisol analyses. Data collection took place between January and November 2003 and also included several personality and work characteristics that were not part of the present study (32,36). Data collection was in accordance with the ethical guidelines of the Social/Behavioral and Biomedical Sciences.

Measures

Intimacy

At each measurement point, participants were asked to report chronologically, in 15-minute intervals, the activities in which they had engaged from the time of the previous beep. For these time use reports, participants used a coding scheme with five overall activity categories, each of which were subdivided into five to eight subcategories (37). Of particular interest to this study was the overall category "personal activities" with the subcategory "exchange of intimacy," defined as "physical affection, such as holding hands, touching, hugging, kissing, or having sexual intercourse." From these activity reports, we aggregated the total duration of intimacy in minutes (mean ± SD) per day (11.33 ± 14.07 minutes).

Affect Quality

At each measurement point, participants rated their concurrent affect quality using three positive (good, relaxed, alert) and three negative (bad, tired, fidgety) adjectives from the Multidimensional Affect Scale (38). Participants chose their responses using a 5-point rating scale (1 = not at all; 5 = very much). Scores on the positive and negative affect scales were unit-weighted composites of the respective items (positive affect: 3.47 ± 0.40; negative affect: 1.89 ± 0.49). The α, calculated based on intraperson averages of each of the three items per scale, was satisfactory (positive affect: α = 0.84; negative affect: α = 0.84).

Chronic Problems of Work Organization

Due to the heterogeneity of working conditions in our sample, we only investigated this rather pervasive kind of job stress. To assess chronic problems of work organization, we used a subscale of the short self-report version of the Instrument of Stress-Oriented Task Analysis (ISTA) (39,40) on the basis of an action theoretical approach. These scales are used widely in German-speaking countries (41,42), have a 5-point Likert format reflecting either frequency or intensity, and show acceptable to good validity coefficients (43). The stressors are time pressure, concentration demands, problems of work organization, uncertainty, and work interruptions. The average self-report scores reported in other studies (44,45) range between 2.5 and 3.5, with SD values between 0.63 and 0.79. Work-related problems were assessed as part of the Internet questionnaire at the beginning of the study.

Salivary Cortisol

At each measurement point, participants also provided saliva samples for cortisol analyses. The first salivary cortisol sample (awakening) was taken with respect to individual wake-up time at 7:04 AM (SD = 77 minutes). The following five saliva samples were taken approximately every 3 hours, with suggested sampling times at 9 AM, 12 PM, 3 PM, 6 PM, and 9 PM. We gave participants the option to individually adjust these times to their schedules to reduce the disruptiveness of the study. This resulted in the following average actual sampling times: 9:26 AM (SD = 51 minutes), 12:22 PM (SD = 22 minutes), 3:17 PM (SD = 60 minutes), 6:13 PM (SD = 59 minutes), and 8:51 PM (SD = 99 minutes), respectively. To address possible noncompliance with saliva sampling (46), subjects were asked to indicate the number printed on the Salivette which they were currently using in the pocket computer questionnaire with every saliva sampling. Subjects used the Salivette sampling device (Sarstedt, Rommelsdorf, Germany). Saliva samples were kept in the participants' home freezers during the study and were then stored at the Technical University of Berlin at −20°C until they were analyzed in a laboratory of the Technical University of Dresden. We calculated total daily cortisol secretion, using a trapezoid formula that takes into account changes in cortisol between the different measurement points and the level at which these changes occur (area under the curve = AUC_{scort}) (47). The mean daily cortisol secretion was 6650.42 ± 1638.21 nmol/l.

We also assessed smoking habits, hormonal contraceptive use, exercise, body mass index, sleep duration, and wake-up time. These measures were introduced as control variables for the cortisol analyses. Sleep, duration and wake-up time were assessed, using modified items from the Pittsburgh Sleep Quality Index (PISQI; 48) that specified the previous night as a time frame. They were assessed every morning after waking up. Smoking habits, hormonal contraceptive use, and body mass were assessed at baseline. Eighty-four (83.3%) subjects in our sample were nonsmokers and 17 subjects indicated smoking either on a regular basis (n = 4, 3.9%) or occasionally (n = 13, 12.7%). Twelve (23.5%) women indicated using hormonal contraceptives, and 39 (756%) women reported not using hormonal contraceptives. Exercise was assessed in 15-minute units as part of the daily diaries. Subjects reported 1.4 hours (range = 0–9 hours) of exercise per week.

TABLE 1. Means and Standard Errors of the Mean (SEM) of the Central Study Variables for Husbands and Wives as Well as Their Intercorrelations (n = 102)

	Mean (SEM)		2	3	4	5	6	7	8	9	10	11
	Men	Women										
1. Salivary cortisol AUC/day (nmol/l)	6442.01 (253.19)	6858.84 (201.12)	−0.050	−0.266**	0.231*	−0.015	−0.058	0.116	−0.184	−0.113	0.018	−0.179
2. Intimacy (min/day)	11.32 (2.19)	10.64 (2.0)		0.151	−0.022	−0.036	0.145	−0.026	−0.109	−0.003	−0.207*	0.014
3. Positive affect	3.51 (0.05)	3.43 (0.06)			−0.758**	−0.046	−0.013	−0.006	−0.011	0.017	0.064	0.009
4. Negative affect	1.88 (0.07)	1.94 (0.07)				0.041	0.099	−0.103	−0.093	−0.127	−0.134	0.133
5. Sum of chronic problems of work organization	10.53 (0.28)	11.27 (0.21)*					0.112	0.020	−0.038	0.101	−0.046	−0.043
6. Smoking	0.22 (0.06)	0.12 (0.05)						−0.163	0.032	−0.079	−0.073	0.170
7. Hormonal contraceptives	—	0.24 (0.06)							−0.117	0.146	0.286**	−0.162
8. Body mass index	24.58 (0.36)	22.44 (0.44)**								0.095	0.027	−0.090
9. Physical activity	0.87 (0.18)	1.15 (0.25)									−0.067	−0.017
10. Sleep duration (min)	415.92 (5.47)	433.11 (5.41)*										0.174
11. Wake-up time (hours, AM)	7.22 (0.10)	7.15 (0.08)										

AUC = area under the response curve; SEM = standard error of the mean.
* $p < .05$; ** $p < .01$.

Statistical Analyses: Multilevel Modeling

All analyses are based on hierarchical linear modeling (HLM 49) to account for the hierarchically nested structure in our data (50,51). The first level concerns the 6 days of time sampling, the second level individual characteristics, and the third level couples. Multilevel analysis allows for missing observations and unevenly spaced time intervals.

Based on the reduced power in interaction analyses, we followed a recommendation by Stone (52) and set the α level for the moderation analysis to $p = .10$. The significance of the mediation tested in model 3 was estimated, using the Sobel test (53).

RESULTS

Following the control model including the main outcome variable, cortisol, and the control variables, the presentation of the results is organized into three parts. First, we present the results on the relationship of intimacy with cortisol. Next, we describe the results on the association of intimacy and cortisol in the presence of chronic problems of work organization. Then, we present the results of the mediation analysis, testing whether the association of intimacy and cortisol is mediated by positive/negative affect.

Table 1 displays the mean and SEM values for the central variables in the male and female partners of this study as well as their intercorrelations. Overall, participants reported higher levels of positive affect as compared with negative affect. Women and men did not differ in any of the dependent variables. However, women reported significantly more chronic problems of work organization than men (Table 1; $F = 4.464$, $p = .037$), body mass was significantly higher in men than in women, sleep duration was significantly longer in women than in men, and only women used hormonal contraceptives.

Intimacy and Daily Salivary Cortisol Secretion

We first examined whether intimacy was associated with reduced daily cortisol secretion. Unconditional models including only the control variables showed that, for daily salivary cortisol, 75% of the variance originated at the day level, 12% at the individual level, and 13% at the couple level. We then specified the following conditional model: Daily cortisol (AUC_{scort}) was modeled as a function of the daily duration of intimacy (β_{1jk}) and a residual component (r_{ijk}). At the individual level (level 2), the intercept β_{0jk} was modeled as a function of the overall mean of intimacy during the time of the study γ_{01k}, gender (γ_{02k}), and measures known to be associated with salivary cortisol secretion, namely smoking (γ_{03k}), use of hormonal contraceptives (γ_{04k}), body mass index (γ_{05k}), physical activity (γ_{06k}), sleep duration (γ_{07k}), wake-up time (γ_{08k}), and a residual component (u_{0jk}). A third couple level of analysis was added to take into account the dyadic data structure of this sample. As no specific predictions were made at the couple level, analyses were based on an empty level 3 model.

In line with our expectations, participants displayed lower levels of salivary cortisol on days with long durations of intimacy as compared with days with no or little intimacy (Table 2, Model 1). We found no association between overall levels of intimacy and cortisol secretion. This means that the exchange of intimacy was related to day-to-day variations in cortisol secretion but that individual differences in overall intimacy were unrelated to cortisol secretion. This model explained 1.0% of the variance in daily salivary cortisol. The reduction in deviance, which is a measure of model fit, was significant (7.16, $df = 2$, $p = .025$).

Impact of Chronic Problems of Work Organization and Intimacy on Cortisol Secretion

In the next step, we examined whether endocrine consequences of chronic problems of work organization would be buffered by intimacy. We therefore added chronic problems of work organization (γ_{09k}) as an individual-level predictor to the above described model. Again, no specific predictions were made at the couple level, and analyses were based on an empty level 3 model.

In line with our prediction, we found a negative trend in the respective interaction term (Table 2, Model 2). This means

TABLE 2. Hierarchical Linear Models Predicting Salivary Cortisol by the Exchange of Intimacy Using Full Maximum Likelihood Estimation (n = 102)

Fixed Effects	Control Model		Model 1: Changes in Cortisol by Intimacy		Model 2: Changes in Cortisol by Intimacy and Problems of Work Organization		Model 3: Changes in Cortisol by Intimacy and Affect Quality	
	Unstandardized Coefficients	SE	Unstandardized Coefficients	SE	Unstandardized Coefficients	SE	Unstandardized Coefficients	SE
Intercept	6549.50**	286.21	6541.88**	278.23	6551.99**	268.40	6551.98**	268.41
Overall intimacy			−591.95	757.20	−576.59	771.04	−576.57	771.04
Gender	130.87	328.16	131.00	325.24	114.54	315.57	114.54	315.57
Smoking	85.58	394.93	126.00	396.40	112.52	387.04	112.50	387.04
Hormonal contraceptives	180.42	481.52	187.32	491.70	190.53	489.33	190.54	489.32
Body mass index	−114.62†	60.88	−118.38	61.19	−118.49	61.30	−118.49	61.27
Physical activity	−147.90	79.52	−149.63	77.84	−150.87*	77.12	−150.86*	77.12
Sleep duration	0.83	3.94	0.17	3.98	0.22	4.10	0.22	4.10
Wake-up time	−8.08	5.12	−7.89	5.17	−7.84	5.22	−7.84	5.22
Daily intimacy			−581.61*[a]	272.76	−608.63*	253.11	−382.28*	191.09
Sum of chronic problems of work organization					18.84	81.42	18.83	81.42
Daily intimacy × work organizational problems					−198.62†	116.88	−169.62	113.83
Daily positive affect							−2086.35**	406.17
Daily negative affect							−300.74	438.17
Random effects								
Residual			4871427.23	2207.13	4856578.33	2203.76	4361650.93	2088.46
Intercept lv 1			767126.43**	875.86	758868.26**	871.13	841478.33**	917.32
Intercept lv 2			843663.65**	918.51	858639.93**	926.63	858520.38**	926.56

SE = standard error.

† $p < .10$; * $p < .05$; ** $p < .01$.

[a] Each hour of intimacy during the day was associated with a 581.61-nmol/l cortisol decrease aggregated over the course of the day (area under the curve). This translates into an aggregated cortisol decrease of 9.69 nmol/l with each minute of intimacy during the day.

that above and beyond the association with daily cortisol secretion, intimacy was related with reduced endocrine reactions toward problems of work organization. This supports our assumption that intimacy is a couple-specific protective factor. This model explained 1.0% of the variance in daily cortisol secretion, and the reduction in deviance was significant on a trend level (deviance reduction = 8.77; $df = 4$; $p = .098$).

Affect Quality as a Mediator of the Relationship Between Intimacy and Salivary Cortisol

Finally, we tested whether the association between intimacy and daily cortisol was mediated by positive and/or negative affect qualities. To test this mediational hypothesis, we first modeled daily positive/negative affect (s_{ijk}) as a function of daily intimacy (β_{1jk}) plus a residual term (r_{ijk}). To test whether affect quality differed between women and men, gender (γ_{01k}) and an error term (u_{0jk}) were included as individual-level variable predicting β_{0jk}.

Results showed that daily intimacy was significantly related to both positive (unstandardized coefficient = 0.12, standard error (SE) = 0.05, $p = .019$) and negative affect qualities (unstandardized coefficient = −0.10, SE = 0.04, $p = .002$). We did not find any relationship between overall intimacy or gender and affect quality.

We then added positive and negative affect as daily predictors to the cortisol model (Table 2, Model 3). Our findings show that the association of intimacy and salivary cortisol secretion was significantly mediated by positive affect ($z = -2.05$; $p = .048$), but not by negative affect ($z = 0.62$; $p = .54$, NS) (Figure 1). This model explained 7.4% of the variance in daily cortisol secretion (deviance reduction = 63.58; $df = 6$; $p < .001$).[1]

[1] In additional analyses of our data, we found significant differences between weekdays and weekends in the time dedicated to intimacy (time during weekdays: 7.6 ± 25 minutes; time during weekends: 20 ± 29 minutes; unstandardized coefficient = 0.13, SE = 0.04, $p = .003$). In addition, aggregated cortisol levels were significantly lower during weekends than during the week (unstandardized coefficient = −2090.88, SE = 195.98, $p < .001$) and during times when the partner was present compared with times when the partner was absent (unstandardized coefficient = −1325.54, SE = 379.04, $p = .001$). However, we did not find a significant interaction of presence of the partner and weekday with regard to cortisol levels, nor did we find a significant relationship between intimacy and cortisol when restricting our analyses to the time off work (weekend). Furthermore, we did not find a significant relationship between intimacy and daily cortisol slopes in our sample.

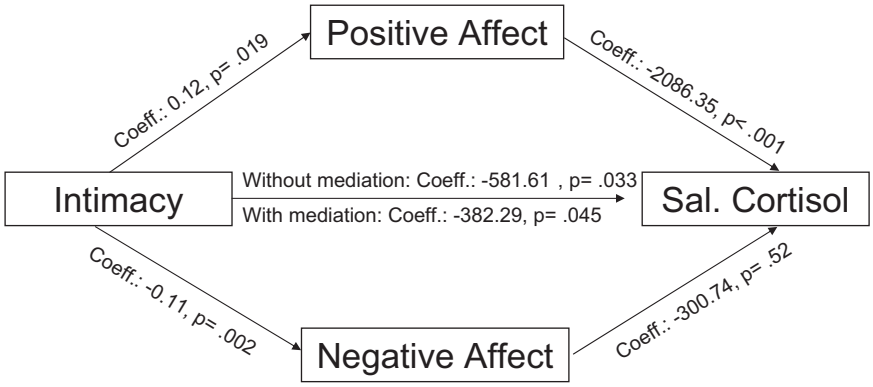

Figure 1. Association between intimacy and daily salivary cortisol levels with and without mediation through affect. Sal. Cortisol = salivary cortisol; Coeff = coefficient.

DISCUSSION

In a sample of 51 dual-career couples, we found that intimacy in everyday life is associated with reduced salivary cortisol secretion. Most interestingly, this effect is not based on an association between overall levels of intimacy and cortisol secretion but rather on daily variations in intimacy. In our study, there was a negative interaction between intimacy and chronic problems of work organization, suggesting that particularly couples with high levels of work problems benefited from the effect of intimacy. In addition, we found the association between daily intimacy and cortisol secretion to be mediated by positive affect.

Our findings, obtained through time-sampling methods, complement past research on the effects of physical contact on physiological stress responses in the laboratory. These studies document a clear protective effect of instructed physical contact (13,18) on cardiovascular and endocrine stress responses. In relation to this research, it is particularly interesting that in our sample, it was not overall intimacy levels but rather daily variations in intimacy that influenced cortisol levels. However, the relatively small effect sizes found in our study require further attention. One possible interpretation is that, compared with couple interactions in the laboratory, the short time devoted to intimacy in everyday life might reduce its association with physiological parameters. Also, and related to this, we did not find a significant association of intimacy and daily cortisol levels in analyses restricted to the time off work (weekends) when the partner was present or a significant relationship of intimacy with daily cortisol slopes. In addition, our intimacy measure covered a relatively broad set of activities. Research focusing specifically on sexual intercourse (54) suggested strong effects of sexual intercourse assessed during a 2-week period on cardiovascular stress responses to a laboratory stress test. Hence, future research may benefit from examining specific intimate activities in terms of their impact on stress responses in everyday life.

Our data suggest a buffering effect of intimacy on endocrine stress levels in the presence of high levels of problems of work organization but we did not find a main effect of work stress on daily cortisol levels. This is in line with data by van Eck and colleagues, who found that affect mediated stressful events and cortisol secretion but did not find a relationship between perceived stress and daily cortisol (55). Our findings are also partly in line with Smyth et al. (56), who did not find prior everyday stressful events to predict cortisol levels in a momentary assessment paradigm. In other studies, however, work-related stress has been associated with elevated cortisol levels (57,58), and social support seems to buffer the negative effects of work stress on physiological outcomes (59). Specifically, problems of work organization might induce feelings of uncontrollability known to increase cortisol levels (60) and to aggravate work-family conflict (21). The conceptualization of intimate couple behavior as nonevaluative social support or a safety signal during stress (13,61) might help to further stimulate research on the possible impact of physical contact on long-term health outcomes. Due to the shared variance of both concepts, it is however methodologically challenging to separate cognitive aspects of social support from beneficial effects of intimate couple behavior. Without doubt, extensive research is needed to evaluate the role of cognitive and affective mediators of this supposed implication of physical contact for health and disease. In this context, daily measures of work stress as opposed to our one-time measure might add important additional information with regard to the supposed interaction of intimacy and work stress. Beyond this, future research might clarify whether the buffer effect of daily variations in intimacy also applies to different kinds of stress other than organizational problems at work.

As suggested by Frankenhaeuser (62,63), physiological stress responses might be mediated by negative emotions during the perception of threat. In our study, the relationship of daily intimacy with cortisol was mediated by positive affect. Although consistent with earlier studies (33,34) and with our hypotheses, these data are in contrast to a relatively large number of studies that do not report effects of social interaction on psychological parameters, such as mood and anxiety during stress in the laboratory (11,13,14,64–67). Thus, our results in part support Frankenhaeuser's model, but further investigation is necessary to elucidate the influence of positive versus negative emotions in terms of their association with physiological stress responses.

Previous evidence suggested that the activation of the attention-caregiving system might reduce physiological stress

reactivity particularly in women (61), suggesting stronger beneficial effects of close social contact in women than in men. Interestingly, we did not find differences between women and men in terms of the association between intimacy and daily cortisol levels. Our data suggest that men and women benefit equally from physical contact in daily life.

Most relevant with regard to our data, laboratory research shows strong effects of negative couple interactions (such as aggression or conflict) on physiological stress reactions (6,68,69) in comparison to the small beneficial effects of positive interactions and affect (7). Ecological momentary assessment paradigms may be particularly suitable for assessing these small effects (56,70), as they assess behavior a) in the natural context and b) in response to daily events. It would be very promising to compare daily intimacy with daily conflicts in terms of their influence on endocrine and/or autonomic functioning.

Limitations

The present study investigated a highly selective sample: well-educated dual-earner couples who reported relatively low levels of negative affect during their daily life interactions. Notably, the participants of this study showed an employment pattern that may not be typical but rated as highly desirable by the majority of German couples with preschool children (71). It would be important to investigate the observed association between intimacy and cortisol in a different socioeconomic group that might face substantial chronic stressors and possibly more negative affect than did our sample. In addition, this study represents a snapshot out of the daily lives of the present sample. Within the context of our study, we cannot draw causal inferences in terms of lead-lag effects. Hence, working parents may exchange more intimacy in times of less stress or they may be less stressed due to an exchange of intimacy. The available laboratory research supports the latter notion (13,18), but future research might disentangle causal ordering in couples' everyday lives.

To summarize, our data, obtained with momentary assessments, complement laboratory research on the buffering effects of intimacy on physiological stress responses with possible effects on long-term health outcomes. Future studies might allow further interpretations about the effect of instructed intimacy in couples' everyday lives, the role of intimacy compared with couple conflict, and the mediating role of positive and negative affect in couples' everyday lives to investigate possible long-lasting effects on physiological stress systems.

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