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BRIEF REPORT

The Impact of Negative Family–Work Spillover on Diurnal Cortisol

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Objective: Both dimensions of the work-family interface, work-to-family and family-to-work spillover, have important implications for health and well-being. Despite the importance of these associations, very little is known about the physiological mechanisms through which the interplay between family and work experiences are translated into long-lasting consequences for health. ***Method:*** This study investigated both positive and negative aspects of each spillover dimension on diurnal cortisol secretion patterns in a large panel study of working adults between the ages of 33 and 80. ***Results:*** Greater negative family-to-work (NFW) spillover predicted lower wake-up cortisol values and a flatter (less "healthy") diurnal cortisol slope. This effect was evident even after controlling for the effects of the other spillover dimensions. ***Conclusions:*** These findings indicate that not all aspects of the work-family interface might impact stress physiology to the same extent and suggest that diurnal cortisol may be an important pathway through which negative aspects of the work-family interface leave their mark on health.

Keywords: work–family interface, negative family-to-work spillover, work–family conflict, cortisol, MIDUS

The impact of work stressors on health and well-being (Kivimäki et al., 2006) is often dependent on day-to-day family dynamics, which can influence one's ability to cope with work demands (Repetti, Wang, & Saxbe, 2009). Studies show that both work-to-family and family-to-work interference (or spillover) can have important consequences on various aspects of well-being (Grzywacz, 2000).[1] For example, negative spillover, which reflects the degree to which negative experiences in one domain intrude into the other, has been associated with incidence of clinical depression (Frone, Russell, & Cooper, 1992) and greater obesity (Grzywacz, 2000). By contrast, positive spillover, which reflects the degree to which events in one dimension benefit experiences into the other, has been associated with lower anxiety and depression (Grzywacz & Bass, 2003).

Despite these associations, the physiological mechanisms through which spillover may affect health remain largely unknown. Both the family and work environments can be sources of chronic stress, which can influence the activity of the hypothalamic–pituitary–adrenal (HPA) axis and it hormonal end-product cortisol (McEwen, 2008). Current research shows robust associations between work stressors and increased cortisol levels throughout the day (Kunz-Ebrecht, Kirschbaum, & Steptoe, 2004). The impact of work stressors on cortisol can also be influenced by family environments (Repetti et al., 2009). For example, wives with lower marital satisfaction tend to show higher cortisol levels in response to work worries (Slatcher, Robles, Repetti, & Fellows, 2010). No studies to date, however, have examined the association between spillover from *home* to *work* and diurnal cortisol responses. This study tries to fill this gap by simultaneously testing the effects of work-to-family spillover and family-to-work spillover on diurnal cortisol secretion in a large, nationally representative sample of American adults.

Method

Data were drawn from the National Study of Daily Experiences (NSDE II; $n = 2{,}022$), a subset of the second wave of the Midlife in the United States (MIDUS II) survey. The NSDE II included 4 days of salivary cortisol collection and eight days of phone interviews (see Almeida, McGonagle, & King, 2009, for further details). Participants with missing values on any of the variables of

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[1] The work–family literature uses various concepts, such as "work-to-family conflict," "work-to-family interference," and "negative spillover from work to family," interchangeably to refer to the challenges in combining the work and family domains. Similarly, constructs like "work-to-family enrichment," "work-to-family enhancement," and "positive spillover from work to family" are also often treated as synonymous concepts referring to the potential advantages arising from combining work and family. In this article we use the terms *negative spillover* to refer to the former, and *positive spillover* to refer to the latter. Our choice was guided by theoretical perspectives and empirical work, which demonstrates that the work–family fit is dependent on interactions between individuals and the environment in which they are embedded, and, as a result, its positive and negative aspects are best conceptualized as orthogonal constructs rather than as opposing points on a single continuum (for a discussion see Grzywacz & Marks, 2000).

interest were excluded from analyses. The final sample included 736 adults who reported currently working for pay during MIDUS II (53.5% female, 95.2% White/Caucasian, 75.1% completed some college or more; age, $M = 51$ years, $SD = 9.1$ years).

Measures

Spillover dimensions. Both "family-to-work" and "work-to-family" dimensions were measured with eight items each during the MIDUS II questionnaire assessment (Grzywacz & Marks, 2000). For each dimension, participants rated on a scale from 1 (*all of the time*) to 5 (*never*) how often in the previous year they experienced each statement. Each spillover dimension was measured with two composites of four items each reflecting negative and positive spillover, respectively. Composites were computed by summing participants' ratings, with higher scores indicating higher levels on each construct.

Family-to-work spillover. Negative family-to-work spillover (NFW) measures the extent to which family environments hamper work performance, whereas positive family-to-work spillover (PFW) measures the extent to which family environments aid work performance. An example item for NFW is "Stress at home makes you irritable at work" ($\alpha = .80$, $M = 8.2$, $SD = 2.34$), whereas items for PFW included "Your home life helps you relax and feel ready for the next day's work" ($\alpha = .71$, $M = 13.53$, $SD = 2.83$).

Work-to-family spillover. Negative work-to-family spillover (NWF) measures the extent to which work environments have detrimental effects on family activities, whereas positive work-to-family spillover (PWF) measures their beneficial effects. An example item for NWF is "Stress at work makes you irritable at home" ($\alpha = .82$, $M = 10.3$, $SD = 2.77$), and items for PWF included "The things you do at work make you a more interesting person at home" ($\alpha = .72$, $M = 11.74$, $SD = 2.75$).

Salivary cortisol. Salivary cortisol was collected using Salivettes (Sarstedt, Rommelsdorft, Germany). On average, saliva collection during NSDE II occurred 20.54 months ($SD = 13.57$) after the MIDUS II questionnaire assessment. On Days 2–5 of the 8-day NSDE study period, participants provided four saliva samples: immediately upon waking, 30 min later to assess cortisol awakening response (CAR), before lunch, and at bedtime. Cortisol concentrations were quantified with a commercially available luminescence immunoassay (IBL, Hamburg, Germany) with intraassay and interassay coefficients of variability less than 5%. Compliance was assessed using nightly telephone interviews and paper-and-pencil logs included in the collection kits. Cortisol values were log-transformed to correct for positive skew in the cortisol distribution (Adam & Kumari, 2009). A constant of 1 was added before the transformation so that all resulting values would be positive.

Potential covariates. Several standard covariates in diurnal cortisol studies (Adam & Kumari, 2009) were included in the analyses. Demographic covariates included age, gender (male = 0, female = 1), education (0 = high school or less, 1 = some college or more), race/ethnicity (0 = White, 1 = non-White), and average wake time. Psychological covariates included average daily negative affect (14 items rated on 5-point Likert scale, $\alpha = .89$) and average daily positive affect (13 items rated on 5-point Likert scale, $\alpha = .96$) during the 8-day NSDE II study.

Data Analysis

Because of the strong diurnal rhythm of cortisol, hierarchical linear modeling (HLM) was used for data analyses. HLM allows for the simultaneous estimation of multiple cortisol parameters (cortisol at wakeup, CAR, slope) and the prediction of individual differences in diurnal cortisol profiles. Following prior research (Adam & Kumari, 2009), time since waking (scaled in hours since waking each day), time-since-waking-squared, and CAR (dummy coded 0 or 1) were modeled at Level-1 to provide estimates of each participant's diurnal cortisol rhythm. The effects of family-to-work spillover dimensions and work-to-family spillover dimensions were tested at Level 2 (person-level). To control for potential confounding effects, all covariates were included at Level 2. In line with prior research (e.g., Adam & Kumari, 2009), cortisol intercept, slope (effect of time), and CAR were all allowed to vary randomly at Level 2, whereas time-since-waking-squared was treated as a fixed effect with no Level 2 predictors. Continuous person-level variables were standardized. All significance tests were 2-tailed with robust standard errors.

Results

Table 1 shows zero-order correlations among the four spillover dimensions, and Table 2 reports the results from the HLM model. As shown in the latter, NFW was negatively associated with waking cortisol ($\beta07 = -.080$, $p = .001$). NFW was also associated with a flatter cortisol diurnal slope ($\beta27 = .006$, $p = .001$). Simple slope analyses revealed that time of the day had a significantly negative effect on cortisol secretion among high NFW individuals ($\gamma = -0.128$, $p = .003$), but the magnitude of this effect was diminished relative to low NFW individuals ($\gamma = -0.141$, $p = .001$; see Figure 1). No association was found between NFW and CAR ($\beta17 = .024$, $p = .152$). Similar null effects were observed for PFW on morning cortisol ($\beta05 = .015$, $p = .369$), CAR ($\beta15 = -.005$, $p = .732$) and cortisol diurnal slope ($\beta25 = .001$, $p = .709$). Neither NWF nor PWF significantly predicted any of the diurnal cortisol parameters. Random effects for morning cortisol ($\tau00 = .14640$), CAR ($\tau11 = .01388$), and cortisol slope ($\tau22 = .00117$) were all significant ($p < .01$); however, the inclusion of family-to-work and work-to-family variables resulted in a reduction of variance of random effects for morning cortisol and cortisol slope of about 2% compared to a model including only covariates. These results remained unchanged when family-to-work spillover dimensions and work-to-family spillover dimensions were considered in separate models.

Table 1
Bivariate Correlations Between Study Variables

Descriptive variable	1	2	3	4
1. PFW	—	.005	.342*	.055
2. NFW		—	.123*	.533*
3. PWF			—	.030
4. NWF				—

Note. PFW = positive family-to-work spillover; NFW = negative family-to-work spillover; PWF = positive work-to-family spillover; NWF = negative work-to-family spillover.
* $p < .01$.

Table 2
HLM Models of Diurnal Cortisol Parameters

Fixed effect (independent variable)	Estimate	*SE*	*p*
Morning cortisol, $\pi0$			
Average waking cortisol (intercept), $\beta00$	2.612	.044	<.001
Female, $\beta01$	−.090	.033	.008
Non-White, $\beta02$	−.272	.075	<.001
Some college, $\beta03$	.122	.041	.003
PWF, $\beta04$	−.007	.017	.687
PFW, $\beta05$	.015	.017	.369
NWF, $\beta06$	.028	.021	.195
NFW, $\beta07$	−.080	.025	.001
Age, $\beta08$	−.010	.018	.565
Daily negative affect, $\beta09$	.003	.021	.876
Daily positive affect, $\beta010$	−.018	.023	.423
Average wake time, $\beta011$	−.059	.024	.015
Cortisol awakening response, $\pi1$			
Average CAR, $\beta10$	.386	.030	<.001
Female, $\beta11$	.099	.026	<.001
Non-White, $\beta12$	.013	.060	.827
Some college, $\beta13$	−.037	.031	.235
PWF, $\beta14$	−.013	.013	.326
PFW, $\beta15$	−.005	.013	.732
NWF, $\beta16$	−.002	.015	.918
NFW, $\beta17$	.024	.017	.152
Age, $\beta18$	.037	.014	.008
Daily negative affect, $\beta19$	.013	.020	.516
Daily positive affect, $\beta110$	.001	.017	.973
Average wake time, $\beta111$	−.009	.015	.551
Time since waking, $\pi2$			
Average linear slope, $\beta20$	−.135	.006	<.001
Female, $\beta21$	.003	.003	.276
Non-White, $\beta22$	.039	.008	<.001
Some college, $\beta23$	−.010	.004	.010
PWF, $\beta24$	.001	.002	.675
PFW, $\beta25$	.001	.001	.709
NWF, $\beta26$	−.003	.002	.079
NFW, $\beta27$	.006	.002	.001
Age, $\beta28$	.004	.002	.032
Daily negative affect, $\beta29$	.002	.002	.260
Daily positive affect, $\beta210$	.001	.002	.640
Average wake time, $\beta211$	−.001	.002	.722
Time since waking^2, $\pi3$			
Average curvature, $\beta30$	.003	.000	<.001

Note. Intercepts indicate average cortisol values at wakeup; average slopes of time since waking indicate change in cortisol per 1-hr change in time; average slopes of time since waking^2 indicate change in cortisol per 1-hr change in time^2. HLM = hierarchical linear modeling; CAR = cortisol awakening response; PFW = positive family-to-work spillover; NFW = negative family-to-work spillover; PWF = positive work-to-family spillover; NWF = negative work-to-family spillover.

Lastly, additional separate models were also run to test whether age, gender, or any other spillover dimension moderated the main effect of NFW on morning cortisol and cortisol slope; none of these interactions were significant (lowest $p = .094$).

Discussion

The current findings suggest that dysregulation of HPA axis activity might be one of the biological pathways underlying the links between family-to-work spillover and health problems (Grzywacz, 2000). These results support theoretical perspectives arguing that each dimension of spillover may be related to different barriers and/or resources (e.g., the asymmetrical boundary hypothesis suggesting that family-to-work may be more consequential than work-to-family spillover for women given gender socialization norms; Pleck, 1977) and, as a result, to different consequences for health and well-being. In line with this argument, previous studies have shown that the impact of family problems on work outcomes may be greater than the impact of work problems on family dynamics, and that the direction of these effects may also extend to health. For example, Rotondo and Kincaid (2008) found that events that increased family-to-work conflict had twice the impact on spillover than events that increased work-to-family conflict. Frone, Russell, and Cooper (1997), on the other hand, showed that family-to-work conflict was related to increased levels of depression and incidence of hypertension over time. Likewise, the current results indicate that negative family-to-work spillover—but not negative work-to-family spillover—was associated with a less "healthy" diurnal cortisol profile. Altogether, these findings suggest that interference of family responsibilities with work activities represents a primary stressor at the work–family interface. Because the current findings emerged from data collected during the prerecession economy, future studies should address whether the same findings would hold in a different economic climate.

It is interesting to note that the current analyses did not reveal any associations between positive family-to-work spillover and cortisol, even though studies have shown that positive family events beneficial to work may also benefit physical and mental health (Grzywacz & Bass, 2003; Grzywacz, Butler, & Almeida, 2008). These results, therefore, lend further support to the idea that the impact of negative events can sometimes overshadow the influence of positive factors on health (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001).

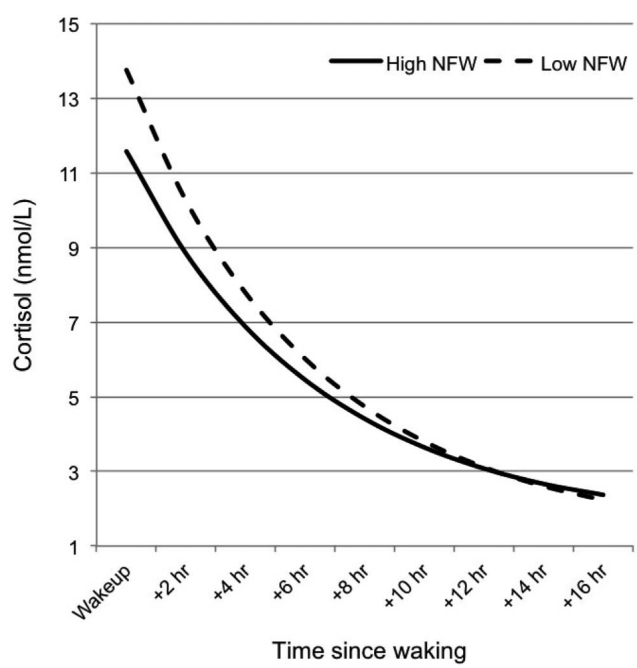

Figure 1. Associations between negative family-to-work spillover (NFW) and diurnal cortisol. Cortisol level is graphed as a function of time since waking, separately for participants with low (1 *SD* below the mean) and high (1 *SD* above the mean) NFW.

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