Episodic Work–Family Conflict, Cardiovascular Indicators, and Social Support: An Experience Sampling Approach

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Work–family conflict, a prevalent stressor in today’s workforce, has been linked to several detrimental consequences for the individual, including physical health. The present study extends this area of research by examining episodic work–family conflict in relation to objectively measured cardiovascular health indicators (systolic and diastolic blood pressure and heart rate) using an experience sampling methodology. The results suggested that the occurrence of an episode of work interference with family conflict is linked to a subsequent increase in heart rate but not blood pressure; however, the relationship between episodes of family interference with work conflict and both systolic and diastolic blood pressure is moderated by perceptions of family-supportive supervision. No evidence was found for the moderating role of work-supportive family. Further theoretical and practical implications are discussed.

Keywords: cardiovascular, work–family conflict, episodic, blood pressure, heart rate

Over the past three decades, industrialized society has been marked by a shift in the roles that men and women occupy in the work and home domains (Galinsky, Aumann, & Bond, 2009; Padavic & Reskin, 2002). In contrast to the traditional breadwinner–homemaker model of the mid-1900s, the majority of contemporary families are dual-earner with both the male and female heads of the household engaged in paid labor (Galinsky et al., 2009). This blurring of roles and dual responsibilities have led to an increasing prevalence of work–family conflict (WFC), or conflict that arises when work and family are mutually incompatible in some respect (Greenhaus & Beutell, 1985). WFC is thought to be bidirectional in nature, such that work can interfere with family (WIF) and family can interfere with work (FIW).

The experience of WFC is linked to numerous detrimental consequences. These consequences include role-related variables, such as job and family satisfaction associated with the domain in which the interference occurs (cf., Ford, Heinen, & Langkamer, 2007) as well as personal well-being in the form of psychological and physical health (Greenhaus, Allen, & Spector, 2006). The purpose of the present study was to extend previous research on WFC and physical health by assessing systolic blood pressure, diastolic blood pressure, and heart rate—all indicators of cardiovascular health. Specifically, based on a 10-day experience sampling design, we adopted an episodic approach to the measurement of WFC (Maertz & Boyar, 2011). The episodic approach enabled us to examine discrete occurrences of WFC in relation to blood pressure and heart rate.

Our study represents a unique contribution beyond previous research in three major ways. First, to our knowledge, previous studies that have investigated blood pressure in relation to WFC (Frone, Russell, & Cooper, 1997; Thomas & Ganster, 1995) have been limited to those that take a levels-based approach (Casper, Eby, Bordeaux, Lockwood, & Lambert, 2007; Greenhaus et al., 2006). The levels-based approach focuses on individual’s chronic “level” of WFC and how this level relates to other constructs (Maertz & Boyar, 2011). Item responses are typically based on agree–disagree Likert scales, and participants are asked to report on their experiences without a time period being specified or over a relatively long period of time (e.g., 3 or 6 months). This is in contrast to the episodes approach, which focuses on specific situations in which work and family are in conflict and subsequent consequences. This distinction is important because the episodic approach better facilitates linkage of WFC with immediate changes in other variables (Maertz & Boyar, 2011). Also, levels-based research assumes that constructs are relatively stable and often involve cross-sectional measurements, whereas episodic approaches assume short-term changes in variables and are conducive to numerous measurements across time (e.g., experience sampling design) and within-subject analyses (Maertz & Boyar, 2011).

The relationships between WFC and blood pressure and heart rate seem particularly suited to an episodic approach with repeated measures over time and within-subject analyses. There is consid-
erable within-person variability in WFC (Ilie et al., 2007), blood pressure (e.g., Gardner & Heady, 1973; Sheps, 2012), and heart rate (e.g., Laskowski, 2010). When levels-based approaches are used, this intraindividual variance is not taken into account, potentially masking effects. Within-subject approaches also possess the benefit of allowing individual differences to be held constant, an important advantage in cardiovascular indicator research as numerous factors (e.g., family history, health behaviors, socioeconomic status; cf. Mayo Clinic, 2012) impact average blood pressure and heart rate levels. In addition, short-term, immediate changes in blood pressure and heart rate as a reaction to specific stressors (e.g., the experience of WFC) are well documented (e.g., Carroll, Davey Smith, Sheffield, Shipley, & Marmot, 1995; Mayo Clinic, 2012) and are consistent with general stress theories (e.g., Cox, 1978). On the other hand, the long-term effects of stressors on blood pressure and heart rate are less clear (Mayo Clinic, 2012). Thus, an episodic, experience sampling approach better aligns with existing theoretical and empirical work than does a chronic, levels-based approach.

An episodic approach is further advantageous in that it may overcome some of the limitations associated with measurement of WFC as a chronic variable. For example, typical measures of chronic WFC (e.g., Carlson, Kacmar, & Williams, 2000; Nete meyer, Boles, & McMurrian, 1996) have been cited as deceptively difficult to answer, owing to their requirements for recall of events over a long period of time and, further, appropriate attribution of events during that time (e.g., was work actually the source of this conflict, and did it affect the family domain?; MacDermid, 2005). Chronic measures have also been criticized as difficult for respondents to distinguish current conflicts from memories of past conflicts (Maertz & Boyar, 2011). Episodic approaches help alleviate these concerns because they ask participants to report the details of a specific incident shortly after it occurs (Maertz & Boyar, 2011).

The second contribution of the present investigation is the use of a physiological, objective measure of health. Most research linking WFC and physical health variables uses self-report measures (cf. Greenhaus et al., 2006). This is a cause for concern because observed associations between variables may be due to a third variable that systematically distorts reports, such as negative affectivity (Grzywacz & Tucker, 2008; Spector, Zapf, Chen, & Frese, 2000). Even studies that use self-reports of physiological indicators such as blood pressure (e.g., Thomas & Ganster, 1995) are prone to bias because participants may not accurately recall their blood pressure or are likely to base their reports on a single measurement taken at a doctor’s office, which may or may not accurately reflect their “true,” average, or current blood pressure level (Grzywacz & Tucker, 2008). For these reasons, the use of physiological indicators accompanied by measurements that can be directly obtained from health instruments is preferable to self-report methods. In the present study, blood pressure and heart rate were measured four times daily across 10 study days using an ambulatory wristwatch heart monitor that electronically stored readings.

Although we know of no previous published research that has examined WFC in relation to heart rate, it is important to note that our study is not the first to assess WFC and objectively measured blood pressure. In a study with a 4-year time lag between measurement points, Frone et al. (1997) examined chronically measured WFC and objective blood pressure; however, blood pressure was dichotomized (normotensive vs. hypertensive), and the aim was to assess whether WFC predicted new incidents of hypertension. Although hypertension has clear health implications, research suggests that very slight changes in blood pressure can relate to substantial changes in cardiovascular functioning (van den Hoogen et al., 2000). For this reason, it seems important to examine blood pressure as a continuous variable and to capture more dynamic changes in blood pressure over time, even if they do not cross the hypertensive threshold. We followed this methodology in the present study.

The final way in which this study extends previous research is by examining moderators of the WFC and cardiovascular health indicator relationships. The investigation of moderators is theoretically consistent with the buffering hypothesis (e.g., Cassel, 1976; Cobb, 1976; Cohen & Wills, 1985), which suggests that social support can weaken the effects of stressors on strain outcomes. Accordingly, we examined individuals’ baseline levels of work and family cross-domain support (i.e., supervisor support for family and family support for work) as moderators on the within-person associations between the occurrence of directional WFC (i.e., WIF, WFW) episodes and blood pressure and heart rate. In summary, by conceptualizing WFC as episodic and by adopting an experience sampling methodology, using repeated objective measures of blood pressure and heart rate, and examining social support variables as moderators, the present investigation aimed to advance our understanding of the health consequences associated with the experience of WFC.

Investigation into the link between WFC and physical health outcomes, particularly indicators of cardiovascular health, has both theoretical and practical significance. From a theoretical standpoint, the current study’s methodology allowed for the assessment of variables likely to be more proximal to WFC and therefore having the potential to help explain the process by which WFC relates to health outcomes such as cardiovascular disease. Such variables are rarely included in WFC and health research (Allen & Armstrong, 2006; Greenhaus et al., 2006). Previous research suggests that chronic WFC and cardiovascular health (Frone et al., 1997; Thomas & Ganster, 1995) are related, but the mechanisms by which they relate are unclear. The present study may shed some insight on this, as it can help discern whether specific incidents of WFC have an immediate impact on biological functioning that presumably, in turn, has cumulative long-term effects over time, or, in the absence of such a relationship, whether there are other mechanisms that need to be explored. Furthermore, the design of the present study with multiple measures of WFC and objective health outcomes takes a step toward the accumulation of evidence that can be used to build a better understanding of causal relationships beyond that of previous cross-sectional studies or those with merely two time points (Frone et al., 1997; Greenhaus et al., 2006; Grzywacz & Tucker, 2008). Clearly, inferences about causality are paramount to our theoretical understanding of the relationship between WFC and well-being. As a final point, the inclusion of moderators extends our theoretical understanding of the boundary conditions for WFC and blood pressure/heart rate associations.

The applied importance of this study lies in the health implications. Short-term heart rate and blood pressure increases can be a function of many factors, including the experience of a stressful incident or increased effort expenditure (e.g., physical activity). Assuming that the physiological systems activated during this
process have the time and ability to stabilize at a baseline level, these short-term increases do not pose a danger to long-term cardiovascular functioning. However, if the recovery process is interrupted by additional resource requirements and the baseline is never met, the physiological systems must operate in a suboptimal state requiring compensatory effort. In turn, this places an increased demand on the system itself and increases the recovery requirements. If this process occurs repeatedly, it alters the homeostatic balance between the various psychological subsystems (i.e., sympathetic and parasympathetic nervous systems; McEwen, 1998; Sluiter, Frings-Dresen, Van der Beek, & Meijman, 2001). Such imbalance has been linked to a sustained increased in factors associated with heart disease, including heart rate, blood pressure, blood lipids, and triglycerides (e.g., von Thiele, Lindfors, & Lundberg, 2006).

When an individual experiences WFC, it is likely to be in the context of other stressful incidents, given that common predictors include work and family demands (Michel, Kotrba, Mitchelson, Clark, & Baltes, 2011). Thus, if WFC is a powerful enough stressor to induce this physiological process, it could begin, or contribute to, a cycle that has detrimental effects. Given the very high cost of health care for organizations (Society for Human Resource Management Cost of Healthcare Benchmarking Study, 2009), empirical evidence that WFC relates to increased blood pressure and to heart rate could be used as a lever by practitioners and policy implementers to underscore the importance of organizational initiatives aimed at reducing WFC, such as flexible work arrangements or dependent care programs (Grzywacz & Tucker, 2008).

**WFC, Blood Pressure, and Heart Rate**

Before delving into the theoretical rationale for the link between WFC, blood pressure and heart rate, a more detailed explanation of these physiological functions is merited. Generally speaking, blood pressure is a measure of the force of blood against the walls of the arteries. It is assessed via two measurements—systolic and diastolic pressure. Systolic blood pressure indicates the pressure in the arteries as the heart is contracting, whereas diastolic blood pressure measures the pressure in the arteries as the heart is resting and refilling with blood in between heartbeats. Both use millimeters of mercury (mmHg) as the unit of measurement. Heart rate represents the number of times the heart beats per minute (American Heart Association, 2012).

Basic stress theories, which suggest that stressors lead to strain reactions, provide a lens through which the relationship between WFC and blood pressure and heart rate can be understood (e.g., Cox, 1978). On experiencing a stressor, the body undergoes numerous physiological changes that are aimed at activating necessary attentional resources and/or inhibiting irrelevant functions with the ultimate goal of dealing with the stressor. Specifically, in reaction to a stressor, the sympathetic–adrenal–medullary system activates the hypothalamus, which, in turn, incites the release of epinephrine and norepinephrine, the hormones responsible for the “fight-or-flight” response. With the release of these hormones come other physiological changes, including an increase in heart rate and a narrowing of blood flow, which ultimately results in increased blood pressure (Adam, 2005; Cox & Cox, 1985; Johnson, Kamarlis, Chrousos, & Gold, 1992; Mayo Clinic, 2012). As a psychosocial stressor, the discrete experience of WFC should incite the aforementioned stress process (Eckenrode & Gore, 1990), resulting in a subsequent increase in heart rate and blood pressure. Furthermore, affective events theory (Weiss & Cropanzano, 1996) also provides a useful framework for understanding why episodic WFC and cardiovascular indicators should relate. The theory argues that work-related events (labeled hassles and uplifts) provoke emotional reactions in individuals, which in turn have a direct influence on attitudes and behaviors. WFC episodes may be considered a type of hassle, and although affective events theory only explicitly focuses on emotional reactions, it is reasonable to expect that physiological reactions also accompany emotional reactions (e.g., Ashton-James & Ashkanasy, 2008; Tooby & Cosmides, 2008).

The aforementioned theoretical rationale for the WFC–cardiovascular indicator link focuses on overall WFC and does not differentiate between WIF and FIW as unique stressors. However, previous research based on conceptualization of WFC as a chronic stressor does suggest that the two directions of conflict are distinct constructs with different patterns of correlates (Byron, 2005; Mesmer-Magnus & Viswesvaran, 2005). These patterns of correlates generally operate in a domain-specific manner (Frone, Russell, & Cooper, 1992), such that the strongest predictors tend to reside in the domain causing the interference, and the most robust consequences of the conflict tend to be experienced in the domain that is the object of interference. Said otherwise, work (family) demands tend to cause WIF (FIW), and effects of WIF (FIW) tend to be felt in the family (work) domain. Notably absent from the model are predictions about patterns of relationships between directional WFC and non–domain-specific outcomes, such as physical health.

A few theoretical models explicitly incorporate WIF, FIW, and physical health (e.g., Grandey & Cropanzano, 1999; Greenhaus et al., 2006). These models argue that FIW and WIF each influence other variables (i.e., negative emotions, work and family distress) that in turn influence physical health. Thus, there is no clear rationale within these models for a differential influence of WIF and FIW on physical health. From an empirical standpoint, Amstad, Meier, Fasel, Elfering, and Semmer (2011) meta-analytically estimated the relationships between WIF/FIW and health problems and somatic/physical symptoms. The confidence intervals for the correlations between WIF and health problems and FIW and health problems overlapped ($r_s = .24$ and $.28$, respectively), suggesting no reliable difference in effect size. On the other hand, the relationship between WIF and somatic/physical symptoms was larger than that of FIW with nonoverlapping confidence intervals ($r_s = .29$ and $.14$, respectively). It is important to note that it is unclear how health symptoms and somatic/physical symptoms were operationalized for the meta-analysis. Lastly, the one known extant study examining both directions of conflict and a cardiovascular indicator (Frone et al., 1997) found results contrary to those of Amstad et al., as only FIW significantly related to hypertension.

Taken together, although there is clear theoretical evidence to suggest a link between experiences of WFC and blood pressure and heart rate, there is less rationale to suggest that the direction of conflict is meaningful. As such, we examined the relationship between the direction of WFC and blood pressure and heart rate in an exploratory manner.
Hypothesis 1: The experience of discrete episodes of WFC relates to subsequent increases in (a) systolic blood pressure, (b) diastolic blood pressure, and (c) heart rate.

Research Question 1: Is the strength of the relationship between discrete episodes of WFC and subsequent increases in (a) systolic blood pressure, (b) diastolic blood pressure, and (c) heart rate dependent on the direction of conflict (WIF or FIW)?

Moderating Role of Work and Family Social Support

Social support, defined broadly as the receipt of psychological and material resources from valued others within one’s social network (Cohen & Wills, 1985; Etzion, 1984), plays an important role in the stressor–strain process. Social support has both protective and recovery functions in the stressor–strain process (e.g., Cohen & Wills, 1985; House, 1981; McCubbin, McCubbin, Thompson, Han, & Allen, 1997). As an antecedent, social support can serve an instrumental function in alleviating actual experiences of stress as well as an appraisal function in increasing the threshold of stress perceptions (Cohen & Wills, 1985; Harber, Einev-Cohen, & Lang, 2008; Hobfoll, 1989; Pearlin, Lieberman, Menaghan, & Mullan, 1981). Social support also plays a moderating role in the process of stress recovery. Individuals with more supportive networks may be less likely to appraise a stressor as threatening, or when an event is deemed a stressor, they may be more able to effectively cope with it so that the negative physiological and psychological consequences on the body are tempered (Cohen & Wills, 1985; House, 1981).

In the chronic WFC context, both perspectives have received some support, although there seems to be a greater focus on the antecedent model (cf., Seiger & Wiese, 2009). Despite this, we focused on the moderating role of social support in the stressor–strain link in the present investigation. This choice was determined by both our focus on the reactionary process after a WFC is experienced and the differing methodology of our study from most past research. Specifically, researchers have found that the meaning and role of social support may be different in instances of specific stress events versus chronic life events (e.g., Quitter, Glueckaufl, & Jackson, 1990). This may in part be explained by the fact that the relationship role of social support in the stress process is dynamic (Lepore, Evans, & Schneider, 1991) and that those who are chronically stressed may actually drive away social support (Lepore et al., 1990; Nolen-Hoeksema & Davis, 1999). Both of these factors would make it difficult to reliably detect buffering relationships when assessing stress in a chronic manner. Therefore, based on our interest in the present investigation and our adoption of an episodic versus chronic approach to WFC, we focused solely on social support as a buffer of the WFC–cardiovascular indicator link while acknowledging that it may play an important predictive role as well.

As noted above, some researchers have previously examined how various forms of social support moderate the relationship between WFC and health-related strain outcomes. With regard to psychological health, evidence consistent with the buffering effect has been found for support in the forms of emotional support from colleagues toward work issues (Lawrence, Gardner, & Callan, 2007) and general support from colleagues and family (O’Driscoll, Brough, & Kalliath, 2004). With regard to physical health, O’Driscoll et al. (2004) reported that family support buffered the relationships between FIW and self-reported physical health symptoms, but no significant effects were detected with WIF. Frone, Russell, and Cooper (1991) cited null results when testing the interaction of global WFC and general social support on somatic symptoms. Finally, in an experience sampling study, Wang, Liu, Zhan, and Shi (2010) found that both family and coworker support buffered the relationship between daily experiences of WIF and alcohol use. Thus, although no known studies have examined support in relation to a physiological indicator of health, there is some previous evidence that it does act as a buffer in the relationship between WFC and other health-related variables.

A noteworthy consistency across the aforementioned studies is that, with one exception (Lawrence et al., 2007), they focused on support in general, as opposed to support toward a specific domain or activity. In their theory of optimal matching, Cutrona and Russell (1990) highlighted the significance of matching the specific type of social support under investigation to the nature of the stressor. To this end, it seemed appropriate to examine social support in the form of cross-domain support when considering WIF and FIW as the stressors. Specifically, WIF results in an intrusion on the family domain, which may cause suffering for not only the individual experiencing WIF but also for family members. Consistent with the buffering hypothesis, when an individual feels that his or her family is generally supportive of the work domain (a construct known as work-supportive family; King, Mattimore, King, & Adams, 1995), (s)he is likely to experience a diminished psychological and physiological reaction to the WIF situation. On the other hand, we should expect the opposite pattern to be most relevant for FIW. In this case, the work domain is intruded on, and the extent to which one’s supervisor is generally supportive of family (a construct known as family-supportive supervision; Hammer, Kossek, Yragui, Bodner, & Hanson, 2009) should serve as a powerful buffer against the negative effects of FIW.

Combining the buffering hypothesis and theory of optimal matching, we examined social support from the work domain (family-supportive supervision) and from the family domain (work-supportive family) as cross-level moderators of the WFC–blood pressure and heart rate links.

Hypothesis 2: Family-supportive supervision moderates the relationship between episodes of FIW and subsequent (a) systolic blood pressure, (b) diastolic blood pressure, and (c) heart rate, such that the positive relationship is weaker for those with greater family-supportive supervision than for those with less family-supportive supervision.

Hypothesis 3: Work-supportive family moderates the relationship between episodes of WIF and subsequent (a) systolic blood pressure, (b) diastolic blood pressure, and (c) heart rate, such that the positive relationship is weaker for those with greater work-supportive families than for those with less work-supportive families.

Method

Participants

Participants were recruited through a variety of methods, including university listserves, a working women’s networking group,
and community postings (e.g., restaurants, parks, grocery stores, health fairs). The study was advertised as the “Work, Family, and Health Study” and listed requirements of eligible participants. Recruitment documents also included the study’s Website, which provided detailed information about the study procedures. Given this recruiting methodology, a true response rate is impossible to calculate. However, some indication of response rate can be given, as participants expressing interest in the study were initially asked to fill out a short recruitment survey. Of the 126 people who completed the survey, 82 (65%) were eligible and 58 (46% of total; 71% of eligible) participated in the study.

To be eligible, a participant had to work in paid employment at least 32 hr/week and be married or living with a partner for at least 1 year who was also employed at least 15 hr/week. As is common in the work–family literature, these criteria were selected in an effort to ensure that participants had responsibilities within both the work and family domains. In addition, because of the adverse health effects associated with night-shift work (Scheer, Hilton, Mantzoros, & Shea, 2009) and misalignment with the diurnal cycle associated with the timing of the blood pressure data collection, individuals who worked a night shift (i.e., 12 a.m. to 6 a.m.) were not eligible.

The majority of participants were female (89.7%), White/Caucasian (72.6% White/Caucasian, 8.6% African American/Black, 8.6% Hispanic or Latino, 8.6% Asian/Pacific Islander), had at least bachelor’s degree (65.5%), and had at least one child living primarily with them (56.9%). Participant mean age was 37.5 years, mean work hours were 41.5 hr/week, and mean household income was $70,000–79,999. Participants worked a wide variety of occupations, including police officer, computer programmer, registered nurse, administrative assistant, research advisor, and company president.

Procedure

Participants who met the screening criteria and consented to participate were invited to a 1-hr training session during which the researchers discussed the data collection procedures in detail, defined WFC, gave examples of relevant episodes, and taught the participants how to use the study instruments, including the heart monitor and the online survey.

The study lasted 10 days and began on the Monday following the training session and concluded on Wednesday of the next week. Weekend days were included in data collection. For each of the 10 days, participants were asked to record their blood pressure and heart rate using the OMRON HEM-673 wristwatch monitor four times per day: first thing in the morning once out of bed, immediately preceding lunch, immediately on arriving home from work, and immediately preceding bedtime. On nonwork days, participants were instructed to conduct the measurement at the time they typically arrived home from work. Finally, before going to bed each evening and after the final blood pressure and heart rate readings, participants completed an online survey. In this survey, they entered the day’s four blood pressure and heart rate readings as well as information about any WFC episodes (detailed below).

If a participant failed to complete a survey during any night of the study, the researchers e-mailed him/her the following morning and asked him/her to fill the survey out at that time. Participants were highly compliant, with only seven instances of missing data (nothing reported for that day) and 29 instances of late (morning after) data across the 10 time points for all 58 participants. The late data were included in analyses. After study completion, participants were compensated $60 in gift cards to a local grocery store. A $10 bonus gift card was given for perfect compliance (i.e., completing all blood pressure readings on time, filling out the survey on time each night).

In between the initial training session and the start of the study, participants filled out a one-time baseline survey online that assessed demographic and control variables, family-supportive supervision, and work-supportive family.

Measures

**Episodic WFC information.** Participants were first asked whether they experienced any WFC that day: “Work–family conflict occurs when work and family produce competing demands. Did you experience work–family conflict today?” Those answering “yes” were then asked how many unique episodes occurred that day. For each WFC episode, participants were prompted to answer the following questions: “Please describe the work–family conflict situation. Be as detailed as possible”, “How was it eventually resolved (i.e., did you choose the work activity, the family activity, or were you able to do both?)?”, “What time did the WFC occur?” This information was collected via the online survey each night of the 10 study days. In total, 167 distinct episodes of WFC were reported.

**Family-supportive supervision.** Family-supportive supervision was measured on the prestudy baseline survey. We used five items from Bond, Galinsky, and Swanberg’s (1998) scale that was subsequently adapted by Behson (2005) and Greenhaus, Ziegert, and Allen (2012). An example item is “My supervisor accommodates me when I have family or personal business to take care of—for example, medical appointments, meeting with child’s teacher, and so forth.” Responses were set on a 5-point Likert scale that ranged from strongly disagree to strongly agree. Cronbach’s alpha in the present study was .88.

**Work-supportive family.** Family support for work was measured with eight items from the King et al. (1995) Family Support Inventory for Workers. Four items were from the Emotional Support subscale (e.g., “When I’m frustrated by my work, someone in my family tries to understand”) and four items were from the Instrumental Assistance subscale (e.g., “If my job gets very demanding, someone in my family will take on extra household responsibilities”). Responses were set on a 5-point Likert scale that ranged from strongly disagree to strongly agree. Internal consistency reliability was adequate (α = .84).

**Control variables.** These variables were included so that the incremental variance of daily episodes of WFC on subsequent blood pressure and heart rate could be assessed over and above other meaningful variables. All the included control variables have been linked to WFC and/or cardiovascular outcomes in previous research (chronic WFC: e.g., Frone et al., 1997; job demands: e.g., Bishop et al., 2003; Michel et al., 2011; dietary behaviors, substance use, body mass index, exercise frequency: e.g., Centers for Disease Control and Prevention, 2011; gender: e.g., Byron, 2005; Oparil & Miller, 2005; income: e.g., Byron, 2005; Leigh & Du, 2012; number of children: e.g., Byron, 2005; age: e.g., Centers for
Disease Control and Prevention, 2011). Composites of multi-item scales were created using averages unless otherwise noted.

**Chronic WIF and FIW conflict.** These constructs were assessed with five items each from the Netemeyer et al. (1996) scale. Example items are “My work keeps me from enjoying my family activities more than I would like” and “Due to stress at home, I am often preoccupied with family matters at work.” Responses were set on a 5-point Likert scale that ranged from never to very often.

**Job demands.** We assessed how demanding participants perceived their jobs to be using Spector and Jex’s (1998) Quantitative Workload Inventory. Example items include “How often does your job require you to work very hard?” and “How often does your job leave you with little time to get things done?” Response options were set on a 5-point Likert scale that ranged from less than once per month or never to several times per day. Participants were asked to consider the past 6 months when answering the question.

**Dietary behaviors.** Numerous measures were collected to assess the participants’ general health and health behaviors. These were selected based on their relationship to cardiovascular disease (American Heart Association, 2012). Fatty food consumption consisted of 15 high-fat foods (e.g., fried chicken, doughnuts, french fries) taken from the measure developed by Caan, Coates, and Schaffer (1995). Healthy food consumption included 12 healthy food items (e.g., fruits, vegetables, fiber cereals) based on the 2003 Behavioral Risk Surveillance System State Questionnaire used by the Centers for Disease Control and Prevention. Participants were asked to indicate the frequency with which they have consumed these food items in the past 3 months. Response options were set on a Likert scale that ranged from never to five or more times per week. An average of the responses was used for both scales, with higher scores indicating more of each type of food consumed.

**Body mass index.** Body mass index was calculated based on participants’ height and weight, which were measured by the researchers using a stadiometer at the presurvey training session. Body mass index was calculated using the following formula: weight (in pounds/height in inches²) × 703 (National Institutes of Health, 2000).

**Substance use.** Participants were asked to report their average weekly consumption of caffeinated beverages, alcoholic beverages, and cigarettes. The frequency values for each were entered individually into analyses.

**Exercise frequency.** Exercise frequency was based on the Godin-Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985). Participants were asked, “Over the last six months, how many times per week on average do you do the following kinds of physical activity for more than 15 minutes during your free time?” Items included “strenuous exercise such as running, hockey, football, soccer, bicycling on hills, basketball, aerobics, sustained swimming, and cross country skiing or anything else that causes a large increase in breathing or heart rate”; “moderate exercise such as baseball, tennis, brisk walking, bicycling on level ground, lawn mowing, housework such as vacuuming, weight lifting, and volley-ball or anything else that causes a small increase in breathing or heart rate”; and “mild exercise such as archery, bowling, and golf or anything else that causes a minimal increase in breathing or heart rate.” Response options included all integers between 0 and 7 and more than 7. An overall exercise frequency score was computed by weighting the responses to the various items. Strenuous exercise frequency was multiplied by 3 (with a score of 8 given to more than 7), moderate exercise frequency was multiplied by 2, and mild exercise frequency was multiplied by 1 (i.e., not given extra weight). These values were summed to obtain a total exercise frequency score.

**Demographic variables.** Gender was measured via a single item that asked participants to indicate whether they were male or female (dummy coded 1 for male, 2 for female for analyses). Income was assessed by asking participants to indicate their household income. Responses were $10,000 increments of income from $10,000–19,999 to $100,000 or higher. Number of children was measured by asking participants to indicate the number of children who lived with them at least 50% of the time. Age was assessed by asking participants to report their age in years.

**Instrument**

Each participant was given an OMRON HEM-673 wristwatch monitor to measure blood pressure and heart rate throughout the study. The monitors are user-friendly and simply require raising the wrist toward the heart to complete a reading. They operate using a built-in sensor that determines the optimal height of the wrist in relation to the heart and provides guidance to the user to ensure positioning is optimal. Each reading takes approximately 30 s and the diastolic and systolic blood pressure, heart rate, and the time and date of the measurement are automatically displayed and stored. OMRON reports that the accuracy of the HEM-673 has been verified by the Association for the Advancement of Medical Instrumentation. In addition, these monitors have been used in previous research with a similar methodology (i.e., Ilies, Dimotakis, & Watson, 2010). Participants were trained to use the monitors during the presurvey training session. Troubleshooting information was given at this time. Participants were told that if their reading was outside of the normal range, defined by the American Heart Association as systolic pressure higher than 135 mmHg or lower than 90 mmHg or diastolic pressure higher than 85 mmHg or lower than 60 mmHg, to wait 2 min and take a second reading. This was to ensure accuracy of the reading. In all cases of double readings, the latter of the two readings was used for analyses. Participants were instructed that the presence of numerous high blood pressure readings posed a significant health risk and in such cases professional medical attention should be sought.

Participants were instructed to report their four daily blood pressure and heart rate readings and the time of each reading on the nightly online survey. This information was verified on return of the monitors as the participants were instructed not to delete any of the readings from the 10 study days. Participants were highly compliant taking the cardiovascular measurements; only 4% of the expected total readings were missing across all participants.

**Results**

**Preliminary Analyses**

Prior to hypothesis testing, we required additional coding of the data. Specifically, three coders (the first author and two research assistants blind to the study hypotheses) reviewed the qualitative WFC information to ensure that the reported information fit with the study’s definition of WFC (“when work and family produce
A few representative WFC descriptions include “My son took his new iPod to school and it was taken away from him. He is 15 and knew better and I wanted to go to the school but could not due to issues at work”; “Daughter was sick all weekend, so one of us had to work from home today. I volunteered since I didn’t have any scheduled meetings”; and “My parents are in town for the week. My husband sent me a text message to find out what we were going to do about dinner tonight, as well as potential plans to get together with his parents either tonight or tomorrow. I had to stop working and respond to the text, letting him know dinner plans as well as finding a solution for plans with his parents and my parents tomorrow.”

Twenty-three episodes were eliminated from further analyses because they did not fit the definition of WFC. Most of the invalid situations involved work interference with personal activities (e.g., exercise, personal doctor appointment) instead of with family. This resulted in 144 valid episodes of WFC. Furthermore, to analyze hypotheses based on direction of conflict (WIF or FIW), coders classified each instance of conflict as one of the two directions. Coding was based on the definition of WIF as “an instance when participation in a work activity interferes with participation in a competing family activity or when work stress has a negative effect on behavior within the work domain” (Greenhaus & Powell, 2003, p. 291). The same definition was used for FIW with work and family reversed. This resulted in 69 episodes coded as WIF and 67 coded as FIW. There were eight instances in which the direction of conflict was deemed undeterminable from the description, and these were removed from analyses involving WIF and FIW, resulting in n = 136. Agreement between coders was high: intraclass correlation (ICC)(2, 3) = .89. Any discrepancies were resolved through discussion.

In addition, some reformating of the data was necessary prior to hypothesis testing. In the Level 1 data file, each day was broken into four time points, representing each of the four cardiovascular measurements. A new variable was created for each of these time points titled “WFC preceded.” A value of zero was entered if participants did not indicate experiencing a WFC episode before the preceding cardiovascular measurement and after the preceding cardiovascular measurement. A value of one was entered if they reported experiencing WFC in that time period. Information about whether or not the WFC had occurred was obtained from the nightly survey on which the participants reported on the exact timing of the day’s WFC episodes. As an example, if a participant reported experiencing one WFC episode at 6:00 p.m. on Day 3 and measured her blood pressure at 8:00 a.m. (Reading 1), 12:30 p.m. (Reading 2), 5:30 p.m. (Reading 3), and 10:00 p.m. (Reading 4), the WFC preceded variable would have a value of zero for Reading 1, Reading 2, and Reading 4, and it would have a value of one for Reading 3.

Analyses

Given the hierarchical nature of the data, with cardiovascular measurements (Level 1 variable) nested within days (Level 2 variable) nested within individuals (Level 3 variable), we tested hypotheses using multilevel modeling analyses. Multilevel modeling produces more accurate standard error estimates than ordinary least squares regression as it takes into account potential dependency among data points (Raudenbush & Bryk, 2002). In running the three-level model, we observed that the Level 2 variance estimates for all three cardiovascular indicators were very small. ICCs calculated for the Level 2 variance produced very small values: .019, .001, and .001 for systolic blood pressure, diastolic blood pressure, and heart rate respectively. Thus, because there was little evidence for variability at Level 2, to preserve power, we dropped the day level from the model. Instead, a two-level model was estimated with the four daily blood pressure measurement points as the Level 1 variable and individuals as the Level 2 variables. The ICCs for the two-level model were .2149 for systolic blood pressure, .4205 for diastolic blood pressure, and .3074 for heart rate. Analyses were based on 2,219 systolic blood pressure, diastolic blood pressure, and heart rate measurements nested across 58 participants.

All variables were standardized before analyses for ease of interpretation of coefficients. Level 1 variables were group centered and Level 2 variables were grand centered for all multilevel analyses. Hypothesis 1 was tested by entering the occurrence of WFC (nondirectional) as a predictor of each dependent variable (systolic and diastolic blood pressure and heart rate). Research Question 1 was tested by entering WIF and FIW as separate predictors of each dependent variable. Interaction terms were tested by entering the Level 2 support variables as moderators and testing the significance of the cross-level interaction. In addition, simple slope tests were used to assess the significance of slopes at high and low values of the moderator (Preacher, Curran, & Bauer, 2006).

Hypothesis Testing

Descriptive statistics and intercorrelations of the study variables are presented in Tables 1 and 2. It is important to note that the correlations between Level 1 variables do not account for the nested structure of the data and should therefore be interpreted with caution (Raudenbush & Bryk, 2002). The results of Hypothesis 1 and Research Question 1 are presented in Table 3.

Hypothesis 1 proposed that discrete episodes of WFC would relate to subsequent increases in the cardiovascular indicators. The hypothesis was not supported for systolic blood pressure (γ = .02, p > .05) or diastolic blood pressure (γ = .00, p > .05), but it was supported for heart rate (γ = .04, p < .05). Consistent with Hypothesis 1 results, neither WIF nor FIW was a significant predictor of systolic (γ = .01, p > .05, for both WIF and FIW) or diastolic blood pressure (γ = -.01, p > .05, for WIF; γ = .00, p > .05, for FIW). However, when WIF and FIW were tested as separate predictors of heart rate, FIW, but not WIF, was a significant and positive predictor (FIW, γ = .05, p < .05; WIF, γ = .02, p > .05).

The results for Hypotheses 2 and 3 are presented in Table 4. Hypothesis 2 proposed that family-supportive supervision would moderate the relationship between FIW episodes and blood pressure. A significant moderator effect was detected for systolic and diastolic blood pressure (γ = -.03, p < .0001; γ = -.05, p < .01, respectively). In both cases, the simple slope of those low (1 standard deviation below the mean) in family-supportive supervision was significant and positive (γ = .04, p < .05, for systolic; γ = .06, p < .05, for diastolic), whereas the simple slope for those high (1 standard deviation above the mean) in family-supportive supervision was not significant (γ = -.01, p > .05, for systolic;...
Descriptive Statistics and Intercorrelations Among Level 2 Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic WIF</td>
<td>2.73 (0.72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Chronic FIW</td>
<td>2.12 (0.70)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Food consumption</td>
<td>3.41 (0.62)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Healthy food consumption</td>
<td>7.65 (3.79)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Caffeine consumption</td>
<td>.29 (0.73)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cigarettes consumption</td>
<td>8.81 (37.5)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>BMI</td>
<td>27.83 (6.69)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Exercise</td>
<td>17.19 (8.36)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of children</td>
<td>0.79 (0.83)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>37.48 (11.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSS</td>
<td>3.73 (0.86)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Note. work interference with family; FIW
family interference with work; BMI
body mass index; FSS
family–supportive supervision; WSF
work–supportive family; WFC
work–family conflict; WIF
work–interference with family

The pattern of results brings up numerous interesting points. With regard to heart rate, the positive link between WFC episodes and subsequent heart rate highlights the importance of assessing this physiological health outcome, which, to our knowledge, has not been examined in previous WFC research. The effects of elevated heart rate over time are serious, as they may cause damage to the heart muscle or increase vulnerability to disorders of cardiac rhythm (National Institutes of Health, 2012). In addition, elevated heart rate is an independent risk factor for hypertension, coronary heart disease, and general mortality (Dyer et al., 1980; Kannel, Kannel, Paffenbarger, & Cupples, 1987). An important question that emerges from these findings is why there are inconsistencies across the heart rate and blood pressure results, given that these are both physiological reactions involved in the same stress process system. Such inconsistencies are not unique to this investigation, as numerous previous studies involving workplace stressors and social support in relation to blood pressure and heart rate have reported unique results across the two cardiovascular measures (e.g., Brondolo et al., 2003; Evans & Steptoe, 2001; Karlin, Brondolo, & Schwartz, 2003; Rau, Georgiades, Fredrikson, Lemne, & de Faire, 2001; Undén, Orth-Gomer, & Elofsson, 1991).

Moreover, we examined the direction of the WFC episode in relation to blood pressure and heart rate in an exploratory manner because of a lack of clear theoretical or empirical rationale to make a specific prediction. The results suggested that FIW is more strongly related to heart rate than is WIF. Speculatively, this could be a function of the fact that in general partners within the family domain tend to be more flexible and forgiving than partners within the work domain (Gatek, Searle, & Klepa, 1991). For example, specific instances of FIW are more likely to have an extreme outcome (i.e., employment termination) than are specific instances...
of WIF (i.e., divorce). As such, it is possible that FIW is perceived as more threatening than WIF and this manifests itself in heart rate changes. Although perceptions of the supportiveness of one’s supervisor can alter the effects of FIW on blood pressure, the relationship between WIF and cardiovascular indicators does not appear to be impacted by perceptions of the supportiveness of one’s family. The logic stated above may be applicable to the moderating role of support as well. If the family role partners are more forgiving than work role partners, individuals may view WIF as a relatively nonthreatening stressor, regardless of how supportive family members are. On the other hand, with the eminent threat associated with FIW as experienced on an episodic basis. Our results suggest that discrete episodes of WFC, namely FIW, are

Implications

Overall, the results of the study have theoretical and practical implications. From a theoretical perspective, our results highlight the need for deepening and broadening the development of theory associated with WFC as experienced on an episodic basis. Our results suggest that discrete episodes of WFC, namely FIW, are

Table 2
Descriptive Statistics and Intercorrelations Among Level 1 Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Episodic WFC</td>
<td>0.05</td>
<td>0.22</td>
<td>.71**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Episodic WIF</td>
<td>0.03</td>
<td>0.16</td>
<td>.03</td>
<td>.66**</td>
<td>.01</td>
<td>.02</td>
<td>.59**</td>
</tr>
<tr>
<td>3. Episodic FIW</td>
<td>0.02</td>
<td>0.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Systolic blood pressure (mmHg)</td>
<td>117.48</td>
<td>12.43</td>
<td>.01</td>
<td>.02</td>
<td>.02</td>
<td>.01</td>
<td>.02</td>
</tr>
<tr>
<td>5. Diastolic blood pressure (mmHg)</td>
<td>76.18</td>
<td>12.43</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Heart rate (bpm)</td>
<td>79.52</td>
<td>13.53</td>
<td>.05</td>
<td>.01</td>
<td>.07**</td>
<td>.20**</td>
<td>.03</td>
</tr>
</tbody>
</table>

Note. WFC = work-family conflict; WIF = work interference with family; FIW = family interference with work; bpm = beats per minute. WFC/WIF/FIW coded such that 1 = WFC/WIF/FIW episode occurred, 0 = no episode occurred.

*p < .05.  **p < .01.

Table 3
Multilevel Regression Analyses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Systolic blood pressure</th>
<th>Diastolic blood pressure</th>
<th>Heart rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic WIF</td>
<td>-13 (.08)</td>
<td>-0.8 (.08)</td>
<td>.08 (.08)</td>
</tr>
<tr>
<td>Chronic FIW</td>
<td>.27** (.10)</td>
<td>.26 (.08)</td>
<td>.13 (.09)</td>
</tr>
<tr>
<td>Job demands</td>
<td>-1.17 (.09)</td>
<td>-1.15 (.08)</td>
<td>-1.10 (.08)</td>
</tr>
<tr>
<td>Fatty food consumption</td>
<td>.14 (.09)</td>
<td>.16 (.08)</td>
<td>.07 (.07)</td>
</tr>
<tr>
<td>Healthy food consumption</td>
<td>.01 (.09)</td>
<td>-.01 (.08)</td>
<td>.03 (.08)</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>-.10 (.12)</td>
<td>-.05 (.11)</td>
<td>.00 (.11)</td>
</tr>
<tr>
<td>Caffeine consumption</td>
<td>-.03 (.11)</td>
<td>-.01 (.10)</td>
<td>.03 (.10)</td>
</tr>
<tr>
<td>Cigarette consumption</td>
<td>.37*** (.09)</td>
<td>.18 (.03)</td>
<td>.10 (.08)</td>
</tr>
<tr>
<td>BMI</td>
<td>.46*** (.08)</td>
<td>.34*** (.07)</td>
<td>.24*** (.07)</td>
</tr>
<tr>
<td>Exercise</td>
<td>.12 (.08)</td>
<td>.04 (.07)</td>
<td>-.09 (.07)</td>
</tr>
<tr>
<td>Gender</td>
<td>-.20 (.11)</td>
<td>-.18 (.10)</td>
<td>-.17 (.10)</td>
</tr>
<tr>
<td>Income</td>
<td>-.17 (.08)</td>
<td>-.05 (.07)</td>
<td>.13 (.08)</td>
</tr>
<tr>
<td>No. of children</td>
<td>-.15 (.08)</td>
<td>-.12 (.07)</td>
<td>-.02 (.07)</td>
</tr>
<tr>
<td>Age</td>
<td>.42*** (.10)</td>
<td>.25 (.09)</td>
<td>-.06 (.09)</td>
</tr>
<tr>
<td>Predictors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WFC occurrence</td>
<td>.02 (.01)</td>
<td>.00 (.02)</td>
<td>.04* (.02)</td>
</tr>
<tr>
<td>df (Level 1, Level 2)</td>
<td>2261, 43</td>
<td>2261, 43</td>
<td>2261, 43</td>
</tr>
<tr>
<td>Level 2 variance</td>
<td>.25***</td>
<td>.20***</td>
<td>.19***</td>
</tr>
<tr>
<td>Level 1 pseudo-$R^2$ with controls only</td>
<td>.513</td>
<td>.221</td>
<td>.122</td>
</tr>
<tr>
<td>Full Model Level 1 pseudo-$R^2$</td>
<td>.513</td>
<td>.221</td>
<td>.124</td>
</tr>
<tr>
<td>WIF</td>
<td>.01 (.01)</td>
<td>-.01 (.01)</td>
<td>.02 (.02)</td>
</tr>
<tr>
<td>FIW</td>
<td>.01 (.01)</td>
<td>.00 (.02)</td>
<td>.05** (.02)</td>
</tr>
<tr>
<td>df (Level 1, Level 2)</td>
<td>2260, 43</td>
<td>2260, 43</td>
<td>2260, 43</td>
</tr>
<tr>
<td>Level 2 variance</td>
<td>.25***</td>
<td>.20***</td>
<td>.19***</td>
</tr>
<tr>
<td>Level 1 pseudo-$R^2$ with controls only</td>
<td>.513</td>
<td>.221</td>
<td>.122</td>
</tr>
<tr>
<td>Full Model Level 1 pseudo-$R^2$</td>
<td>.513</td>
<td>.221</td>
<td>.124</td>
</tr>
</tbody>
</table>

Note. WIF = work interference with family; FIW = family interference with work; BMI = body mass index; WFC = work-family conflict. The coefficients represent standardized betas. Standard errors are within parentheses. Pseudo-$R^2$ was calculated using the formula provided by Snijders and Bosker (1999).

*p < .05.  **p < .01.  ***p < .001.
associated with proximal physiological change after controlling for chronic levels of WFC. This is consistent with recent work demonstrating that the negative consequences of WFC can readily manifest and change quickly (Wang et al., 2010). The bulk of previous research has assessed WFC as a generalized and fairly consistent state (Kreiner, Hollensbe, & Sheep, 2009). As noted by previous research has assessed WFC as a generalized and fairly consistent state (Kreiner, Hollensbe, & Sheep, 2009). As noted by Kreiner et al. (2009), affective events theory has been particularly useful in underscoring the importance of distinguishing specific events from generalized states. Continued application of the affective events theory could be useful in developing a more comprehensive understanding of how daily episodes of WFC unfold and inform individual generalized reports of WFC as well as how both of these specific events as well as generalized states relate to short-term and long-term health.

In terms of practice, our results indicating that supportive supervisors have a protective benefit in terms buffering the negative physiological impact of FIW on employees further underscores the powerful role family supportive supervisors play in alleviating the strain associated with FIW. This finding has important practical implications in that recent research suggests that supervisors can be trained to become more family supportive, and this training is associated with improved employee physical health (Hammer, Kossek, Anger, Bodner, & Zimmerman, 2011). In addition, the results showing a main effect for WFC episodes and heart rate, not moderated by family-supportive supervision, suggest that alternative processes also need to be considered to fully mitigate physiological reactions to WFC episodes. One such alternative approach may be providing employees with the tools to recognize and control variability in heart rate function through mindfulness-based practice training. Research has shown that mindful attention to the variability in one’s heart rate can result in more regulatory control variability in heart rate function through mindfulness-based practice training. Research has shown that mindful attention to the variability in one’s heart rate can result in more regulatory heart rate control (Delizonna, Williams, & Langer, 2009). Moreover, recent research shows that dispositional mindfulness is associated with work–family balance (Allen & Kiburz, 2012). Thus, a two-pronged supervisor-based and individual-based approach to training may be especially beneficial.

Limitations and Future Research Ideas

Despite the strength of the current study, there are a few limitations worth noting. First, the measures of WFC were not taken at the exact moment that they occurred. By collecting information about the WFC episode within a short timeframe after it occurred (i.e., that day) and instructing participants that it was imperative for them to recall the exact timing of incidents, we hoped to reduce the potential for memory problems or bias in recall. Although this short-term time lag does reduce recall biases, we cannot say with certainty that all recall biases were eliminated. Second, the sample

---

**Table 4**

**Moderator Analyses**

<table>
<thead>
<tr>
<th>Variable</th>
<th>WIF and work-supportive family</th>
<th></th>
<th></th>
<th>WIF and family-supportive supervisor</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Systolic blood pressure</td>
<td>Diastolic blood pressure</td>
<td>Heart rate</td>
<td>Systolic blood pressure</td>
<td>Diastolic blood pressure</td>
<td>Heart rate</td>
</tr>
<tr>
<td>Predictor</td>
<td>.01 (.01)</td>
<td>−.01 (.02)</td>
<td>.02 (.02)</td>
<td>.01 (.01)</td>
<td>.01 (.02)</td>
<td>.04</td>
</tr>
<tr>
<td>Moderator</td>
<td>.08 (.08)</td>
<td>.20 (.06)</td>
<td>.17 (.07)</td>
<td>.07 (.07)</td>
<td>.12 (.07)</td>
<td>.13 (.06)</td>
</tr>
<tr>
<td>Interaction</td>
<td>.00 (.01)</td>
<td>.00 (.02)</td>
<td>.01 (.02)</td>
<td>−.03*** (.01)</td>
<td>−.05** (.02)</td>
<td>.03 (.02)</td>
</tr>
<tr>
<td>d(f) (Level 1, Level 2)</td>
<td>2260, 42</td>
<td>2260, 42</td>
<td>2260, 42</td>
<td>2260, 42</td>
<td>2260, 42</td>
<td>2260, 42</td>
</tr>
<tr>
<td>Level 2 variance</td>
<td>.25***</td>
<td>.17***</td>
<td>.17***</td>
<td>.25***</td>
<td>.19***</td>
<td>.18***</td>
</tr>
<tr>
<td>Full model Level 1 pseudo-(R^2)</td>
<td>.51</td>
<td>.26</td>
<td>.15</td>
<td>.51</td>
<td>.23</td>
<td>.14</td>
</tr>
</tbody>
</table>

**Note.** WIF = work interference with family; FIW = family interference with work. The coefficients represent standardized betas. Standard errors are within parentheses. Pseudo-\(R^2\) was calculated using the formula provided by Snijders and Bosker (1999). Models were estimated with all control variables. Coefficients of individual control variables are not reported for space-saving purposes but are available on request.

\(p < .05. \quad ** p < .01. \quad *** p < .001.\)

---

**Figure 1.** Effect of interaction between family interference with work (FIW) and family-supportive supervision (FSS) on systolic blood pressure.

**Figure 2.** Effect of interaction between family interference with work (FIW) and family-supportive supervision (FSS) on diastolic blood pressure.
was composed primarily of women, and it is unclear the extent to which the results are generalizable. This is important in that at least in one study (Frankenhaeuser, Lundberg, Frederikson, & Melin, 1989) gender differences were reported in patterns of blood pressure, such that women’s blood pressure stayed high at the end of the work day, whereas men’s decreased sharply. As such, additional research is needed that includes a greater proportion of men in the sample so that gender can be examined as a moderator.

Finally, research suggests that there are various types of WFC, including time-based, strain-based, behavior-based, energy-based, and emotion-based (Greenhaus et al., 2006; Greenhaus & Beutell, 1985; Wilson, 2009). In addition, work can conflict with other nonwork domains that do not involve family, such as leisure or exercise (Warren, 2004). Given the importance of recovery experiences (e.g., de Jonge, Spoor, Sommetag, Dormann, & van der Tooren, 2012) and physical activity to health outcomes, these forms of conflict are likely to also have relevance to blood pressure and heart rate. In this study, we used a definition of WFC (“a situation when work and family produce competing demands”) intended to elicit a broad range of episodes. An idea for future research is to explicitly ask about various types of work–nonwork conflict and assess whether they have a differential impact on indicators of cardiovascular well-being.

In addition to the aforementioned ideas for future research, we have a few other recommendations that we believe will advance this line of inquiry. In the present study, context was incorporated by examining the average level of support an individual perceives from his or her supervisor and family for the other domain. Although our results suggest that this broader support context does impact the stressor–strain process, it is likely that the immediate context surrounding each individual WFC episode plays an even greater role in the impact of that WFC episode on well-being. As an example, it would be interesting to examine the coping or resolution strategies that are invoked in each unique situation to determine which are more or less effective from a strain perspective. Other researchers (e.g., Butler, Grzywacz, Bass, & Linney, 2005; Judge, Ilies, & Scott, 2006) have suggested that the physical domain where one is located (i.e., work or home) when experiencing the WFC episode impacts the way the WFC is perceived; thus, inclusion of this variable may also provide some relevant context information.

Given the linkage demonstrated here between episodes of WFC and heart rate, future research on this topic is needed. An increase in heart rate can be the result of increased input from the sympathetic nervous system or the result of decreased parasympathetic nervous system input (Choi & Gutierrez-Osuna, 2009). In future studies, an examination of heart rate variability that involves the sweat glands is interesting to assess episodic WFC and emotions through physiological measures such as the electrical resistance of the skin, and is used to capture the autonomic nerve response of the sweat glands. Changes in the conductance are an indication that the individual is having an emotional reaction (Kreibig, 2010; Westerink, van der Broek, Schut, van Herk, & Tuinenbreiger, 2008). Such inquiry would give us a fuller picture of the physiological repercussions associated with discrete experiences of WFC.

Conclusion

Experiencing at least occasional conflicts between work and family demands is an inevitable byproduct of multiple role engagement. Answering both the call for research that investigates episodes of WFC (Maertz & Boyar, 2011) and the call for greater incorporation of objectively measured physiological health outcomes of WFC (Allen, 2012; van Steenburgen & Ellemers, 2009), the current study is the first to examine the relationship between WFC episodes and cardiovascular function indicators using an experience sampling approach. We established an empirical link between the two as well as identified family-supportive supervision as a moderator. We hope that the results of the current study pave the way for additional inquiry that will further our understanding of the immediate as well as long-term health impact of not only chronic states of WFC but also the impact of specific WFC episodes.

References


with a special emphasis on cross-domain versus matching-domain relations.


