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Los Angeles

Stress begets stress:

Three studies of the daily behavioral and affective mechanisms of spillover

A dissertation submitted in partial satisfaction

of the requirements for the degree

Doctor of Philosophy in Psychology

by

Meredith Stipek Sears

2015

ABSTRACT OF THE DISSERTATION

Stress begets stress:

Three studies of the daily behavioral and affective mechanisms of spillover

by

Meredith Stipek Sears

Doctor of Philosophy in Psychology

University of California, Los Angeles, 2015

Professor Rena L. Repetti, Chair

The studies that make up this dissertation adopt process-oriented approaches to examine the mechanisms by which daily stressors result in disruptions to interpersonal relationships. To do so, all three studies made use of daily diaries or momentary survey assessment techniques to measure changes in stressors, cognition, behavior and affect across multiple time points. Each study also examined individual- and couple-level factors that were hypothesized to affect recovery from stressful events. The first study examined the day-to-day effects of difficult, highly demanding days on marital behavior over the course of 56 days in a diverse sample of 47 couples. The behaviors measured were marital anger and two types of withdrawal: hostile withdrawal and reductions in affection and disclosure, or "retreat." A self-reported desire to withdraw from the family explained increases in marital anger, hostile withdrawal and retreat when participants experienced overload; negative mood, however, only explained increases in

marital anger and hostile withdrawal. Husbands' tendency to express anger or retreat on overloaded days was associated with poorer overall marital satisfaction. Using the same sample of 47 families, the second study examined the interaction between parents' daily conflicts with each other and with their children. Marital conflicts predicted increases in negative parenting behavior, and parent-child conflicts predicted increases in marital anger. Negative mood partially mediated the majority of these associations, suggesting that additional variables may exist that explain the transfer or "spillover" of conflict across family dyads. Conflict spillover was exacerbated by children's externalizing behavior and fathers' neuroticism. The third study tested the hypothesis that certain emotional and behavioral responses to stressors impact whether individuals will go on to generate new stressors—specifically, interpersonal difficulties—in a sample of 137 college students. By assessing stressor occurrence, mood and behavior four times a day for five days, this study found that strong negative emotional reactions to stressors increased the likelihood of interpersonal problems later that day. This was particularly true when individuals engaged in avoidance while experiencing severe distress. Individuals with poorer psychological functioning reported more interpersonal stressors overall, but were not more likely to generate interpersonal stressors immediately following stressful events.

The dissertation of Meredith Stipek Sears is approved.

Theodore F. Robles

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Rena L. Repetti, Committee Chair

University of California, Los Angeles

2015

DEDICATION

I am tremendously grateful to my advisor and dedicated mentor, Dr. Rena Repetti. I hope one

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ACKNOWLEDGMENTS

VITA

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Introduction

Individuals must constantly navigate frustrating interactions, onerous tasks, and anxiety-provoking demands. These stressful daily experiences may generate distress and attempts to cope with the situation that, far from resolving the problem, lead to new disruptions in the individual's life. One major class of stressors that can result from the emotional and behavioral changes triggered by stressful events is interpersonal problems. The three studies that make up this dissertation adopt process-oriented approaches to examine whether and how stressful daily events are associated with short-term increases in social stress. More specifically, the studies test changes in emotional distress, angry or avoidant behavior, and attempts to problem-solve or recuperate as mechanisms that may lead to increases in interpersonal discord and withdrawal when individuals experience daily stress.

Daily stressors are defined for the purposes of this study as day-to-day events that most people would view as problematic or challenging, differentiated from the adverse emotional reactions people experience to these events. For example, conflict with a spouse, poor performance at school or work, or having to rush to get somewhere are some of the daily stressors addressed in the following studies. There is enormous variation in how people respond to such stressors, how well they cope with feelings of stress, and how pervasively stressors in one context, such as work, affect other contexts, such as romantic relationships. Sometimes individuals seem to "contain" stress very effectively; they may be constitutionally less reactive, engage a coping mechanism more effectively, or regulate emotions and behavior well. In contrast, sometimes individuals experience more difficulty containing their responses to stressors; stressful experiences may continue to affect their mood and behavior long after the event has resolved. In these cases, individuals may be highly physiologically or emotionally

reactive, and may engage in less effective coping, and as a result either fail to resolve or even generate new problems of daily life. Factors exist at both the situation level and the individual level that might affect how well a person responds to a stressor. For example, a strong emotional reaction, regardless of an individual's overall pattern of responding, may exacerbate the effects of a stressful event. The effects of individual traits or patterns of functioning may also influence day-to-day affective and behavioral responses over and above features of the situation.

The tendency to carry the effects of stress from one context to another holds particular importance for interpersonal relationships and mental health. Individuals do not develop chronic difficulties with stress, negative affect, and interpersonal relationships in a vacuum: Processes that occur on a daily basis generate, over time, patterns that can be identified in more traditional cross-sectional methodologies. Researchers must attend to day-to-day processes to understand how these patterns develop. The three studies included in this dissertation apply daily diary and momentary assessment methodologies to examine the short-term effects of stressful experiences on emotional distress and interpersonal interactions.

The first study examines the daily effects of difficult, highly demanding days on couples' behavior in their marital relationship, and cognitive and affective mechanisms that may determine whether husbands and wives will withdraw socially or express anger towards their spouses. The second study focuses on family relationships by examining the interaction between parents' daily conflicts with each other and with their children. The third study identifies individual emotional and behavioral responses to stressors that are believed to affect whether individuals go on to generate new interpersonal stressors. Each of these three studies also examines individual-level factors that may affect recovery from stressful events, such as psychological functioning or personality traits.

Relationships plagued by daily stressors and emotional reactivity can benefit from process-level research that puts daily behavior under the microscope. Rather than making assertions about broad patterns of behavior, daily diary and momentary assessment techniques can identify the effects of specific emotional and behavioral responses to stress at a within-subjects level, and potentially identify more adaptive responses that help limit discord. These three studies aim to identify the mechanisms by which daily stressors produce avoidance and withdrawal, marital battles, or parenting difficulties—and examine the potential for coping behaviors to facilitate recovery.

STUDY 1

I just want to be left alone: Marital anger and withdrawal in response to overload

On a daily basis, husbands and wives are challenged to avoid letting demands on their time and energy negatively impact their marital interactions. The difficulty of this task is reflected in the robust evidence of spillover between stressful daily experiences and relationships at home. *Spillover* describes the process by which stressors in one domain, such as work or household chores, exert short-term influences on an individual's mood and behavior in another domain, such as by increasing angry interactions with family members (Repetti, 1987).

Resource theories suggest that we have finite reserves of the time and energy required to meet daily demands at home and at work, and that we experience stress when we feel that these resources are being depleted (Hobfoll, 2002). Feelings of being overloaded or that one's day has been very busy or fatiguing are associated with feelings of distress at home (Chan & Margolin, 1994; ten Brummelhuis, Haar, & van der Lippe, 2010; Williams & Alliger, 1994), and increases in negative marital interactions (Crouter, Bumpus, & Head, 2001; Crouter, Perry-Jenkins, Huston, & Crawford, 1989; Doumas, Margolin, & John, 2003; Schulz, Cowan, Pape Cowan, & Brennan, 2004; Story & Repetti, 2006).

Daily diary studies have identified two primary effects of overload on couples' social behavior. On days in which individuals report high levels of stress (e.g., frenetic days and work overload), researchers have found evidence of spillover in increases in irritability and anger directed towards spouses (Bolger, DeLongis, Kessler, & Wethington, 1989; Crouter et al., 2001, 1989; Doumas et al., 2003; Repetti, 1989; Schulz et al., 2004; Story & Repetti, 2006). Researchers have also observed some forms of social withdrawal from family members (Crouter

et al., 1989; Doumas et al., 2003; Repetti, 1989; Schulz et al., 2004; Story & Repetti, 2006).

Among studies of marital behavior, the term *withdrawal* has been used to describe a wide range of behaviors and cognitive processes, from actions as subtle as a lack of eye contact during a videotaped marital discussion (Paley et al., 2005), to self-reports of cognitive or affective aspects of withdrawal (wanting to spend time alone or feeling distant from one's spouse; Doumas et al., 2003), to self-reports or naturalistic videotape of actual withdrawal behavior (engaging in activities alone when the spouse would have liked attention or reducing time spent in conversation with the spouse; Repetti, 1989; Wang, Repetti, & Campos, 2011).

Limited theory and evidence exist to explain the processes that determine whether individuals will experience anger spillover, withdrawal, or no behavioral change at all under conditions of overload. Further, while high average levels of marital anger and some types of withdrawal are associated with negative long-term outcomes for marital relationships, the results of engaging in these behaviors specifically in response to overload are unknown. The lack of consensus around a definition makes it particularly difficult to determine whether using withdrawal as a coping strategy has positive or negative effects on marriages. The current study differentiates among three types of withdrawal: a conscious cognitive state, *desire to withdraw*, and two sets of behavior: *hostile withdrawal* (e.g., ignoring a spouse's wishes or needs) and *retreat* (e.g., decreasing affectionate contact or disclosure). We examine potential mechanisms by which marital anger and withdrawal behaviors may arise from feelings of overload, and associations between marital anger and withdrawal and overall couple marital satisfaction.

Much of the literature cited above examines overload associated with employment stress. Work, family and domestic responsibilities, however, all contribute to conflict between the work and family domains (Michel, Kotrba, Mitchelson, Clark, & Baltes, 2011) and to daily negative

mood (Jones & Fletcher, 1996). One study of spillover in single-earner couples found that irrespective of employment status, feelings of low energy contributed to marital withdrawal (Doumas, Margolin, & John, 2008). Limiting analyses of spillover and other effects of overload to employed samples also limits generalizability to non-employed populations. To broaden the reach of this study, overload is defined as feeling that one's day has been unusually fast-paced, overwhelming, and tiring, regardless of cause.

Mechanisms of Anger and Withdrawal Responses to Overload

The negative mood spillover hypothesis asserts that increases in irritability and tension following a stressor are carried across contexts, increasing the likelihood of angry behavior in the new context. This model offers a clear mechanism by which angry marital behavior follows a stressful day: persistent negative mood. Cognitive and affective experiences that trigger withdrawal behavior when a day has been overwhelming are less well understood. One study found that wives' responses of both marital anger and withdrawal to stressful workdays were mediated by negative mood (Story & Repetti, 2006), whereas another observed that wives' marital withdrawal was predicted by workday pace, but that husbands' withdrawal was predicted by their negative affectivity at the end of the workday (Schulz et al., 2004). Doumas and colleagues (2003) determined that lack of energy was a predictor of both conflict and feeling withdrawn from one's spouse; Crouter and colleagues (1989) found that husbands' fatigue at the end of the work day predicted withdrawal (low involvement in housework), whereas feelings of stress predicted marital discord.

A number of sex differences in how individuals respond to overload are evident in these findings, although the differences are not consistent across studies. One group found that husbands were more likely to withdraw and wives to engage in angry behavior following busy

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workdays (Schulz et al., 2004), whereas another found that husbands but not wives experienced spillover of social tension from work relationships to the marital relationship (Bolger, DeLongis, Kessler, & Wethington, 1989). Sex differences may also affect the mechanisms by which spillover occurs: Story and Repetti (2006) found that wives' negative mood mediated spillover from difficult experiences at work to marital interactions, including both withdrawal and anger responses, but husbands' negative mood did not tend to mediate responses to workplace stress.

Over and above the effects of negative mood, we propose that the desire to withdraw may contribute to behavior change on overloaded days. In diary studies, wanting to be left alone to recuperate after a stressful day is frequently incorporated into measures of withdrawal, which makes it difficult to determine how this cognitive process may relate to actual behavioral withdrawal. Understanding the association between a conscious desire to withdraw and actual marital behavior may clarify whether certain behaviors (e.g., retreat) are more intentional than others. Additionally, a thwarted desire to withdraw could potentially lead to more hostile behavior, such as the types of withdrawal behaviors (disengaging emotionally, lack of eye contact, conscious disregard, and so on) described in laboratory discussion studies and some diary studies. This paper considers both negative mood and the desire to withdraw as potential mediators of spillover from overload to daily marital interaction, and as potential determinants of which marital behavior will occur on highly demanding days.

Long-term Outcomes of Anger and Withdrawal as Responses to Overload

There is disagreement in the literature as to whether conflict or withdrawal acts as a more "adaptive" reaction to daily feelings of being overloaded. Marital discord shows both short- and long-term effects on husbands' and wives' emotional distress, parenting behavior, and children's emotional adjustment and behavior problems (E. M. Cummings, 1994; E. M. Cummings &

Davies, 2002; Erel & Burman, 1995; Goldfarb, Trudel, Boyer, & Préville, 2007; Krishnakumar & Buehler, 2000; Zimet & Jacob, 2001). Repeated spillover from demand overload to hostile behavior with family members is one likely contributor to chronic marital discord. There is evidence to suggest, however, that romantic partners respond differently to negative affect when they are aware that their partners are experiencing high levels of stress (Thompson & Bolger, 1999). It is possible that marital anger expressed on high-overload days may not have the same negative impact that high overall levels of marital anger have on relationships.

Longstanding patterns of social withdrawal also appear to disrupt marital and parent-child relationships. One longitudinal study found that a self-reported tendency to withdraw from family members was associated with poorer well-being a year later, including increased rates of depression and negative affect among wives, and perceptions of conflict between work and family domains among both wives and husbands (Neal & Hammer, 2009). Laboratory studies have likewise reported associations between marital withdrawal and marital dissatisfaction (Heavey, Christensen, & Malamuth, 1995; Story & Bradbury, 2004). One longitudinal laboratory study examining very brief periods of withdrawal (e.g., stonewalling, unresponsiveness) during a marital interaction task found these behaviors to be associated with increases in negative affect and decreases in positive affect during later family interactions (Paley et al., 2005). In fact, the negative outcomes of withdrawal are most often based on observations of behaviors that occur in structured conversations (e.g., during discussion tasks in the laboratory), which are akin to the apparently intentional withdrawal behaviors described in this study as hostile withdrawal.

Withdrawal as a Buffer

Examinations of daily diary reports of parents' behavior as it is enacted in their natural settings have generated a hypothesis that an overloaded individual's withdrawal may actually

benefit families. Short-term withdrawal from social situations may act as a buffer, impeding the transmission of distress to spouses by allowing stressed individuals time to recover from energy-depleting daily experiences (Larson & Gillman, 1999; Repetti, 1992; Story & Repetti, 2006). Withdrawal in this line of research is conceptualized as a defense specifically against the increased friction that results from negative emotion spillover, which could potentially protect family relationships in the long run from the outcomes that arise from frequent, repeated daily conflict. This type of withdrawal, described in this study as retreat, differs from hostile withdrawal in that the stressed individual distances him or herself from family members through overall reductions in physical touch and conversation, rather than disengaging specifically in response to a partner's needs.

In support of this hypothesis, distraction, relaxation and short periods of solitude are known to be associated with improvements in mood, declines in physiological arousal, and decreased focus on stressful events (Repetti, 1992). Husbands exhibit higher rates of marital withdrawal along with declines in marital anger following stressful workdays (Repetti, 1989; Schulz et al., 2004). Similarly, on evenings following demanding workdays, fathers have been observed to be more distracted and less emotionally involved and warm—and also less likely to engage in disciplinary behavior or express negative affect towards children (Repetti, 1989, 1994; Repetti & Wood, 1997). Thus, while short-term social withdrawal may constitute a reduction in affection or behavioral involvement with family members, it also may help to prevent discord.

The Current Study

Naturalistic repeated measures such as daily diaries offer several benefits over more traditional cross-sectional and laboratory-based methodologies in addressing daily processes like spillover. First and most importantly for this study, daily diaries capture natural processes as they

unfold in families, without imposing restrictions on interaction length, discussion topics or other determinants of behavior. Second, they capture reports of stressors, affective responses, and behaviors within hours of their occurrence, which reduces some of the recall biases associated with self-report methods. Third, daily diaries offer an opportunity to assess intraindividual variability, so the participant's mood and behavior reports on days when they experience energy and time depletion may be compared to their own means (Almeida, McGonagle, & King, 2009). This reduces systematic error that inflates correlations due to individual differences, such as personality traits, stressor frequency, and interpretation of self-report items.

This study applies daily dairy methods to examine spillover from busy, highly demanding days to participants' behavior with their spouses. For 56 consecutive days, husbands and wives self-reported on their feelings of overload, negative mood and desire to withdraw at home, and their angry and withdrawn behavior with their spouses. They also completed one-time questionnaires assessing the overall quality of their marital relationship. We focus on three marital behaviors that are believed to occur as a result of overload: marital anger, hostile withdrawal, and retreat. This study addresses the following research questions:

Research Questions

(1) Does overload predict increases in same-day anger, hostile withdrawal and retreat?

(2) Are anger, hostile withdrawal and retreat distinguishable according to the mechanisms by which they arise in response to overload? Specifically, do desire to withdraw and negative mood predict whether or not overload results in anger, hostile withdrawal or retreat?

(3) How is marital satisfaction associated with one's own, and one's spouse's:

(a) average levels of anger, hostile withdrawal and retreat?

(b) tendency to respond to overload with anger, hostile withdrawal or retreat?

Methods

Participants

Cohabiting heterosexual parents with at least one child between the ages of 8 and 13 were recruited through schools, community centers, medical clinics, and direct mailings to potentially eligible families identified by a marketing agency. At least one parent and one child in the target age range were required to participate. Collection of biological samples (e.g., salivary cortisol) necessitated screening participants for a range of mental and physical health problems.

A total of 47 families participated, including 47 wives (mean age = 43.29, *SD* = 6.31) and 39 husbands (mean age = 43.67, *SD* = 8.1). These 47 families included 38 couples in which both the husband and wife responded to study measures; in one additional family, the parents were divorced and remarried and so reported separately on their marital interactions. Parents self-reported their own ethnicities as 45% non-Hispanic white, 22% Latino/Hispanic, 17.5% African-American, 12.5% Asian, 1.5% Native American and 1.5% "Other" (primarily of mixed ethnicity). The parents' median self-reported individual income fell within the $32,000-$64,000 tax bracket and ranged from below $8,725 to above $171,850. Of the 86 parents, 3.5% had up to a high school degree, 32.5% some college, 40% an associate's or bachelor's degree, and 24% a graduate degree. The majority of participants reported working full-time (45% of wives and 78% of husbands); 21% of wives and 13% of husbands reported working part-time, and 34% of wives and 8% of husbands were not working (e.g., unemployed, disabled or homemaker). Among full- and part-time employed participants, the mean number of hours worked per week was 36.8 (*SD* = 13.3, range: 5 to 70).

Procedure

Trained graduate students and undergraduate research assistants visited the families'

homes to discuss the study procedures, obtain informed consent, and train participating members

on procedures to complete the online daily diaries. Participants used personalized password-

protected webpages to communicate with study staff and access that day's daily diary and

additional questionnaires. Though not required for study participation, all families had home

Internet connections; paper diaries were provided as back-ups in case of technical difficulties, as

well as a date-time stamp device to track compliance. The first Saturday following the home

visit, was the first of 56 consecutive days of data collection. Participants were asked to complete

the diaries at night before going to bed. Compliance (defined as diary completion prior to 9am

the next day) was measured via automated time-stamping procedures included in the online

survey program (SurveyMonkey.com). If a participant did not complete three consecutive days

of diaries, staff members contacted the family to troubleshoot. All 86 participating parents

completed diaries. Parents earned up to $200 for completion of the daily diary and questionnaire

portions of the study, including $5 gift card rewards on weeks with 100% diary compliance.

Measures

Daily Diaries

The analyses presented here utilize couples' 56 daily self-report measures of overload

due to highly demanding days, angry marital behavior, hostile marital withdrawal behavior,

reductions in marital affection and disclosure ("marital retreat"), desire to withdraw, and

negative mood. By applying a Generalizability Theory framework (Cranford et al., 2006), we

estimated daily diary scale reliability at both the between-person level (R_{KF}) and the within-

person level (R_C). R_{KF} represents the reliability of average scale ratings from all items across all

days. R_C represents the reliability of the scale for detecting systematic changes within

respondents over the 56 days of daily diary data collection. The reliability estimates reported

below were generated using SAS/STAT® software version 9.2 for Windows.

Overload. This 5-item scale adapted from Repetti's (1989) busy day at work scale assessed feelings of being overloaded throughout the day. The prompt "Thinking about the entire day, including when you were at work and when you were at home, describe your total workload," was followed by items such as "It was a very busy day"; the full list of items is presented in Appendix A-1. Items were rated on a scale of 1 (*completely inaccurate*) to 4 (*completely accurate*). The average wife's mean daily rating was 2.14 ($SD = .78$, $R_{KF} = 1.00$, $R_C = .85$) and the average husband's was 2.09 ($SD = .67$, $R_{KF} = .99$, $R_C = .84$). These scores are comparable to another study that used this scale, although participants were specifically referencing overload due to work ($M = 2.19$, $SD = .83$; Saxbe, Repetti, & Nishina, 2008).

Paid employment hours. In each of their diaries, parents estimated the number of hours they had worked at a paying job that day; the response options were: *None* (which accounted for 59% of all responses), *<4 hrs* (4%), *4-6 hrs* (6%), *7-9 hrs* (23%), *10-12 hrs* (6%), and *>12 hrs* (2%). This variable was used to control for differences in overload and behavior that might be accounted for by occupational time demands (e.g., less time spent with family on days with more employment hours).

Weekend. A dichotomous variable for weekend day was used to control for differences in overload and behavior due to the different balance of leisure activities and family time often associated with weekends (weekend days were coded as 1, and weekdays as 0).

Daily marital behavior. Three factor-based scales were constructed out of the 12 marital behavior items included in the daily diaries that were expected to measure marital anger and withdrawal; 11 items had high loadings on one of the first three factors. The three factors that emerged mapped on to marital anger, hostile withdrawal, and retreat constructs, for both

husbands and wives. The twelfth item, "I hit, pushed or shoved my partner," failed to load onto any factors (likely due to its low rate of occurrence), and so was not included in the marital behavior variables described below. All 11 items, which are presented in Appendix A-1, were adapted from the Adult Home Data Questionnaire (Margolin, 1990).

Marital anger. Five items assessed the participant's own conflictual, frictional behavior towards his or her spouse (e.g., "I expressed anger or irritation at my partner" and "I nagged my partner," rated on a 1 (*not at all*) to 3 (*a lot*) scale). The average wife's mean daily rating was 1.10 ($SD = .19$, $R_{KF} = .98$, $R_C = .66$), and the average husband's was 1.07 ($SD = .16$, $R_{KF} = .98$, $R_C = .69$).

Hostile withdrawal. Hostile marital withdrawal is defined for the purposes of this study as conscious disregard of the spouse's needs and feelings. The two items read: "I ignored my partner's wishes or needs" and "I took my partner's feelings lightly," and were rated on a 1 (*not at all*) to 3 (*a lot*) scale. The average wife's mean daily rating was 1.08 ($SD = .12$, $R_{KF} = .99$, $R_C = .75$) and the average husband's was 1.06 ($SD = .13$, $R_{KF} = 1.00$, $R_C = .91$).

Retreat. Marital retreat is defined for the purposes of this study as a reduction in self-reported affection and disclosure with family members. Two items ("My partner and I kissed and hugged each other" and "My partner and I had good conversations") were rated on a scale of 1 (*not at all*) to 3 (*a lot*). Three additional items ("Please rate the degree to which you disclosed each of the following to your partner today: (a) Facts and information, (b) Thoughts, and (c) Feelings") were originally rated by participants on a 1 (*not at all*) to 5 (*extremely*) scale, then were re-coded on a 1 to 3 scale (where a score of 5 was recoded as 3, 4 as 2.5, 3 as 2, and so on) to match the other item rating systems in the retreat scale. After all 5 items were reverse-scored, the average wife's mean daily retreat rating was 2.02 ($SD = .30$, $R_{KF} = 1.00$, $R_C = .72$) and the

average husband's was 1.99 ($SD = .27$, $R_{KF} = 1.00$, $R_C = .67$).

To further establish discriminability among the three marital behavior scales, three multilevel models were developed to determine whether the three types of behaviors tend to co-occur or occur independently on a daily basis. Same-day associations were tested between (a) anger and hostile withdrawal, (b) anger and retreat, and (c) hostile withdrawal and retreat. Because participants' status as "wife" or "husband" was non-random, a 3-level multilevel model in which days were nested within participants who were nested within couples was collapsed into a 2-level (days nested within couples) model. This model was adjusted to accommodate distinguishable dyadic diary data following the guidelines described in Bolger and Laurenceau (2013); further details on this method of analysis are presented in the *Results* section. Anger and hostile withdrawal were positively associated with each other on a day-to-day basis in both wives (B = .27, SE = 04, df = 44, $t = 7.13$, $p < .001$) and husbands (B = .38, SE = .06, df = 34, $t = 5.84$, $p < .001$). Anger and retreat were not associated in either wives (B = -.03, SE = .03, df = 44, $t = -.95$, $p = .35$) or husbands (B = -.01, SE = .03, df = 34, $t = -.35$, $p = .73$). Hostile withdrawal and retreat were not associated in either wives (B = .04, SE = .03, df = 34, $t = 1.21$, $p = .23$) or husbands (B = .06, SE = .04, df = 25, $t = 1.66$, $p = .11$).

Daily mediators. *Desire to withdraw.* Participants reported on their own desire to withdraw from their family by responding to two items. The prompt "Overall, when I was with my family today..." was followed by: "I would have preferred more time to be alone" and "I was too tired to interact with my family," rated on a 1 (*completely inaccurate*) to 4 (*completely accurate*) scale. The items were adapted from a 12-item Marital Withdrawal Scale ($\alpha = .61$-.88; Story & Repetti, 2006). A mean of the two responses was calculated to represent the individual's desire to withdraw score for that day. The average wife's mean daily rating was 1.58 ($SD = .70$;

$R_{KF} = .99, R_C = .63$) and the average husband's was 1.38 ($SD = .56, R_{KF} = .99, R_C = .65$).

Negative mood. The daily mood scale was adapted from Cohen et al. (2003). Participants rated their own negative mood on a 1 (*completely inaccurate*) to 4 (*completely accurate*) scale based on the prompt, "Please rate how accurately each of the following adjectives describe how you felt today." Eight negative mood items (e.g., "sad," "on edge," "angry") were averaged to create an overall negative mood score for the day. This mood scale has previously shown good internal reliability (Cronbach's α = .87-.93 across anxious, depressed and angry mood subscales in Cohen et al., 2003). In the current study, the average wife's mean negative mood was 1.46 ($SD = .33, R_{KF} = 1.00, R_C = .82$) and husband's was 1.34 ($SD = .34, R_{KF} = 1.00, R_C = .85$).

Marital satisfaction

Participants completed the Couples Satisfaction Index (CSI; Funk & Rogge, 2007), a 32-item self-report measure of marital satisfaction. Items, such as "I have a warm and comfortable relationship with my partner," were rated on a six-point scale (0 to 5), with varying response options (e.g., *Not at all true* to *Completely true*, *All of the time* to *Never*, etc). Higher scores indicate a more satisfying relationship. Previous research shows that the CSI has high convergent validity with other measures of relationship satisfaction and high internal consistency (α = .98), with a mean summary score of 121 ($SD = 32$; Funk & Rogge, 2007). In the current study, inter-item reliability was high (α = .84, $N = 77$). Wives' mean score on the CSI was 115.35 ($SD = 28.35, N = 40$), and husbands' was 124.70 ($SD = 22.21, N = 37$). A paired t-test indicated that husbands' ratings of satisfaction were significantly higher than wives', $t(33) = -2.19, p < .05$.

Results

Due to the nesting of 56 consecutive days of daily diary responses within 47 wives and 39 husbands, multilevel models were used to examine daily-level associations among overload,

marital behavior, desire to withdraw and mood. Within-subject variation (participants' daily diary responses) is represented in level 1. Between-subject variation is represented at level 2.

Same-day Associations between Overload and Marital Behavior

Dyadic multilevel models similar to those described in the *Methods* section testing associations among the three marital behaviors were used to examine same-day associations between feelings of overload and marital behaviors. The three models were analyzed using SAS/STAT® University Edition software for Windows. "Wife" and "husband" models were combined by suppressing the model's intercept and by separating the variability associated with the predictor (overload) into a level 2 between-subjects average value (each participant's average level of overload across 56 days) and a level 1 within-subjects daily variation from that participant-level average. Husband and wife dummy codes were used to "select" observations based on sex, producing separate fixed effects for each member of the couple. The variance structure was adjusted to allow autocorrelation between adjacent study days and to allow couples' responses to covary. In this sample equation, overload predicted daily marital anger:

Marital Anger = Wife + Wife*Overload(within) + Wife*Overload(between) +

Husband + Husband*Overload(within) + Husband*Overload(between) + Error

The fixed effect of interest is the coefficient associated with the within-subject daily variation in overload ("Wife*Overload(within)" and "Husband*Overload(within)"), which indicates the increase in marital anger with a same-day one-unit increase in overload. Random slopes for overload were included in the anger and retreat models, but not in the hostile withdrawal model as variability was more limited and inclusion of random slopes prevented model convergence. Overload did not significantly predict same-day anger in husbands ($B = .00$, $SE = .01$, $df = 38$, $t = .43$, $p = .67$) or in wives ($B = .01$, $SE = .01$, $df = 46$, $t = .69$, $p = .50$).

Overload did, however, predict same-day hostile withdrawal (significantly in wives, B = .02, SE = .01, df = 4042, t = 2.56, p = .01, marginally in husbands, B = .02, SE = .01, df = 4042, t = 1.78, p = .07); greater overload also predicted both wives' (B = .03, SE = .01, df = 46, t = 2.65, p = .01) and husbands' (B = .03, SE = .01, df = 38, t = 2.91, p = .01) retreat from intimacy that day.

To control for the potential influence of differences in the daily balance of work and family time that might affect feelings of overload as well as marital behavior, the above models were adjusted to control for weekends and the number of paid employment hours reported by the participant. The addition of these two variables prevented dyadic model convergence, so separate multilevel models for husbands and for wives tested same-day associations between overload and marital behaviors with the control variables. The primary difference between the findings of the dyadic analyses described above and the separated husband and wife analyses presented in Table 1 is that results from the latter analyses showed that overload did significantly increase the likelihood of husbands' or wives' marital anger. As can be seen in the middle and lower panels of Table 1, results for the significant effects of overload on wives' hostile withdrawal and retreat and on husbands' retreat, and the marginal effect of overload on husbands' hostile withdrawal, remained consistent even with the addition of the control variables.

Cognitive and Affective Mechanisms

Next, potential differences in mechanisms by which specific marital behaviors associate with overload on a daily basis were addressed. Self-reported desire to withdraw and negative mood were examined simultaneously in a multilevel mediation model to control for overlap between the two mediators. The multilevel mediation models were conducted using an adaptation of a restricted maximum likelihood multilevel mediation program (*ml_mediation*; Ender, 2011) using Stata 12 software (StataCorp, 2011), which was altered to include random

slopes for overload and to allow for two mediators to be tested simultaneously. Distinguishable

dyadic multilevel models failed to converge when both mediators and overload were included as

predictors, so wives' and husbands' data were again examined separately for a total of six

mediation models (wives' and husbands' anger, hostile withdrawal and retreat).

As depicted in Figure 1, each mediation model consisted of four steps. First, direct

associations between husbands' or wives' feelings of overload and the marital behavior outcome

(the "c" pathway in Figure 1) were presented in Table 1. The second pathway, between overload

and the desire to withdraw mediator ("a_1" in Figure 1), was examined while controlling for the

other hypothesized mediator (negative mood), and the third pathway, between overload and

negative mood ("a_2"), was examined while controlling for desire to withdraw. As shown in Table

2, overload significantly predicted both desire to withdraw and negative mood, even when

controlling for the other mediator. Fourth, the simultaneous effects of overload and both

mediators on the behavioral outcome (anger, hostile withdrawal or retreat) were examined

(pathways "b_1," "b_2" and "c'" in Figure 1). Appendices A-2, 3 and 4 provide the coefficient

estimates from these three models. To obtain standard errors and confidence intervals, the results

were bootstrapped with 500 replications. In some cases, parameters were not estimable in all 500

replications; completed replications ranged from 473 to 500 across the six models.

The four steps resulted in estimations of total, direct and indirect mediation effects in

each of the four models. Beginning with marital anger as the outcome variable, the bootstrapped

effects of the mediation models are presented in the top panel of Table 3. The indirect effects

show that both negative mood and desire to withdraw were mediators of daily overload on

marital anger in wives, but only negative mood was a mediator of husbands' marital anger. Both

negative mood and desire to withdraw mediated the effects of overload on hostile withdrawal, in

both husbands and wives (see the middle panel of Table 3). Lastly, as can be seen in the lower panel of Table 3, desire to withdraw was a significant mediator of overload's effect on marital retreat for both husbands and wives, but negative mood was not.

Associations between Marital Behaviors and Marital Satisfaction

A couple's evaluation of the overall quality of their marriage should be reflected in behaviors like responsiveness to each other's feelings, expressions of affection and anger, disclosure, and conflict. In addition to a couple's typical interactions, we can also consider how marital behavior changes in response to a particularly demanding day. Associations were examined between marital satisfaction and (a) participants' average reports of engaging in each of the three marital behaviors, and (b) participants' overall tendencies to respond to overload with anger, hostile withdrawal and retreat. In the first set of analyses, multiple regression Actor-Partner Interdependence Models (APIMs; Kashy & Kenny, 2000) were used to test for associations between marital satisfaction and husbands' and wives' typical angry and withdrawn behavior. APIMs allow for the examination of bidirectional effects by testing effect of the wife's average behavior on her own marital satisfaction (the "wife-as-actor" effect) as well as on her husband's satisfaction (the "wife-as-partner" effect), and the husband's average behavior's effect on his own (husband-as-actor) and his wife's (husband-as-partner) satisfaction, in a single between-subjects regression model.

Table 4 presents the results for the APIM in which average levels of marital anger, hostile withdrawal and retreat predicted husbands' and wives' marital satisfaction. The coefficient labeled "H $\rightarrow$ H" indicates the husband-as-actor effect: for example, a one unit increase in husbands' self-reported marital anger averaged over 56 days corresponded with a 118.41 unit decrease in marital satisfaction score relative to the group's intercept, 362.44. Similarly, "W $\rightarrow$

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W" indicates the wife-as-actor effect on her own marital satisfaction, "W $\rightarrow$ H" the wife-as-partner effect on her husband's marital satisfaction, and "H $\rightarrow$ W" the husband-as-partner effect. Given that the coefficients reported in Table 4 fall well outside the normal range of marital satisfaction scores (44 to 159), it is worth a reminder here that the marital behavior variables were scored on a comparatively small 1 to 3 scale with standard deviations of .12 to .30 among participants; a full unit increase in average marital behavior would be a larger deviation from the average than was actually observed in the data set.

As can be seen in the upper panel of Table 4, average marital anger was associated with lower marital satisfaction, with one exception: husbands' marital anger was not associated with significant differences in wives' marital satisfaction. The middle panel of Table 4 indicates that wives' hostile withdrawal was associated with decreases in their own and in their husbands' marital satisfaction, but husbands' hostile withdrawal did not have significant effects on the satisfaction of either member of the couple. Lastly, the bottom panel of Table 4 shows nearly mirror image results for retreat: husbands' average retreat corresponded with significant decreases in wives' satisfaction and marginally significant decreases in husbands' own satisfaction, but there was no significant effect of wives' retreat on either party's satisfaction.

A second set of APIMs examined how an individual's tendency to respond to overload with each of the three marital behaviors was linked to marital satisfaction. To calculate scores representing the tendency to respond to overload with a particular marital behavior, empirical Bayes' (EB) estimates were derived from the multilevel models described in the first step of the mediation models (tests of pathway "c," presented in Table 1). EB estimates are calculated as between-subjects weighted sums of the models' intercept and slope estimates. In this case, they indicate the average magnitude of each individual's change in marital behavior associated with

each one-unit increase in feelings of overload, adjusted according to the sample's distribution. Husbands' and wives' EB estimates were included as predictors of their own and their spouses' marital satisfaction in an APIM. Results are presented in Table 5.

Husbands' tendency to respond to overload with anger was associated with significantly lower husband as well as wife marital satisfaction; wives' tendency to respond with anger was not significantly associated with their own or their husbands' satisfaction. Neither husbands' nor wives' tendency to respond to overload with hostile withdrawal was associated with changes in their own or their spouses' marital satisfaction. As with anger, husbands' tendency to retreat in response to overload predicted lower marital satisfaction (marginally for their own, and significantly for their wives'), but wives' tendency to respond with retreat did not show significant associations with their own or their husbands' marital satisfaction.

Discussion

All three marital behaviors examined in this study—anger, hostile withdrawal, and retreat—increased on days when participants experienced high levels of overload. Two cognitive and affective experiences were tested as mediators. Although negative mood alone accounted for the effects of overload on husbands' marital anger, negative mood and the desire to withdraw independently mediated the effects of overload on wives' anger and husbands' and wives' hostile withdrawal. It is unsurprising that negative mood played a role in the association between overload and marital anger and hostile withdrawal; because marital behavior, mood and overload were measured at the same time, it is possible that the negative mood may have been, at least in part, a response to tense interactions with the partner. Negative mood played no role, however, in explaining a reduction in intimacy and disclosure on high workload days. A reported wish to have more time alone solely explained the effects of overload on husbands' and wives' retreat.

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Average levels of marital anger, wives' tendency to disregard husbands' needs, and husbands' tendency to express low levels of affection and share very little, were associated with less marital satisfaction. When these marital behaviors occurred specifically on overloaded days, however, only husbands' marital anger and retreat were associated with poorer marital satisfaction.

Differentiating Hostile Withdrawal and Retreat

The present study provided evidence that behaviors widely encompassed by the term "withdrawal" differ in occurrence, cause and potentially in outcome. Specifically, a decline in a couple's usual level of social intimacy (less affection, conversation, disclosure) is not the same as emotional neglect of the partner (an active disregard for his or her feelings, wishes, or needs). First, the lack of a same-day correlation between retreat and hostile withdrawal indicates that the two sets of behaviors do not tend to coincide. Second, differences in the affective processes that predict hostile withdrawal and retreat on highly demanding days (i.e., that hostile withdrawal was mediated by negative mood, but retreat was not) suggest that the two sets of withdrawal behaviors arise out of different conditions. In fact, hostile withdrawal seemed more aligned with marital anger, in that these two sets of behaviors were correlated on a day-to-day basis and both were mediated by negative mood. Third, as will be elaborated below, gender differences in the effects of average levels of hostile withdrawal and retreat on marital satisfaction offer further evidence supporting the distinction between these two sets of withdrawal behaviors.

Desire to Withdraw

Even after controlling for negative mood, a conscious wish to avoid social interaction mediated the effects of overload on all three marital behaviors in women and, among men, two of those behaviors (hostile withdrawal and retreat). An impulse to reduce social interaction could represent an intention to recover from fatigue and negative mood. By limiting further social

stimulation and reducing the chance of short-tempered or insensitive family interactions, the goal may be a return to baseline levels of emotional and physiological arousal. The effects of overload on marital retreat were explained only by a desire to withdraw; the participant's feelings of anger, anxiety or sadness that day did not appear to play a role. A one-day decline in expressions of affection and communication with the spouse may therefore represent the uncomplicated fulfillment of the wish to avoid social engagement. Hostile withdrawal, however, was mediated both by a wish to be alone and by negative mood on overloaded days. It seems possible that this kind of emotional distancing results when an intention to avoid others is combined with emotional distress, whether because the desire to be alone has been unfulfilled or because feelings of stress or anger make attempts to create space less effective. Both a desire to withdraw and negative mood explained wives' reports of more anger and conflict with their husbands on highly demanding days, suggesting that the urge to be alone was thwarted in some way. Future research could measure these processes multiple times per day to clarify the sequencing of these desires, emotions, and behaviors on days with more than the usual demands and pressures.

Effects of the Partner's Social Withdrawal on Marital Satisfaction

It is not surprising that husbands and wives who described less satisfying marriages also, on average, reported more friction with their spouses (disagreements, expressions of anger, nagging). Women in unhappy marriages were also more likely to indicate that they neglected their husbands' emotional needs. In addition to these "actor effects," we found that a *partner's* self-reported social withdrawal behavior was also consequential for marital satisfaction. The type of social withdrawal, however, differentially predicted wives' and husbands' reports of marital quality. Husbands described a less happy marriage if, over 56 days, their wives reported more frictional interactions and being more emotionally neglectful. In other words, a husband's marital

satisfaction was tied to his wife's, not his own, average score for hostile withdrawal. In contrast, wives' marital quality ratings were tied to their husbands' average levels of retreat. Here we see a wife's marital satisfaction linked to her husband's, not her own, dearth of daily affection, conversation and disclosure in marital interactions.

Behavioral Responses to Overload Correlate with Marital Satisfaction

Wives' social reactions to overload had no association with their own, or with their husbands', marital satisfaction. In contrast, both husbands' and wives' marital satisfaction scores were correlated with husbands' responses to a hard day. In particular, both spouses were less satisfied if husbands reacted to overload with marital anger or with retreat. The withdrawal-as-a-buffer hypothesis received only moderate support with hostile withdrawal and no support with retreat: husbands' tendency to decrease affection and conversation on stressful days had negative associations with marital satisfaction, but neither partner's conscious disregard of the other's feelings or needs appears to have had ill effects. One explanation for the finding that changes in wives' marital behavior and in husbands' hostile withdrawal on stressful days were not related to marital satisfaction may be that spouses have different interpretations or tolerance levels when they are aware that their partners have experienced a stressful day: they may be more forgiving of irritability and less likely to escalate angry interactions.

It is important to note that this study did not have a lengthy enough time frame to determine whether marital satisfaction acts as a predictor or an outcome of the daily occurrence of marital anger, hostile withdrawal or retreat. On one hand, if marital anger is frequently expressed or one member of a couple frequently ignores the other's needs or withdraws affection, it seems likely that this would erode marital satisfaction over time. On the other hand, dissatisfied couples may be more likely to experience negative mood spillover because they are

already prone to experience conflict and to experience contagion of negative affect between spouses (Story & Repetti, 2006). A longitudinal research study would offer the opportunity to establish causality between marital satisfaction and daily behavioral responses to overload.

Limitations and Future Directions

The simultaneous daily measurement of feelings of overload, negative mood, desire to withdraw and marital behavior was a clear constraint. Assessing these variables at several time points throughout the day would better address the temporal sequence presumed in mediation. Another limitation of this study is the relatively small sample of families, which limited statistical power. This was likely a contributor to the failure of the dyadic multilevel models to converge when paid employment hours and weekend status were included as control variables.

This study has important clinical implications and raises interesting questions for future studies. Our findings indicate that withdrawal in the context of negative mood generates different behavior than withdrawal without negative mood. Improving communication around one's desire to withdraw may facilitate a more supportive spousal response, decreased negative mood, and quicker recovery from highly demanding days. More research is needed, however, to ascertain the potential of withdrawal to behave as a buffer between stressful days and marital conflict.

This study identified three distinct marital behaviors that are affected by daily experiences of overload and established differential associations between these behaviors and overall levels of marital quality. Future process-oriented research would ideally unpack the complex interactions between the affective, cognitive and behavioral experiences described here, and establish opportunities for intervention to improve marital interactions and satisfaction.

Table 1

Direct Effect of Overload on Marital Behavior

	Wives						Husbands					
	B	SE	*z*	*p*	95%	CI	B	SE	*z*	*p*	95%	CI
Marital Anger												
Intercept	1.05	0.02	44.34	*<.001*	1.01	1.10	1.05	0.02	47.04	*<.001*	1.01	1.09
Overload	0.03	0.01	2.35	*.019*	0.00	0.05	0.02	0.01	2.41	*.016*	0.00	0.04
Hours Worked	0.00	0.00	-0.00	*.999*	-0.01	0.01	-0.01	0.00	-2.28	*.022*	-0.02	-0.00
Weekend	0.08	0.01	6.07	*<.001*	0.05	0.10	0.03	0.01	2.47	*.013*	0.01	0.05
	B	SE	*z*	*p*	95%	CI	B	SE	*z*	*p*	95%	CI
Hostile Withdrawal												
Intercept	1.01	0.02	54.44	*<.001*	0.97	1.05	1.00	0.02	43.37	*<.001*	0.95	1.05
Overload	0.03	0.01	2.67	*.008*	0.01	0.05	0.03	0.02	1.72	*.085*	-0.00	0.06
Hours Worked	0.00	0.00	0.02	*.982*	-0.01	0.01	-0.00	0.00	-0.62	*.534*	-0.01	0.01
Weekend	0.03	0.01	2.50	*.012*	0.01	0.05	0.02	0.01	1.49	*.138*	-0.01	0.05
	B	SE	*z*	*p*	95%	CI	B	SE	*z*	*p*	95%	CI
Retreat												
Intercept	1.94	0.06	35.22	*<.001*	1.83	2.05	1.88	0.05	39.50	*<.001*	1.78	1.97
Overload	0.04	0.02	2.17	*.030*	0.00	0.07	0.04	0.01	2.58	*.010*	0.01	0.06
Hours Worked	0.02	0.01	2.48	*.013*	0.00	0.03	0.03	0.01	4.99	*<.001*	0.02	0.04
Weekend	-0.08	0.02	-5.01	*<.001*	-0.11	-0.05	-0.03	0.02	-1.97	*.049*	-0.07	-0.00

Figure 1

Schematic Diagram of Mediation Model
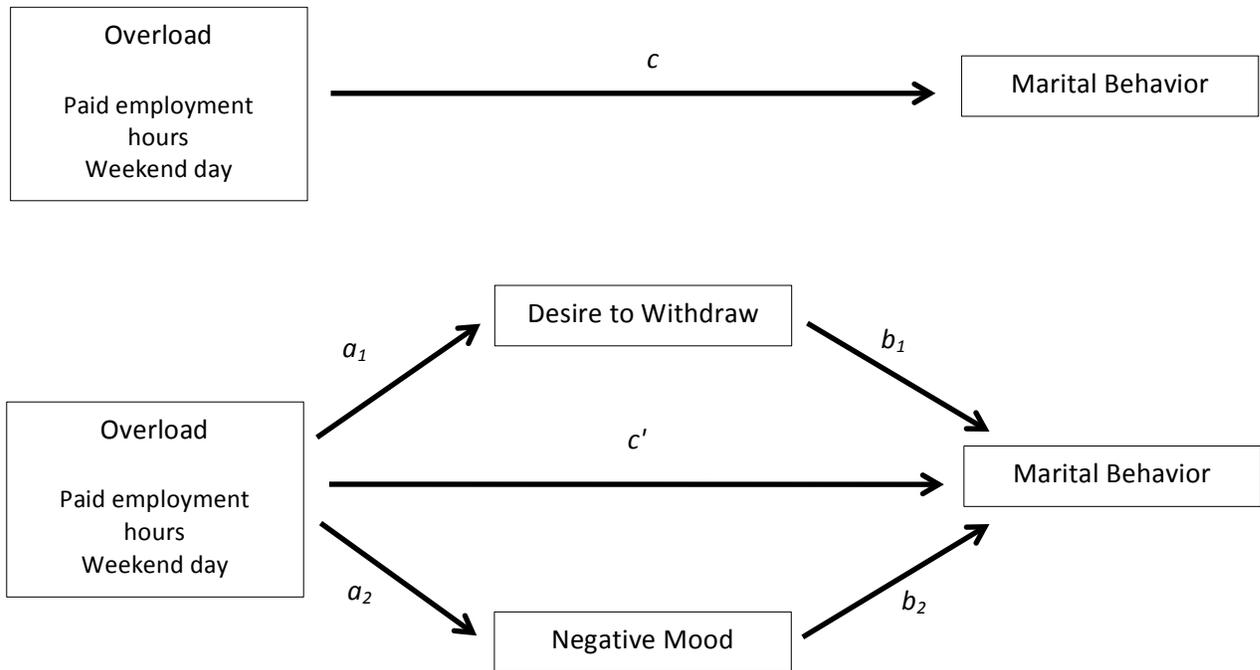
Table 2

Overload Predicts Desire to Withdraw (Controlling for Negative Mood) and Negative Mood (Controlling for Desire to Withdraw):

Mediation Pathways a_1 and a_2

	Wives					Husbands				
	B	SE	*z*	*p*	95% CI	B	SE	*z*	*p*	95% CI
1. Desire to Withdraw										
Intercept	0.80	0.08	10.05	*<.001*	0.64 – 0.95	0.77	0.08	10.23	*<.001*	0.62 – 0.92
Overload	0.17	0.03	5.22	*<.001*	0.11 – 0.24	0.15	0.04	3.88	*<.001*	0.07 – 0.22
Negative Mood	0.25	0.04	6.75	*<.001*	0.18 – 0.32	0.25	0.05	5.10	*<.001*	0.15 – 0.35
Hours Worked	0.02	0.01	1.30	*.194*	-0.01 – 0.05	-0.00	0.01	-0.17	*.864*	-0.02 – 0.02
Weekend	0.01	0.02	0.28	*.777*	-0.04 – 0.05	0.00	0.02	0.02	*.986*	-0.04 – 0.05
2. Negative Mood										
Intercept	0.83	0.06	14.67	*<.001*	0.72 – 0.94	0.90	0.05	18.09	*<.001*	0.81 – 1.00
Overload	0.15	0.02	8.43	*<.001*	0.12 – 0.19	0.13	0.02	6.51	*<.001*	0.09 – 0.17
Desire to Withdraw	0.18	0.03	6.59	*<.001*	0.13 – 0.23	0.13	0.03	4.46	*<.001*	0.07 – 0.19
Hours Worked	0.00	0.01	0.15	*.878*	-0.02 – 0.02	-0.00	0.01	-0.76	*.448*	-0.02 – 0.01
Weekend	-0.01	0.02	-0.59	*.553*	-0.05 – 0.02	-0.04	0.02	-2.52	*.012*	-0.08 – -0.01

Table 3

Effect of Overload on Marital Behavior, Mediated by Desire to Withdraw and Negative Mood: Bootstrapped Effect Size Estimates

	Wives					Husbands				
	B	SE	*z*	*p*	95% CI	B	SE	*z*	*p*	95% CI
Marital Anger										
Indirect effects of:										
Desire to withdraw	0.00	0.00	2.08	*.037*	0.00 – 0.01	0.01	0.01	0.80	*.421*	-0.01 – 0.03
Negative mood	0.03	0.00	7.65	*<.001*	0.02 – 0.03	0.00	0.00	2.39	*.017*	0.00 – 0.01
Total indirect effect	0.03	0.00	8.32	*<.001*	0.02 – 0.04	0.02	0.00	4.58	*<.001*	0.01 – 0.03
Direct effect	-0.00	0.01	-0.27	*.784*	-0.02 – 0.01	0.02	0.00	5.38	*<.001*	0.02 – 0.03
Total effect	0.03	0.01	3.38	*.001*	0.01 – 0.05	-0.02	0.01	-1.78	*.075*	-0.03 – 0.00
Hostile Withdrawal										
Indirect effects of:										
Desire to withdraw	0.00	0.00	2.41	*.016*	0.00 – 0.01	0.01	0.00	2.46	*.014*	0.00 – 0.01
Negative mood	0.01	0.00	4.29	*<.001*	0.01 – 0.02	0.01	0.00	3.27	*.001*	0.01 – 0.02
Total indirect effect	0.02	0.00	4.73	*<.001*	0.01 – 0.02	0.02	0.00	3.96	*<.001*	0.01 – 0.03
Direct effect	0.00	0.01	0.27	*.786*	-0.02 – 0.02	-0.00	0.01	-0.14	*.889*	-0.02 – 0.02
Total effect	0.02	0.01	2.33	*.020*	0.00 – 0.03	0.02	0.01	1.82	*.069*	-0.00 – 0.04
Retreat										
Indirect effects of:										
Desire to withdraw	0.01	0.00	3.33	*.001*	0.00 – 0.02	0.01	0.00	2.77	*.006*	0.00 – 0.02
Negative mood	0.00	0.00	0.81	*.416*	-0.00 – 0.01	0.00	0.00	1.48	*.140*	-0.00 – 0.01
Total indirect effect	0.01	0.00	3.14	*.002*	0.01 – 0.02	0.01	0.00	3.38	*.001*	0.01 – 0.02
Direct effect	0.03	0.01	2.09	*.037*	0.00 – 0.05	0.03	0.01	2.30	*.022*	0.01 – 0.06
Total effect	0.04	0.01	3.35	*.001*	0.02 – 0.06	0.05	0.01	3.38	*.001*	0.02 – 0.07

Table 4

Regressions: Associations between Marital Satisfaction and Average Levels of Marital Anger,

Hostile Withdrawal and Retreat

		Coef.	SE	t	*p*	95% CI	
Anger							
Intercept		362.44	36.24	10.00	*<.001*	290.0	434.8
Actor	H → H	-118.41	36.62	-3.23	*.002*	-191.6	-45.3
	W → W	-193.84	42.87	-4.52	*<.001*	-279.5	-108.2
Partner	W → H	-98.66	35.83	-2.75	*.008*	-170.3	-27.1
	H → W	-27.61	39.18	-.70	*.484*	-105.9	50.7
Hostile Withdrawal							
Intercept		254.14	49.80	5.10	*<.001*	154.7	353.6
Actor	H → H	-49.81	51.34	-.97	*.336*	-152.4	52.8
	W → W	-81.21	38.58	-2.10	*.039*	-158.3	-4.1
Partner	W → H	-73.02	38.02	-1.92	*.059*	-149.0	2.9
	H → W	-49.40	51.41	-.90	*.370*	-149.1	56.3
Retreat							
Intercept		212.59	18.83	11.29	*<.001*	175.0	250.2
Actor	H → H	-45.99	24.24	-1.90	*.062*	-94.4	2.4
	W → W	12.30	23.82	.52	*.607*	-35.3	59.9
Partner	W → H	1.44	23.34	.06	*.951*	-45.2	48.1
	H → W	-59.66	24.77	-2.41	*.019*	-109.1	-10.2

Table 5

Regressions: Associations between Marital Satisfaction and Tendency to Respond to Overload with Marital Anger, Hostile Withdrawal and Retreat

		Coef.	SE	t	*p*	95% CI	
Anger							
Intercept		126.83	4.01	31.59	*<.001*	118.81	134.9
Actor	H → H	-367.43	119.73	-3.07	*.003*	-606.6	-128.2
	W → W	79.75	193.64	.41	*.682*	-307.1	466.6
Partner	W → H	64.96	162.60	.40	*.691*	-259.8	389.8
	H → W	-324.42	119.94	-2.70	*.009*	-564.0	-84.8
Hostile Withdrawal							
Intercept		127.00	3.74	33.96	*<.001*	119.5	134.5
Actor	H → H	-120.78	123.02	-.98	*.330*	-366.5	125.0
	W → W	-161.26	118.09	-1.37	*.177*	-397.2	74.7
Partner	W → H	-156.56	114.48	-1.37	*.176*	-385.3	72.1
	H → W	-60.20	124.11	-.49	*.629*	-308.1	187.7
Retreat							
Intercept		139.58	8.18	17.07	*<.001*	123.2	155.9
Actor	H → H	-455.16	235.67	-1.93	*.058*	-926.0	15.6
	W → W	20.16	69.45	.29	*.773*	-118.6	158.9
Partner	W → H	17.85	69.20	.26	*.797*	-120.4	156.1
	H → W	-580.22	236.23	-2.46	*.017*	-1052.1	-108.3

Appendix A-1

Daily Diary Items and Subscales

Overload
- It was a very busy day
- There were more demands on my time than usual
- I felt like I barely had a chance to breathe
- I could have used more time for a break
- It was a fairly slow day—RS

Desire to withdraw
- I would have preferred more time to be alone
- I was too tired to interact with my family

Hostile Marital Withdrawal
- I ignored my partner's wishes or needs
- I took my partner's feelings lightly

Marital Retreat
- My partner and I kissed and hugged each other—RS
- My partner and I had good conversations—RS
- I disclosed facts to my partner today—RS
- I disclosed thoughts to my partner today—RS
- I disclosed feelings to my partner today—RS

Marital anger
- I expressed anger or irritation at my partner
- I nagged my partner
- My partner and I disagreed about a child-related issue
- My partner and I disagreed about an issue unrelated to children

RS = Reverse Scored

Appendix A-2

Overload Predicts Same-day Marital Anger, with Mediation by Desire to Withdraw and Negative Mood: Full Model

	Wives					Husbands				
	B	SE	*z*	*p*	95% CI	B	SE	*z*	*p*	95% CI
Intercept	0.83	0.03	25.53	*<.001*	0.77 – 0.89	0.88	0.03	27.34	*<.001*	0.82 – 0.95
Desire to Withdraw	0.02	0.01	2.22	*.026*	0.00 – 0.04	0.03	0.01	2.80	*.005*	0.01 – 0.05
Negative Mood	0.17	0.03	6.29	*<.001*	0.12 – 0.23	0.15	0.03	4.62	*<.001*	0.09 – 0.22
Overload	-0.00	0.01	-0.24	*.813*	-0.02 – 0.02	-0.02	0.01	-1.48	*.138*	-0.04 – 0.01
Hours Worked	0.00	0.00	0.09	*.932*	-0.01 – 0.01	-0.01	0.00	-1.89	*.059*	-0.01 – 0.00
Weekend	0.08	0.01	7.07	*<.001*	0.06 – 0.10	0.04	0.01	3.51	*<.001*	0.02 – 0.06

Appendix A-3

Overload Predicts Same-day Hostile Withdrawal, with Mediation by Desire to Withdraw and Negative Mood: Full Model

	Wives					Husbands				
	B	SE	*z*	*p*	95% CI	B	SE	*z*	*p*	95% CI
Intercept	0.92	0.02	36.98	*<.001*	0.87 – 0.97	0.86	0.03	28.92	*<.001*	0.81 – 0.92
Desire to Withdraw	0.03	0.01	2.66	*.008*	0.01 – 0.05	0.04	0.01	3.25	*.001*	0.02 – 0.07
Negative Mood	0.07	0.01	5.78	*<.001*	0.05 – 0.09	0.10	0.02	6.15	*<.001*	0.07 – 0.14
Overload	0.00	0.01	0.23	*.814*	-0.02 – 0.02	-0.00	0.02	-0.08	*.935*	-0.03 – 0.03
Hours Worked	-0.00	0.00	-0.28	*.781*	-0.01 – 0.01	-0.00	0.00	-1.06	*.288*	-0.01 – 0.00
Weekend	0.03	0.01	2.67	*.008*	0.01 – 0.05	0.02	0.01	1.19	*.232*	-0.01 – 0.04

Appendix A-4

Overload Predicts Same-day Retreat, with Mediation by Desire to Withdraw and Negative Mood: Full Model and Bootstrapped Effect

Size Estimates

	Wives					Husbands				
	B	SE	*z*	*p*	95% CI	B	SE	*z*	*p*	95% CI
Intercept	1.85	0.07	27.58	*<.001*	1.72 – 1.99	1.77	0.08	23.01	*<.001*	1.61 – 1.92
Desire to Withdraw	0.06	0.02	3.58	*<.001*	0.03 – 0.09	0.06	0.03	2.27	*.023*	0.01 – 0.11
Negative Mood	0.02	0.03	0.54	*.591*	-0.05 – 0.08	0.04	0.04	1.04	*.300*	-0.04 – 0.12
Overload	0.03	0.02	1.32	*.186*	-0.01 – 0.06	0.03	0.02	2.00	*.046*	0.00 – 0.06
Hours Worked	0.02	0.01	2.68	*.007*	0.01 – 0.03	0.03	0.01	4.41	*<.001*	0.01 – 0.04
Weekend	-0.09	0.02	-5.52	*<.001*	-0.12 – -0.06	-0.04	0.02	-2.22	*.026*	-0.07 – 0.00

STUDY 2

Spillover in the Home: The Effects of Family Conflict on Parents' Behavior

Friction is a normal part of everyday family life. Parents use conflictual, irritable behavior to communicate that their spouses or children have engaged in unwanted actions. Unfortunately, turbulence in one relationship tends to spread into other relationships, and discord seems to be particularly contagious between the marital and parent-child dyads. The effects of discord in one dyad on the other may amplify the long-term negative outcomes of frequent marital and parent-child conflict that are observed in all members of the family.

Marital discord is associated with parents' harshness, inconsistency, psychological control, and reduced acceptance and sensitivity with their children (Benson, Buehler, & Gerard, 2008; Buehler, Benson, & Gerard, 2006; Klausli & Owen, 2011; for reviews on this topic, see Erel & Burman, 1995; Krishnakumar & Buehler, 2000). In fact, the link between marital discord and parenting may partly explain the association between highly conflictual marriages and child emotional outcomes (Chung, Flook, & Fuligni, 2009; Schulz, Waldinger, Hauser, & Allen, 2005). In the reverse direction, a more limited literature indicates that difficulties between parents and children also affect marital relationships and parents' emotional distress (Almeida, Wethington, & Chandler, 1999; Jenkins, Simpson, Dunn, Rasbash, & O'Connor, 2005; VanderValk, Spruijt, Goede, & Meeus, 2007).

Traditional correlational designs limit the potential for new knowledge about the spread of conflict within families. While tensions in the marital and parent-child dyads are known to be closely linked, the research literature has less to say about the day-to-day mechanisms by which difficulty in one dyad is transmitted to the other. As a result, researchers have called for process-

oriented research to begin to clarify the *why* and *how* of established associations between marital and parent-child discord (E. M. Cummings & Davies, 2002). Examining daily within-family conflict processes offers an opportunity to take a more detailed look at one potential step along the long pathway from one day's conflictual encounters to longstanding patterns of relational, behavioral and emotional disturbances in parents and children. Further, assessing short-term within-person processes examines the day-to-day effects of conflict against the backdrop of the individual's own typical behavior (as opposed to the whole sample's typical behavior), which limits the influence of individual traits, shared genes and environments, and gene-by-environment interactions. This process-level examination offers unique information about daily fluctuations in behavior as compared to the broad associations between marital and parent-child conflict described in cross-sectional and long-term prospective studies.

One mechanism by which tension in one family dyad may affect the other dyad on a daily basis is the short-term effects that conflictual encounters have on parents' behavior. *Spillover* occurs when a stressful experience in one context (such as marital conflict) has a direct short-term impact on an individual's affect or behavior in another context (such as by increasing the parent's irritability in an interaction with a child; Almeida et al., 1999; Bolger, DeLongis, Kessler, & Wethington, 1989; Repetti, 1987, 1994). A handful of studies have examined short-term effects of marital and parent-child conflict on other family dyads using within-subjects methods like daily diaries (Almeida et al., 1999; Bolger, DeLongis, Kessler, & Wethington, 1989; Chung et al., 2009; Kitzmann, 2000; Margolin, Christensen, & John, 1996). These studies have observed a link from marital conflict to tension in the parent-child relationship on the same or the next day, including both affective (e.g., increases in distressed mood) and behavioral (e.g., disagreements) changes (Almeida et al., 1999; Bolger, DeLongis, Kessler, & Wethington, 1989;

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Chung et al., 2009; Margolin et al., 1996). Similarly, one laboratory study found that negativity in a marital discussion predicted more parental negativity during a family conversation immediately afterwards (Kitzmann, 2000). To date, there has been little evidence addressing spillover from the parent-child to the marital relationship. One daily diary study found spillover from parent-child interactions to next-day marital interactions among fathers but not mothers (Almeida et al., 1999), whereas another found no evidence of either marital or parent-child arguments spilling into arguments in the other family dyad the next day (Bolger, DeLongis, Kessler, & Wethington, 1989). The present study will build upon this daily diary literature by examining bidirectional spillover, from the marital to the parent-child dyad and vice versa.

This study also takes a somewhat novel approach to operationalizing within-family conflict spillover. Previous diary studies have typically examined the co-occurrence of conflictual encounters within two family dyads. For example, parents might indicate whether they experienced a disagreement or tension with a family member, without specifying whose behavior may have been driving the conflict (e.g., Almeida et al., 1999; Bolger, DeLongis, Kessler, & Schilling, 1989). The present study focuses on parent behavior, which is the common factor in marital and parent-child dyads and the most likely agent carrying tension from one relationship to the other. We define spillover as a process in which a conflictual encounter in one dyad generates a short-term increase in the parent's own "frictional" (irritable, intolerant, impatient, or insensitive) behavior in the other family dyad, above their typical behavior.

For example, imagine a marital interaction in which both parents engage in frictional, conflictual behaviors (e.g., yelling and ignoring each other's needs). This "conflict event" represents both of their frictional behaviors. Regardless of whether or not both individuals contribute conflict-generating behavior during the event, the event itself is a possible predictor of

spillover. On the same day as this marital dispute, imagine the mother and the child also have a conflictual encounter: the child avoids homework, and the mother responds with a sharp reprimand. If the mother's behavior with her child is more irritable than is typical for her, this is deemed an example of spillover. In summary, we distinguish between conflict events (the predictors, which represent combinations of both dyad members' frictional behavior) and the parent's frictional behavior (the outcome of spillover). We make this distinction in an attempt to focus specifically on spillover as manifested in the behavior of the parent, who is common to both marital and parent-child dyads.

In addition to making the operationalization of spillover more specific and examining bidirectional effects between the marital and parent-child dyads, several other important targets for investigation remain. These include the mediating role of negative mood and the effects of parent emotion regulation skills and children's behavior problems on conflict spillover processes.

The Role of Negative Mood in Spillover

One explanation for increases in frictional behavior following a conflict event is that a negative mood (e.g., irritability, frustration) generated by the initial stressful encounter changes the individual's response patterns in later social interactions (Bolger, DeLongis, Kessler, & Schilling, 1989; Story & Repetti, 2006). Distress and anger can reduce parents' sensitivity toward their children and tolerance of misbehavior, resulting in increased parental hostility (Erel & Burman, 1995; Krishnakumar & Buehler, 2000). Previous studies have defined spillover as changes in parents' mood or their behavior, but have not examined the indirect effect of negative mood on the behavior changes associated with spillover. To illustrate this idea, we return to the mother whose child was avoiding homework: We would hypothesize that her increased likelihood of responding to the child's demand with more aggressive, frictional behavior than is

typical for her is (a) because she had a difficult marital interaction (the direct spillover effect), and (b) because that marital interaction left her in a negative mood (e.g., feeling irritated or frustrated) that lingered through her later unrelated interaction with her child (the indirect effect of negative mood on spillover).

The posited role of negative mood in driving behavioral spillover calls attention to a complexity that arises with the use of self-report data. Mood colors perceptions and memory of social interactions and stressful events; induced negative mood can affect participant self-report, such as by increasing the number of negative life events and the availability of social support reported (L. H. Cohen, Towbes, & Flocco, 1988). Descriptions of social behavior provided by spouses *and* children can help to evaluate the extent to which previous studies' reports of conflict spillover reflect observable behavioral changes as opposed to attentional and cognitive reporting biases associated with negative affect. In this study, in addition to parent self-reports, spouses' reports of marital conflict events and frictional marital behavior and children's reports of parent-child conflict events and frictional parenting behavior are used to test the spillover model.

Parent Neuroticism

Individual differences in emotion regulation skills are believed to affect overall rates of family conflict (Krishnakumar & Buehler, 2000; Margolin et al., 1996), and may also increase the likelihood of higher emotional reactivity to and slower emotional recovery from a conflict event. If, as suggested above, negative affect plays a role in determining whether conflict in one relationship shapes behavior in another relationship, then a parent's overall negative affectivity and emotion regulation skill (or lack thereof) may contribute to spillover.

Neuroticism is a term that describes higher tonic levels of negative affect, more intense negative emotional responses to negative events (reactivity), and slower subsidence of a negative

emotional response following the cessation of the negative event (recovery; Costa & McCrae, 1980; Gross, Sutton, & Ketelaar, 1998; Ng & Diener, 2009). Individuals high in neuroticism sometimes experience more intense negative emotional responses when presented with unpleasant scenarios or experiences, and slower recovery from that negative emotion as the experience improves (Gross et al., 1998; Ng & Diener, 2009). No studies have examined the role of neuroticism in within-family conflict spillover, and even previous evidence for a possible moderating role of trait negative affectivity is limited. We hypothesize that, because of differences in emotional reactivity and recovery patterns, parent neuroticism will be associated with a greater likelihood of spillover between marital and parent-child tensions.

The Role of Child Behavior

Children's externalizing (e.g., impulsive, aggressive and hyperactive) behavior is associated with more parental hostility, parent-child conflict and marital conflict, at least in part because child externalizing behavior increases parents' arguments about the child (Edwards, Barkley, Laneri, Fletcher, & Metevia, 2001; Jenkins et al., 2005; VanderValk et al., 2007). We hypothesize that parents' frictional behavior will be more likely to increase following conflict events in the family when the child has a tendency to display externalizing behavior. There are several ways this might occur. Parent-child conflict events may be more provocative with a child whose behavior is more uncontrolled, resulting in a more substantial disruption to the parent's mood and interactions with his or her spouse. For example, teens with ADHD and their parents use more negative and fewer positive behaviors during conflict discussions than control families (Edwards et al., 2001). Parents of children who externalize may also have more limited patience or higher sensitivity to acting out behavior. This proposed sensitivity might make parents' interactions with their children particularly vulnerable to disruption following a marital dispute.

The Current Study

The current study uses diary data collected on 56 consecutive days from families with children between the ages of 8 and 13 to assess same-day spillover effects from conflict events with spouses and children to mothers' and fathers' frictional behavior with the other family member. In addition to daily self-reports of behavior and interactions with spouses and children, this study uses the spouse and the child as independent sources of information about discord in those relationships. This study also addresses the indirect effect of parents' daily negative mood on spillover (i.e., by testing mood as a mediator of spillover). Lastly, this study evaluates how individual differences in parent neuroticism and child externalizing symptoms may moderate parents' relative risk of experiencing daily within-family conflict spillover.

Method

Participants

Cohabiting parents with at least one child between the ages of 8 and 13 living in the Los Angeles area were recruited through elementary and middle schools, community centers, medical clinics, and direct mailings to families with children in the target age range as identified by a marketing agency. At least one parent and one child in the target age range from each family were required for the family to participate, although both parents were encouraged to do so. All participants were screened for a range of mental and physical health problems to ensure that collection of biological samples not discussed here (e.g., salivary cortisol) would not be disrupted by medication or chronic health problems. Though the study did not exclude homosexual cohabiting parents, only heterosexual parents participated.

A total of 47 families participated, including 86 parents (47 mothers, mean age = 43.29, SD = 6.31, and 39 fathers, mean age = 43.67, SD = 8.1), and 47 "target" children (19 boys, 28

girls, mean age = 11.2, *SD* = 1.5). These 47 families included 38 intact couples in which both the husband and wife responded to study measures; in one family, the parents were divorced and remarried and so both reported separately on their interactions with their child and their own marital interactions, but not on marital interactions with each other. Parents self-reported their own ethnicities as 45% non-Hispanic white, 22% Latino/Hispanic, 17.5% African-American, 12.5% Asian, 1.5% Native American and 1.5% "Other." Parents reported target children's ethnicities as 38% non-Hispanic white, 30% Latino/Hispanic, 15% African-American, 8.5% Asian, and 8.5% "Other" (primarily of mixed ethnicity). The parents' median self-reported individual income fell within a $32,000-$82,000 bracket and ranged from below $8,725 to above $171,850.

Procedure

During an initial visit to the family's home, trained research assistants discussed the study procedures and obtained informed consent. Following this visit, parents and children completed a series of baseline questionnaires. About a week later, research assistants made a second visit to the family's home to train participating members on daily diary procedures. On the first Saturday following the training visit, participating parents and children began a period of 56 consecutive days of daily data collection. Daily diaries consisted of questions about participants' experiences and mood that day and were completed online each evening prior to bed. To complete the daily diaries, participants were given access to a personalized, password-protected webpage on the study's online portal, which allowed private communication with study staff, links to that day's daily diary, and access to blocks of additional questionnaires. Though not required for study participation, all families had home Internet connections; however, each family was given 14 paper diaries as back-ups in case of technical difficulties, as well as a date-time stamp device to

track compliance.

Online diary compliance was measured via automated time-stamping procedures included in the online survey program (SurveyMonkey.com). If a participant did not complete three consecutive days of daily diaries, lab staff members contacted the family to troubleshoot improving compliance. Parents earned up to $200 and children up to $100 for completion of the portions of the study's procedures discussed in this study, including a $5 gift card for each week of 100% diary compliance (given if each diary had been completed before 9am the following morning). Further details on other study procedures (e.g., laboratory activities and biological sample collection) are described by Robles, Reynolds, Repetti & Chung (2013).

Measures

Daily Diaries

Each day mothers and fathers rated their own, their spouses' and their children's behavior, and children rated their own and each of their parents' behavior. As we described in the *Introduction*, we distinguished between "conflict events," which were measured using average item responses on scales that asked each reporter about *both* the focal parent's and his or her social partner's conflictual behavior, and "frictional behavior," which was restricted to reports of only the focal parent's behavior. In total, the present study utilized: (a) parent self- and partner-report of marital conflict events, and parent self- and child-report of parent-child conflict events, (b) parent self- and partner-report of the focal parent's frictional marital behavior, and parent- and child-report of the focal parent's frictional parenting behavior, and (c) parent self-reports of negative mood.

Reliability for daily diary scales was estimated at both the between- and within-person level by applying a Generalizability Theory framework (Cranford et al., 2006). The between-

person estimate (R_{KF}) indicates the degree of between-person reliability, or how well a scale differentiates between people, given the diary period (*K* represents the number of days, 56; *F* indicates that the number of days is fixed). The within-person estimate (R_C) represents the scale's ability to detect meaningful day-to-day changes ("*C*") within respondents over all 56 days.

   Marital conflict events. This scale, which was adapted from the Adult Home Data Questionnaire (Margolin, 1990), assessed a combination of 12 items. Seven items describe the parent's own behavior ("my behavior," R_{KF} = .98, R_C = .66 among wives and R_{KF} = .98, R_C = .69 among husbands). Five items describe the parents' observations of his or her spouse's behavior ("partner's behavior," R_{KF} = .98, R_C = .72 among husbands' reports of wives and R_{KF} = .99, R_C = .68 among wives' reports of husbands). Items such as "I expressed anger or irritation at my partner" ("my behavior") and "My partner took my feelings lightly" ("partner's behavior") were rated on a 1 (*not at all*) to 3 (*a lot*) scale. Appendix A-1 presents all 12 items. Averaging across daily responses within participants, wives' daily rating of marital conflict (across all 12 items) was 1.11 (*SD* = .12) and husbands' was 1.08 (*SD* = .08), indicating that on average at least one of the twelve items was endorsed each day. One set of analyses was conducted using parents' self-reported marital conflict events and, for the families in which both partners participated, a second set of analyses was conducted using partner-reported marital conflict events.

   Frictional marital behavior. The subset of the marital conflict items describing the focal parent's behavior was used to test for differences in a parent's marital behavior on days when a parent-child conflict event had occurred. Responses to the 7-item "my behavior" segment of the marital conflict scale (described in the previous paragraph) were used as a measure of the parent's self-reported frictional behavior towards the spouse. Wives' average self-reported frictional marital behavior was 1.10 (*SD* = .10), and husbands' was 1.07 (*SD* = .07).

Among the families in which both husband and wife participated in the study, responses to the 5-item "partner's behavior" segment of the marital conflict scale were used as a measure of frictional marital behavior as observed by the spouse. Wives' average ratings of their husbands' frictional marital behavior was 1.12 ($SD = .15$), and husbands' average ratings of their wives' behavior was 1.09 ($SD = .10$).

Parent-child conflict events. As with marital conflict events, reports of both the parent's and the child's conflictual behavior were averaged to indicate a conflict event.

(a) Parent self-report: The 9-item parent-child conflict scale (e.g., "I punished my child," rated on a 1 (*not at all*) to 3 (*a lot*) scale; see Appendix A-2 for a full reproduction of the scale) was adapted from the Adult Home Data Questionnaire (Margolin, 1990). Parents responded to eight items regarding their own conflictual behavior with the target child and one item regarding their child's conflictual behavior. Among mothers, the scale's mean was 1.18 ($SD = .16$, R_{KF} = .99, $R_C = .83$), and among fathers it was 1.11 ($SD = .10$, $R_{KF} = .99$, $R_C = .79$).

(b) Child-report: Children's reports of daily mother-child and father-child conflict offered an independent assessment of parent-child conflict events. Items were based on the Youth Everyday Social Interaction and Mood scales (YES I AM; Repetti, 1996) and the Child Home Data Questionnaire (Margolin, 1990). Three items per parent (e.g., "My mom got mad at me today"; see Appendix A-2 for a full reproduction of the scale), one of which referred to the child's behavior and two to the parent's behavior, were rated on a 1 (*not at all*) to 3 (*a lot*) scale. Averaging across families, mean child-reported mother-child conflict was 1.17 ($SD = .20$, R_{KF} = .99, $R_C = .75$) and father-child conflict was 1.13 ($SD = .16$, $R_{KF} = .99$, $R_C = .76$).

Frictional parenting behaviors. *(a) Parent self-report:* Eight of the nine parent-reported parent-child conflict event items that referred to the parent's own behavior assessed frictional

parenting behaviors. Across families, mothers' frictional parenting behavior was rated 1.19 (SD = .17, R_{KF} = .99, R_C = .82) on average, and fathers' was 1.11 (SD = .10, R_{KF} = .99, R_C = .77).

(b) *Child-report:* Two of the three items included in the child-report of parent-child conflict were used to measure child-reported frictional parenting behaviors. Mothers' frictional parenting behavior as reported by children was rated 1.15 (SD = .33, R_{KF} = .98, R_C = .58) on average, and fathers' was 1.12 (SD = .31, R_{KF} = .98, R_C = .60).

Parent negative mood. The daily mood scale was adapted from Cohen et al. (2003). Parents rated their own positive and negative mood on a 1 (*completely inaccurate*) to 4 (*completely accurate*) scale based on the prompt, "Please rate how accurately each of the following adjectives describe how you felt today." Eight negative mood items (e.g., "sad," "on edge," "angry") were averaged to create an overall negative mood score for the day. This mood scale has previously shown good internal reliability (Cronbach's α = .87-.93 across anxious, depressed and angry mood subscales; (S. Cohen et al., 2003). In the current study, the average mother's mean negative mood was 1.46 (SD = .33, R_{KF} = 1.00, R_C = .82) and father's was 1.34 (SD = .34, R_{KF} = 1.00, R_C = .85).

Questionnaire Measures

Parents responded to a series of one-time questionnaires online prior to completing all 56 days of daily diaries.

Parent neuroticism. The Big Five Inventory (BFI; John & Srivastava, 1999), a self-report measure of the five factor model of personality, includes 8 items measuring neuroticism. Parents' responses on these 8 items were averaged for the current study (α = .85 in this study and .87 in a previous study; John, Naumann, & Soto, 2008). Example items include "Worries a lot," and "Can be moody," rated on a 1 (*disagree strongly)* to 5 (*agree strongly*) scale. The BFI has

been validated in diverse samples and is often used in research with adults in the general population. Mothers' average score was 21.5 ($SD = 6.35$, $N = 46$; one mother declined to complete a series of questionnaires that included the BFI) and fathers' was 16.7 ($SD = 5.67$, $N = 39$). Mothers scored significantly higher than fathers ($t(83) = -3.67$, $p < .001$).

Child externalizing behavior. The Child Behavior Checklist for children aged 6-18 (CBCL; Achenbach, 1991) is a well-validated and frequently used parent-report measure of child internalizing and externalizing symptoms. It contains 113 items; 30 items measure externalizing problems, ($\alpha = .93$ in the current study). These 30 items, such as "Disobedient at school," and "Lying or cheating" rated on a 0 (*not true*) to 2 (*very true or often true*) scale, were included in the current study. Mothers' average summary rating of their children's externalizing behavior was 4.6 ($SD = 5.15$, $N = 47$, ranging from 0 to 19) and fathers' was 4.3 ($SD = 4.29$, $N = 39$, ranging from 0 to 17). Boys' and girls' scores were not significantly different ($p > .05$).

Results

The 56 consecutive days of daily diary responses were nested within 47 mothers, 39 fathers and 47 child respondents. Within-subject variation is represented in Level 1 of the model, which contains daily diary responses by parents or children. Between-subject variation is represented at Level 2.

Direct Spillover Effects and Indirect Effects of Negative Mood

The tests of the direct spillover effect and the indirect effect of negative mood as a mediator of spillover were examined in two sets of multilevel mediation models: spillover from marital conflict events to frictional parenting behavior, and from parent-child conflict events to frictional marital behavior. Both spillover models included negative mood as a mediator. Both of these models were estimated twice, using different respondents as sources of information: One

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pair of models used parent self-report to assess both the predictor and the outcome, and the second pair of models used "independent" reporter ratings (partner-reports of marital conflict and marital behavior, and child-reports of parent-child conflict and parenting behavior). These four models are represented schematically in Figure 1. Lastly, while parent gender differences are not a focus of this study, tests of spillover among mothers and fathers are presented separately for a total of eight analyses examining direct and indirect effects.

The multilevel mediation analyses were conducted by applying the multilevel mediation method recommended by Bauer, Preacher and Gil (2006), using Stata 12 software (StataCorp, 2011; UCLA: Statistical Consulting Group, 2011). Multilevel models traditionally test each mediation pathway in two separate steps: The first model tests the association between the independent variable and the mediator (the "a" pathway), and the second tests both the association between the mediator and dependent variable ("b" pathway), and the direct effect of the initial predictor on the outcome ("c'"), so that the unique effect of each can be estimated controlling for the other. These pathways are labeled on Figure 1. The approach used in this study combines these three pathways into a single mixed model that allows for covariance of random effects if the pathways from the predictor to the mediator variable and from the mediator to the outcome variable are random (Bauer et al., 2006). These mixed models resulted in estimations of total, direct and indirect mediation effects in five of the eight analyses.

In two analyses (fathers' marital conflict events predicting father-child conflict, both self-report and independent reporter models), initial separate estimations of the a pathway and the b and c' pathways revealed that the latter model could not converge with random effects of the negative mood mediator (only with random effects of the initial predictor). In one additional model (independent reports of father-child conflict events predicting frictional marital behavior),

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all random effects were estimable when the two steps were conducted separately, but the single mixed model failed to converge. As a consequence, these three analyses were not conducted using a single mixed model; instead, effects were estimated separately in the two steps described above. To obtain standard errors and confidence intervals, the results were bootstrapped with 1,000 replications. As with the effects reported in the five analyses for which the mixed mediation model successfully converged, these two-stepped analyses resulted in estimations of total, direct and indirect mediation effects. Results from the four parent self-report models are presented in Table 1, and results from the four independent-reporter models in Table 2.

As expected, the total effect of conflict events on parent behavior—not controlling for negative mood—was significant in each of the eight models tested; results of the total effect analysis are presented in the bottom line of each panel in Tables 1 and 2. Significant direct effects of spillover were also found in all eight of the tests presented in Tables 1 and 2, indicating significant associations between conflict and parent behavior even when controlling for negative mood. Same-day associations of marital and parent-child conflict with frictional parenting and marital behaviors (respectively) were robust: Spillover effects were observed in both directions, for both mothers and fathers, both in self-report models and in independent-reporter models—even when negative mood was controlled. In other words, the intensity of focal parent negative mood is not the sole explanation for within-family conflict spillover.

The indirect effects reported in the top rows of results for each model presented in Tables 1 and 2 address the role of the negative mood mediator in the association between marital conflict and frictional parenting behavior. As evidenced by the significant indirect effects, negative mood significantly partially mediated spillover in four out of eight models, and did so marginally in one additional model ($p = .055$). As can be seen in the left-hand panels of both

tables, three of the mothers' spillover models contained significant indirect effects of negative mood, including one model in which husbands and children reported on mothers' conflict events and behavior. Negative mood also significantly partially mediated the spillover of conflict in one out of four tests of fathers' frictional behavior (independent reports of the effect of father-child conflict events on fathers' marital behavior, Table 2), and marginally partially mediated the spillover of fathers' self-reported marital conflict to frictional paternal behavior (Table 1).

Moderation of Spillover

Parent Neuroticism

Parent neuroticism was hypothesized to increase the likelihood of conflict spillover. Maximum likelihood multilevel models were estimated using Stata 12 software (StataCorp, 2011). As with the negative mood mediation analyses described above, eight spillover models were estimated, removing negative mood as a mediator and adding parent neuroticism as a moderator. A first-order autoregressive variance-covariance matrix was applied to all eight models to allow Level 1 residuals to covary across days.

To illustrate, in the following multilevel equation, parent neuroticism moderates spillover from marital conflict to frictional parental behavior:

$$\text{Frictional Parental Behavior}_{ij} = \gamma_{00} + \gamma_{10}(\text{Marital Conflict}_{ij}) + \gamma_{01}(\text{Neuroticism}_j) +$$

$$\gamma_{11}(\text{Marital Conflict}_{ij}*\text{Neuroticism}_j) + u_{1j}(\text{Marital Conflict}_{ij}) + u_{0j} + e_{ij} ,$$

where frictional parental behavior for parent j on day i is a function of the daily effect of marital conflict (γ_{10}), the effect of the parent's neuroticism score (γ_{01}), the interaction between the neuroticism score and the daily marital conflict rating (γ_{11}), and error at Level 1 and Level 2.

Only one of the eight tests found a significant interaction with parent neuroticism. Fathers' neuroticism moderated fathers' self-reported spillover from marital conflict to parenting

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behavior, such that higher paternal neuroticism scores were associated with a higher likelihood of spillover. This moderation effect, labeled "Neuroticism x Marital Conflict" in the top panel of Table 3, was not observed among mothers. Parental neuroticism did not significantly moderate spillover from parent-child conflict to marital behavior in either mothers or fathers ($p = .87$ and .90, respectively), or any spillover effects when based on the daily reports of independent raters ($p = .19$ for both mothers' and fathers' marital conflict predicting parenting behavior, and $p = .73$ and .90 for mothers' and fathers' parent-child conflict predicting marital behavior, respectively).

Child Externalizing Behavior

Child externalizing behavior was also hypothesized to exacerbate spillover between marital and parent-child interactions. Models analogous to those described above were estimated with child externalizing scores tested as a moderator. Significant interactions were found in three of the eight models. The results are shown in the lower two panels of Table 3. Child externalizing behavior moderated both mothers' and fathers' self-reported spillover from marital conflict to parenting behavior, such that parents of children high in externalizing behavior were significantly more likely to experience spillover from marital conflict to frictional parenting behavior. Independent reporters corroborated mothers' self-report, such that father-report of marital conflict interacted with child externalizing to predict child-report of same-day frictional maternal behavior; the same was not true of independent reports of fathers' spillover from marital conflict to paternal behavior ($p = .88$). As with parent neuroticism, child externalizing scores did not significantly moderate spillover from parent-child conflict to frictional marital behavior in either mothers' or fathers' self-reports ($p = .63$ and .41, respectively) or according to independent reports of mother and father behavior ($p = .55$ and .66, respectively).

Discussion

Across 56 days of reporting, mothers and fathers of 8-13 year olds were reliably more likely to express irritation, punish, nag, or yell at their children, and nag, disagree with, ignore or disregard the needs of their spouses, on days when they experienced conflict events with the other family member. There was evidence of conflict spillover not only in parents' self-reports, but also when behavior and interactions were described by spouses and children. The corroboration of other family members' perceptions indicates that the spillover effect reflects observable changes in behavior and not merely the parent's attentional bias due to negative mood. This is a particularly important finding given that conflict events and mood were all reported at the same time at the end of the day. The robustness of these spillover findings is especially striking in the context of the relatively low levels of conflict reported.

Mediating Effect of Negative Mood on Spillover

Negative mood intensity partially mediated spillover from conflict events to parents' frictional behavior with their family members in a number of cases: mothers' self-reported spillover from conflict events with husbands or children to their behavior with the other family member, and independent reports of mothers' spillover from the marital to the parent-child dyad and fathers' spillover in the reverse direction. The negative mood mediation findings in the context of a daily within-subjects design suggest that spillover is often promoted by short-term fluctuations in emotions. Despite the role that negative affect plays in spillover, a significant direct association between conflict events in one dyad and behavior in the other dyad remained in all models even after controlling for negative mood. In other words, spillover also appears to occur even in the *absence* of conscious negative mood. Alternative processes that may contribute to spillover include parents' attributions and tolerance for unwanted behavior, which are not necessarily contingent on experiencing intense negative mood. For example, parents may

experience friction if one believes the other failed to support a decision made during a difficult parent-child interaction. In addition, ego depletion, defined as a deficit in self-regulatory strength, diminishes performance on self-control tasks (Hagger, Wood, Stiff, & Chatzisarantis, 2010): Spillover may be occurring in the context of parents' momentarily reduced self-regulatory capacity, with or without the contribution of negative mood. Fatigue and individuals' perceptions of the difficulty of the self-regulatory task are both significant contributors to ego depletion (Hagger et al., 2010).

An additional contributor to spillover as it is tested in this study could be timing: Marital and parent-child conflict may sometimes co-occur rather than occurring in sequence. For example, a single episode of a child's misbehavior may generate tense negotiations between parents about an appropriate response as well as reprimands of the child. Lastly, even very low levels of negative mood may be sufficient to increase the likelihood of conflictual behavior (feelings of mild irritation, as opposed to full-blown anger). In other words, there may be a threshold effect, whereby subtle or fleeting changes in mood affect a parent's attributions and ability to tolerate interpersonal problems that arise. Those brief flares of negative mood may not be reflected in this study's end-of-day ratings, which are more likely to represent the parent's average or typical mood that day. For both of these reasons, this study's daily protocol was not ideally suited to testing the meditational model's presumed sequence of events (i.e., a conflict, followed by a change in mood, followed by a change in behavior).

Moderators of Spillover: Parent Neuroticism and Child Externalizing

Given the strong association between negative mood and within-family conflict spillover, it was hypothesized that the spillover pattern would be exacerbated for parents who have chronic difficulties with reactivity to and recovery from stressful events. The only evidence consistent

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with that prediction was higher rates of spillover from marital conflict to parenting behavior among fathers who reported higher levels of neuroticism. There is precedent for the differential effect of neuroticism on spillover in mothers and fathers; one naturalistic observational study similarly found that fathers' (but not mothers') neuroticism increased spillover from work stress to negative social behavior with their families (Wang et al., 2011). The limited evidence of a moderating role of neuroticism, though, generally seems to indicate that within-family conflict spillover is a robust phenomenon throughout this sample of parents. Specifically, the data indicate that spillover is driven more by parents' day-to-day fluctuations in mood than their tonic levels of negative affect. Simply put, parents are more likely to experience spillover on days when they experience a heightened negative mood ("state" negative affect), regardless of whether or not they generally experience high "trait" negative affect.

Consistent with the second moderation hypothesis, fathers' and mothers' self-reports and independent reports of mothers' behavior suggested higher rates of spillover from marital conflict to parenting behavior if the focal parent had described the target child as generally exhibiting more externalizing behavior. Children who display more uncontrolled behavior may be more likely to respond to marital discord with misbehavior, which then may instigate reprimands or punishment from parents. Recovery from a tense interaction with a spouse may be particularly challenging when attempting to cope with problematic child behaviors. Additionally, longitudinal research has found evidence that the association between marital conflict and youth externalizing behavior is mediated by parent-youth conflict (Gerard, Krishnakumar, & Buehler, 2006): It may be that the daily findings in this study reflect longstanding family conflict spillover patterns that, over time, have contributed to the development of child externalizing behavior. There was no evidence that child externalizing moderated spillover from parent-child conflict to
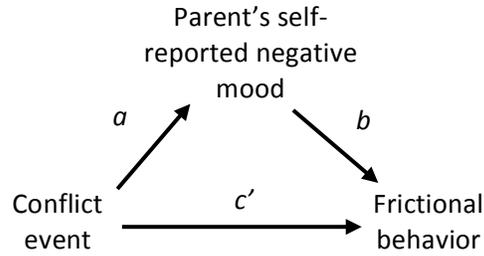
frictional marital behavior.

Limitations and Future Directions

As mentioned above, the simultaneous measurement of negative mood, conflict events and behavior once each day was a constraint for the mediation analyses. For example, negative mood may have preceded (or coincided with) both conflict events, rather than being instigated in one dyadic interaction and transmitted to a subsequent interaction with another family member. Assessment of family conflict and mood at several time points throughout the day would better address the hypothesized sequential nature of spillover. Another notable limitation of this study is the relatively small sample of families, which limited statistical power to test between-subjects hypotheses, such as the effects of parent neuroticism and child externalizing behavior.

The low levels of family conflict that were typically reported by the participants in this study are not inherently dangerous: indeed, children may learn how to cope with disagreements through observing and practicing conflict resolution strategies at home. Spillover may be the rule rather than the exception, which indicates that some "leakage" of irritability and conflict from dyad to dyad is a normal part of daily family life. Longitudinal studies that incorporate intensive repeated measures methodologies such as ecological momentary assessment would be well equipped to ascertain the point at which within-family conflict spillover begins to signal a possible threat to the well-being of families and their individual members. Interventions for families at high risk for marital and parent-child conflict would benefit from continued targeted research on the behavioral mechanisms by which spillover occurs.

Figure 1

Diagram of the Direct Spillover Effect and Indirect Effect of Negative Mood

	Parent's self-reported negative mood	
	a b	
Conflict event	c'	Frictional behavior

Model 1	Self-reported marital conflict event	Self-reported frictional parental behavior
Model 2	Self-reported parent-child conflict event	Self-reported frictional marital conflict behavior
Model 3	Spouse-reported marital conflict event	Child-reported frictional parental behavior
Model 4	Child-reported parent-child conflict event	Spouse-reported frictional marital behavior

Table 1

Tests of Direct Effects of Conflict Events and Indirect Effects of Negative Mood on Parent Frictional Behavior: Parent Self-Report

(a) Marital conflict predicting frictional parenting behavior

Effect	Mothers					Fathers				
	B	(SE)	*z*	*p*	95% CI	B	(SE)	*z*	*p*	95% CI
Indirect effect of negative mood	0.08	(0.03)	2.70	*.007*	0.02 - 0.14	0.02[a]	(0.01)	1.92	*.055*	-0.00 - 0.03
Direct effect of marital conflict	0.19	(0.05)	3.77	*<.001*	0.09 - 0.29	0.21	(0.04)	4.72	*<.001*	0.12 - 0.29
Total effect	0.27	(0.06)	4.74	*<.001*	0.16 - 0.38	0.22	(0.04)	5.22	*<.001*	0.14 - 0.30

(b) Parent-child conflict predicting frictional marital behavior

Effect	Mothers					Fathers				
	B	(SE)	*z*	*p*	95% CI	B	(SE)	*z*	*p*	95% CI
Indirect effect of negative mood	0.03	(0.01)	2.17	*.030*	0.00 - 0.05	0.01	(0.01)	0.83	*.406*	-0.01 - 0.03
Direct effect of parent-child conflict	0.12	(0.03)	4.27	*<.001*	0.07 - 0.18	0.15	(0.05)	3.24	*.001*	0.06 - 0.25
Total effect	0.15	(0.03)	4.94	*<.001*	0.09 - 0.21	0.16	(0.05)	3.32	*.001*	0.07 - 0.26

[a] Model failed to converge with random effect of mediator, so pathways were examined separately but with random effect of marital conflict; effects reported are bootstrapped with 1000 replications

Table 2

Tests of Direct Effects of Conflict Events and Indirect Effects of Negative Mood on Parent Frictional Behavior: Independent Reporters

(a) Marital conflict (partner-report) predicting frictional parenting behavior (child-report)

	Mothers					Fathers				
Effect	B	(SE)	*z*	*p*	95% CI	B	(SE)	*z*	*p*	95% CI
Indirect effect of negative mood	0.07	(0.03)	2.06	*.039*	0.00 - 0.14	0.01[a]	(0.01)	1.01	*.311*	-0.01 - 0.02
Direct effect of marital conflict	0.25	(0.08)	3.03	*.002*	0.09 - 0.42	0.11	(0.06)	1.98	*.048*	0.00 - 0.23
Total effect	0.33	(0.09)	3.50	*<.001*	0.14 - 0.51	0.12	(0.06)	2.13	*.033*	0.01 - 0.23

(b) Parent-child conflict (child-report) predicting frictional marital behavior (partner-report)

	Mothers					Fathers				
Effect	B	(SE)	*z*	*p*	95% CI	B	(SE)	*z*	*p*	95% CI
Indirect effect of negative mood	0.01	(0.01)	1.37	*.171*	-0.01 - 0.03	0.01[b]	(0.004)	2.28	*.023*	0.00 - 0.02
Direct effect of parent-child conflict	0.08	(0.03)	2.65	*.008*	0.02 - 0.14	0.08	(0.04)	2.37	*.018*	0.01 - 0.15
Total effect	0.09	(0.03)	2.81	*.005*	0.03 - 0.16	0.09	(0.04)	2.58	*.010*	0.02 - 0.16

[a] Model failed to converge with random effect of mediator, so pathways were examined separately but with random effect of marital conflict; effects reported are bootstrapped with 998 of 1000 attempted replications

[b] Mixed model failed to converge with all random effects included, so mediation pathways were examined separately but with random effects; effects are bootstrapped with 966 of 1000 attempted replications

Table 3

Moderators of Spillover from Marital Conflict to Frictional Parenting Behavior

	Mothers				Fathers			
	B	(SE)	*z*	*p*	B	(SE)	*z*	*p*
Parent Neuroticism: Parent self-report								
Intercept	0.72	(0.21)	3.50	*<.001*	1.14	(0.16)	7.20	*<.001*
Marital Conflict	0.32	(0.21)	1.52	*.13*	-0.09	(0.16)	-0.55	*.59*
Neuroticism	0.01	(0.01)	0.86	*.39*	-0.02	(0.01)	-1.81	*.07*
Neuroticism x Marital Conflict	-0.00	(0.01)	-0.24	*.81*	0.02	(0.01)	2.08	*.04*
Child Externalizing: Parent self-report								
Intercept	0.92	(0.06)	14.38	*<.001*	0.98	(0.07)	13.89	*<.001*
Marital Conflict	0.17	(0.06)	2.70	*.01*	0.08	(0.07)	1.07	*.28*
Externalizing	-0.01	(0.01)	-0.60	*.55*	-0.03	(0.01)	-2.27	*.02*
Externalizing x Marital Conflict	0.02	(0.01)	2.13	*.03*	0.04	(0.01)	3.06	*.002*
Child Externalizing: Independent reporters								
Intercept	0.99	(0.13)	7.44	*<.001*	0.94	(0.08)	12.40	*<.001*
Marital Conflict	0.13	(0.11)	1.15	*.25*	0.16	(0.07)	2.37	*.02*
Externalizing	-0.03	(0.02)	-1.66	*.10*	0.01	(0.01)	0.62	*.54*
Externalizing x Marital Conflict	0.04	(0.02)	2.46	*.01*	-0.00	(0.01)	-0.15	*.88*

Appendix B-1

Daily Diary Marital Conflict Items[a]

My behavior			

Please rate each of the following statements about your interaction with your partner today:	*Not at all*	*Some*	*A lot*
1. I expressed anger or irritation at my partner	1	2	3
2. I hit, pushed or shoved my partner	1	2	3
3. I nagged my partner	1	2	3
4. I ignored my partner's wishes or needs	1	2	3
5. I took my partner's feelings lightly	1	2	3
6. My partner and I disagreed about a child-related issue	1	2	3
7. My partner and I disagreed about an issue unrelated to children	1	2	3

Partner's behavior			

Please rate the degree to which your partner did the following today:	*Not at all*	*Some*	*A lot*
1. Expressed anger or irritation at me	1	2	3
2. Hit, pushed or shoved me	1	2	3
3. Nagged me	1	2	3
4. Ignored my wishes or needs	1	2	3
5. Took my feelings lightly	1	2	3

[a]One item from each scale ("my behavior" and "partner's behavior") was removed from the original 14-item marital conflict scale due to content that better mapped onto a social withdrawal construct than on a conflict construct ("I felt distant or withdrawn from my partner" and "My partner seemed distant and withdrawn from me").

Appendix B-2

Daily Diary Parent-Child Conflict Items

Parent report

Please complete the following sentences: Today, I…	*Not at all*	*Some*	*A lot*
1. ...punished my child	1	2	3
2. ...nagged my child	1	2	3
3. ...yelled at my child	1	2	3
4. ...was irritated with my child	1	2	3
5. ...was angry with my child	1	2	3
6. ...had to warn my child s/he might be punished	1	2	3
7. ...had to tell my child to stop doing something	1	2	3
8. ...had to ask my child to do something (chore) more than once	1	2	3
9. How angry was your child at you today?[a]	1	2	3

Child report

Please tell us about your day with your MOM/DAD[b]:	*Not at all*	*Some*	*A lot*
1. My mom/dad got mad at me today	1	2	3
2. I was angry at my mom/dad today[a]	1	2	3
3. My mom/dad punished me today	1	2	3

[a]These items were included in the parent-child conflict event score, but not in the parent's

frictional parenting behavior score.

[b]Children rated interactions with their mothers and fathers separately.

STUDY 3

Coping strategies and emotional intensity

as daily mechanisms of stress generation and negative mood reactivity

Decades of research have established strong ties between stress and mental health. The diathesis-stress model, which states that stressful events serve as triggers for the onset of mental illness, is the most widely applied theory that explains the high rates of life stressors seen in individuals diagnosed with psychiatric disorders. Other theories, however, point to a more complex interrelationship between stress and mental illness. Hammen (1991) observed that individuals with a history of depression experience more than the average number of "dependent" stressors (stressors to which their own actions contribute, most often negative interpersonal events; Liu & Alloy, 2010), whereas they seem to experience a typical number of "independent" stressors (stressors unlikely have been determined by the individual's action; e.g., death of a loved one, natural disaster). She theorized that some quality of depression or depressed individuals caused them to experience higher rates of stressful events, as opposed to depression being caused by higher rates of stressful events (Hammen, 1991; Liu & Alloy, 2010). This phenomenon is known as *stress generation*.

Stress generation has been thoroughly documented in a series of daily diary studies in which measures of depression prospectively predict the number of stressful daily life events that are documented over the course of several days or weeks (see Liu & Alloy, 2010 for a review). Though stress generation was first identified in the context of unipolar depression, several other indices of mental health have also been associated with the generation of dependent stressors, including anxiety and personality disorder traits (particularly borderline, narcissistic and

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histrionic; Daley, Hammen, Davila, & Burge, 1998; Hammen, 1991, 2006; Uliaszek et al., 2012).

It remains unclear, however, *how* these symptom profiles impact the stressful events an

individual encounters on a day-to-day basis.

Cross-sectional research has identified a number of factors as being associated with stress

generation. These include high negative affectivity combined with stress reactivity (Hankin,

2010), neuroticism (Bolger & Schilling, 1991; Kercher, Rapee, & Schniering, 2009),

introversion (Uliaszek et al., 2012), avoidance coping (Holahan, Moos, Holahan, Brennan, &

Schutte, 2005), poorer ability to manage conflict, provide emotional support to others, and

initiate new interactions or relationships (J. A. Cummings, Hayes, Laurenceau, & Cohen, 2010),

negative styles of solicitation, receipt and provision of marital support (Davila, Bradbury, Cohan,

& Tochluk, 1997), incongruence in non-verbal expressions of involvement in conversations with

interviewers (Bos, Bouhuys, Geerts, van Os, & Ormel, 2007), negative cognitive styles (e.g.,

self-criticism and rumination; Liu & Alloy, 2010), and anxious and avoidant attachment

(Bottonari, Roberts, Kelly, Kashdan, & Ciesla, 2007; Hankin, Kassel, & Abela, 2005). The

question remains, however: What is happening on a *daily* basis to give rise to these stressors?

Bolger and Zuckerman (1995) proposed four daily processes by which personality traits

might affect mental health outcomes: by (a) increasing exposure to stressors, (b) increasing

reactivity (i.e., distress responses) to a typical number of stressors, (c) impairing coping strategy

selection, such that less effective coping strategies are used, and (d) reducing the efficacy of the

coping strategies that are chosen (even if the same strategy could be used effectively by another

person). The extant stress generation literature offers clear evidence to support the first proposal:

depression and a number of other personality traits and symptom profiles do increase the

likelihood that stressful interpersonal events will occur. A recent study clarified the stress

generation findings even further: not only did depressed and anxious individuals experience higher rates of dependent stressors, but the authors determined that these higher rates were *not* accounted for by the continuation of stressors originating prior to the depressive episode (Uliaszek et al., 2012).

I propose that Bolger and Zuckerman's (1995) four processes operate together to create a pathway from overall patterns of behavior and functioning to stress generation and mental health outcomes, such that the latter three daily processes (reactivity, coping strategy selection, and coping effectiveness) play a significant role in explaining why some individuals experience higher exposure to stressful daily interpersonal events. To test this hypothesis, the present study uses experience sampling methods. Diaries were delivered online via cell phone four times a day for five days to study the within-day mood, coping and stressor patterns that, accumulated, are hypothesized to account for the association between individual traits and stress generation.

Reactivity

Studies of daily life have observed that emotional and behavioral change often occurs following stressful experiences, and persists even once an individual has left the stressful environment (Erel & Burman, 1995; Repetti, 1989). This process is known as *spillover*. It is presumed that negative mood resulting from a stressful event "spills over" into new contexts, causing the individual to behave in a more irritable, conflictual or withdrawn manner in the new setting (Schulz et al., 2004; Story & Repetti, 2006).

If stressors are defined as events that generate subjective feelings of being distressed or overwhelmed, or more generally that generate negative affect, then in many cases the behavior or interaction that results from the spillover process may also function as a new stressor. For example, a negative interaction at work and consequent work-related stress spills over into the

romantic relationship and leads to conflict, which is a stressor in its own right; discord with the romantic partner may then spill over into a third context, a third to a fourth, and so on. The potential for cascading stressors would mean that individuals who are particularly prone to spillover (e.g., those who are highly emotionally reactive) would be at risk to experience far more than the average number of daily stressful events. An example of a trait that might be associated with vulnerability to this cascading stressor effect is neuroticism, which is known to predict higher depressive and angry emotional reactions to stressors (i.e., higher reactivity), and is also associated with higher rates of interpersonal stressor occurrence (Bolger & Zuckerman, 1995; Kercher et al., 2009). Spillover is thus hypothesized to contribute to stress generation through reactivity processes. Specifically, I hypothesize that stressful events will result in the generation of additional dependent stressful events in the short-term, and that this pathway is mediated by elevations in negative mood. This is demonstrated visually in Figure 1, on the pathway marked "Reactivity."

The term spillover traditionally refers to the effects of one event on the individual's experience in another context; for example, a conflict with a partner being followed a few hours later by another conflict with that same partner would not be considered spillover. It might be described as essentially a recurrence or continuation of the original stressor. This study tests whether some individuals are more prone to experience new, particularly interpersonal, stressors as a result of previous stressors. This extension of stressors could occur in at least two ways: Vulnerable individuals fail to effectively regulate their negative mood following a stressful experience and thereby generate new stressor in a new environment (i.e., spillover), or experience a new event in the same context, such as repeated but distinct conflicts with the same individual. Both processes constitute one stressor generating a new stressor. As such, I do not

differentiate between stressful events that occur across contexts or within one context. Thus, I refer to this extension of daily stressors by which an initial stressor leads to a secondary stressor as *stress kindling*. This concept of kindling is borrowed from the depression literature, where it refers to the increasing likelihood of experiencing new depressive episodes following each past episode (Post, Rubinow, & Ballenger, 1986).

Choice of Coping Strategy

Poor coping strategy selection is hypothesized to be a second daily process by which stress generation occurs. Coping behaviors and cognitive appraisals are viewed as critical mediators between stressful experiences and their outcomes (Lazarus & Folkman, 1984). Emotional reactivity and stress kindling are presumably less likely to occur if individuals select highly effective coping strategies that minimize their affective and behavioral stress responses. Coping should impact stress kindling in one of two ways: effective coping should either minimize the negative mood reaction in the first place (by moderating the link between the initial stressor and the resultant negative mood), or prevent the negative mood reaction from adversely affecting behavior (by moderating link between the negative mood reaction and a later stressful event). In other words, the coping strategy is hypothesized to moderate the mediation of stress kindling by negative mood, as is pictured in the pathway in Figure 1 labeled "*Process #2*."

Coping behaviors have sometimes been categorized in terms of "problem-approach" strategies, which include actions designed to affect the stressful situation, and "avoidance" strategies, in which individuals do not engage with a problem. Cross-sectional studies of participants' typical patterns of coping have shown that problem-solving is associated with overall higher positive affect and lower negative affect, whereas avoidance is associated with lower positive and higher negative affect (Ben-Zur, 2009). Along these lines, daily process

studies found that students who reported having avoidance goals (as opposed to approach goals) were more likely to experience negative events throughout their semester (Elliot, Thrash, & Murayama, 2011), and individuals who reported using more distraction or relaxation-oriented coping techniques, which are forms of avoidance coping, reported higher negative affect at the end of the day (Gunthert, Cohen, & Armeli, 1999).

Depression, personality disorders, and neuroticism are associated with the tendency to use avoidance coping (Bijttebier & Vertommen, 1999; Holahan et al., 2005; O'Brien & DeLongis, 1996), and patterns of avoidance have generally been linked to more negative long-term mental and physical health outcomes than approach coping (Elliot et al., 2011; O'Brien & DeLongis, 1996). However, in other research, avoidant coping does *not* predict more negative affect following stressful experiences (Dunkley, Zuroff, & Blankstein, 2003). In fact, benefits of avoidance have been identified, particularly in uncontrollable situations (e.g., awaiting a possible cancer diagnosis; Heckman et al., 2004), and/or when resources are overwhelmed and capacity for problem-solving or emotional processing is exceeded (e.g., if a person is extremely emotionally charged; Elliot et al., 2011; Suls & Fletcher, 1985). One daily diary study found that women's daily self-reported reassurance-seeking was associated with same-day romantic partner conflict (Eberhart & Hammen, 2009). These findings implicate verbally confrontive behavior and social engagement as increasing risk of interpersonal stress (in this case, conflict). Another study found that confrontive coping typically resulted in more depressed mood, and that high-neuroticism individuals were more likely than low-neuroticism individuals to engage in confrontive coping, which resulted in higher rates of depressed mood among those high in neuroticism (Bolger & Zuckerman, 1995).

Social withdrawal may have a short-term protective role in reducing the risk of conflict,

despite potentially negative consequences associated with chronic withdrawal in relationships (Wang et al., 2011). A withdrawal from social situations may impede stress kindling by allowing stressed individuals time to recover from negative emotion arousal and by reducing the likelihood of conflict-inducing approach-coping behaviors like reassurance-seeking or expressing anger (Larson & Gillman, 1999; Repetti, 1992; Story & Repetti, 2006). In short, strong patterns of avoidance or problem-solving may suggest that an individual is relying too much on one coping strategy, but these patterns do not definitively indicate that the individual is inappropriately selecting that strategy on a case-by-case basis (Roth & Cohen, 1986).

Coping Efficacy

These contrasting findings around the effects of avoidance and problem-solving are one example of the overall lack of success researchers have had categorizing coping strategies as across the board adaptive or maladaptive. The success of a given coping attempt appears to depend on a variety of circumstances, including (but not limited to) features of the situation, such as the controllability of the event or the individual's affective intensity at that moment, and features of the individual, such as personal capabilities (Lazarus, 1993). I hypothesize that the efficacy with which coping is attempted in its specific context plays a role in determining whether or not stress kindling occurs.

Features of the Situation: Negative Affect

Emotional reactivity plays a key role in the stress kindling hypothesis presented here, by virtue of its capacity to create both more intense and longer-lasting negative moods that affect an individual's behavior even after a stressor is no longer present. I additionally hypothesize that affective intensity is one factor that may affect coping efficacy. The clinical literature suggests that if individuals are highly affectively charged, short-term reductions of negative emotion may

be required in order for the individual to avoid escalating a stressful situation if they choose to approach the problem head-on (Linehan, 1993), whereas when individuals are *not* highly affectively charged, action towards a goal may generate more positive long-term outcomes (Dimidjian et al., 2006). Thus, some coping behaviors (e.g., avoidance behaviors like social withdrawal or distraction) may be effective only in the context of intense negative affect, whereas other coping behaviors (e.g., problem-solving) may be effective only in the context of zero to moderate negative affect. In other words, the effect of specific coping behaviors on stress kindling processes may be moderated by the intensity of negative affect at the time of the coping attempt. This hypothesis is represented by the third pathway in Figure 1, "Coping Effectiveness," in which the intensity of the negative mood experienced at the time of coping is hypothesized to affect whether or not problem-solving or avoidance effectively decrease stress kindling and negative mood reactions to stressors.

Features of the Individual

When asked about the efficacy of their coping attempts throughout the day, individuals who reported that they had been unsuccessful in their attempts to cope were found to have higher negative affect at the end of the day, and this was particularly true for those high in neuroticism (Gunthert et al., 1999). Bolger and Zuckerman (1995) found that low-neuroticism individuals experienced depression when they used escape-avoidance coping techniques, but high-neuroticism individuals did not; they also found that low-neuroticism individuals who reported exerting self-control were less likely to experience depressed mood at the end of the day, whereas high-neuroticism individuals who did so were more likely to report depressed mood. Another study found that problem-focused coping was ineffective at reducing negative affect among self-critical perfectionists (Dunkley et al., 2003). A cross-sectional study found that

individuals high on neuroticism or agreeableness who reported using avoidance coping experienced more negative affect, whereas individuals low in agreeableness who reported using avoidance coping experienced more positive affect (Roesch, Aldridge, Vickers, & Helvig, 2009).

There is a possibility that a unique factor outside of mood reactivity, coping selection and coping efficacy exists as a part of these personality traits and symptom profiles and uniquely contributes to stress kindling. For example, people with certain traits or disorders (such as depression) may experience more distress when they encounter stressors to which they have a particular vulnerability (such as social stressors), an idea known as the Congruency hypothesis (Dunkley et al., 2003). To account for unique individual-level factors independent of the daily processes described above, this study examines depression, neuroticism, and other symptom and personality profiles as moderators of stress kindling and its hypothesized processes.

Measuring Stress and Coping

Momentary assessment techniques are critical to addressing the day-to-day stress generation and coping processes described above. One reason is that these techniques decrease participant cognitive burden: retrospective reports of stressors and coping behaviors require that participants recall past events, aggregate them into "average" behavior, and often even attempt to compare their own behavior against the hypothetical average person. Evidence shows that cross-sectional questionnaires do not compare well to momentary assessments of coping behaviors (Schwartz, Neale, Marco, Shiffman, & Stone, 1999; Slatcher, Robles, Repetti, & Fellows, 2010). One study found that participants' recall of coping behaviors used even within as short a period as the last two days showed significant divergence from reports made every 20 to 60 minutes throughout those same two days (Stone et al., 1998). Studies also suggest that when participants are asked to aggregate their own behavior across a broad span of time, they are more susceptible

to biases associated with social heuristics and beliefs about themselves (Porter et al., 2000). Momentary associations between affect and daily stressors and behavior can also be addressed more readily using this momentary assessment strategies: because spillover is generally observed to be a short-term process, occurring within minutes to hours, having several observations within a day as was done in this study allowed us to capture short-term stress kindling processes.

A second strategy used in this study to limit perceptual biases was to employ behaviorally-specific language in the daily coping assessments. Individuals do not necessarily consciously practice specific behaviors to manage feelings of stress; for example, someone may attribute eating a cookie to a chance craving or to hunger without interpreting the act of eating comforting food as an attempt to reduce stress. Thus, in this study "coping behaviors" are behaviors commonly associated with avoidance and problem-solving coping without necessarily being assigned to specific stressors or interpreted as "coping" by the participant.

Unlike individual daily stress and coping behaviors, models of psychopathology, personality traits and psychological functioning are defined by aggregations of emotional, cognitive and behavioral patterns across time. Using multilevel modeling techniques, this study examines day-to-day associations between changes in the environment and in the participant's mood and behavior (referred to as "level 1" or within-subject associations). It also examines how these processes are associated with overall psychological functioning (referred to as "level 2" or between-subject variables). By examining level 1 moderators of associations between stressful experiences, affect and behavior, we can watch stress kindling processes unfold at a microscopic level. By examining level 2 moderators of within-subject associations, we are able to determine how facets of overall psychological functioning like depressive symptoms interact with daily experiences to predict behavior, over and above the influence of proximal events.

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Study Aims

1. Stress kindling: Test whether or not the level of distress associated with stressor occurrence endorsed at one time point ("stressful events" hereafter) predicts a higher likelihood of an interpersonal stressor occurring on the next time point.

2. Reactivity:

    a. Test whether or not stressful events endorsed on one survey predict a higher negative mood later that day.

    b. Examine negative mood as a mediator of the association between stressful events and later interpersonal stressor occurrence (i.e., stress kindling).

3. Coping strategy selection:

    a. Test avoidance and problem-solving as moderators of stress kindling.

    b. Test avoidance and problem-solving as moderators of negative mood reactivity.

4. Coping effectiveness:

    a. Examine intense negative mood as a moderator of the effectiveness of avoidance and problem-solving as moderators of stress kindling.

    b. Examine intense negative mood as a moderator of the effectiveness of avoidance and problem-solving as moderators of negative mood reactivity.

5. Examine the roles of depressive symptomatology, BPD symptomatology, neuroticism, interpersonal functioning, social role (e.g., academic/work) functioning, and symptom distress in stress kindling, negative mood reactivity, and coping strategy selection.

    a. Test associations between these psychopathology and functioning measures and stress kindling.

    b. Test associations between these psychopathology and functioning measures and

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negative mood reactivity.

    c.   Assess individual-level associations between stressor occurrence and coping

behavior use, and measures of psychopathology and functioning.

Method

Participants

A total of 137 students (110 women, 27 men) participated in the study. Participants had

an average age of 20.8 (*SD* = 3.02) and were evenly dispersed across the first four years of

college (28% in their first year, 23% in each of the second, third and fourth years, and 3% in

their fifth year or higher). In terms of ethnic background, 51% reported that they were of

primarily Asian descent, 29% Caucasian, 12% Latino, 1% African-American and 7% mixed or

other. When asked about romantic relationships, 50% of the participants reported that they were

single and not dating anyone, 13% were single but dating, 34% had a boyfriend or girlfriend, and

3% were married.

Procedure

Undergraduate students were recruited through psychology classes and were awarded

course credit for completion of the study's procedures. All students over the age of 18 were

eligible to participate. Students were able to view a brief synopsis of the study and sign up for a

baseline session on an online portal through the Psychology department website. During the

baseline session, a research assistant obtained informed consent, practiced the study procedures

to troubleshoot any technical problems, and scheduled the daily surveys to ensure there were no

significant conflicts with participants' schedules. During this meeting participants also filled out

a series of questionnaires (see "Materials" for a description of the questionnaires). On the

Tuesday following the baseline session, participants received their first daily surveys.

Participants completed four daily surveys per day for five days at the time points scheduled during their baseline sessions.

The span of five days (Tuesday through Saturday) was chosen for the daily surveys to capture three consecutive days during which most students attend class (Tuesday through Thursday) and at least one weekend day (Saturday) so as to contrast a day of "recovery" with weekdays. Survey time points were scheduled according to the participant's needs, aiming for 3 to 4 hour gaps between time points. On average, participants scheduled their surveys for 10:45am, 2:00pm, 6:00pm and 9:50pm. Participants received email and text-message reminders reading, "Survey time!" with a link to the appropriate daily survey at their individually scheduled times. Email and text message reminders were pre-scheduled using a secure online program called "Lettermelater," and surveys were administered using the secure online program Surveymonkey.com.

The surveys were, on average, taken within 15 minutes of their scheduled time. The number of course credits each participant received was dependent on the number of surveys completed on time (i.e., taken within an hour of receiving their reminder): participants received all 5 available credits if 18 out of 20 of the surveys were completed on time, 4 credits if they completed 16-17 surveys on time, and so on. Response rates were excellent: 94% of all surveys were completed within one hour of the scheduled survey time, with no substantive differences in response rate associated with time of day or day of the week. On average, each participant completed 18.7 ($SD = 1.5$) out of the maximum 20 observations, resulting in a total of 2,559 observations.

Measures

Daily Diaries

Mood. The 14-item daily diary mood scale was adapted from Cohen et al. (2003).

Participants rated their own positive and negative mood on a 1 (*not at all*) to 7 (*extreme*) scale

based on the prompt, "Please rate how well each of the following adjectives describes how you

have felt since you woke up this morning," or, in the case of afternoon surveys, "…since you

took your last survey." Six items assessed positive mood (e.g., "lively," "cheerful," "at ease"),

and eight items assessed negative mood (e.g., "sad," "on edge," "angry"); all items can be

viewed in Appendix C-1. Scores on these items were averaged at a daily level for an overall

positive mood score (mean across all observations: 3.71, *SD* = 1.22) and negative mood score

(mean = 2.17, *SD* = 1.08). Studies have found these scales to have good internal reliability

(Cronbach's alphas ranging from .87 to .93 across subscales; Cohen et al., 2003).

Intense negative mood. In addition to the average negative mood score, an "intense"

negative mood score was developed to determine the extent to which extreme emotional distress

contributes to coping efficacy. This consisted of a rating scale in which the negative mood

ratings reported during a given observation were coded as "1" if they averaged at or above a

score of 4 (n = 212 observations, or 7% of the total number of observations) and as a "0" if they

averaged at or below a score of 2 (n = 1,312 observations, or 51% of the total). Scores between 2

and 4 were coded as missing in this variable.

Stressors. The 10 items on the stressful events checklist assessed recent stressful work,

school, financial, and interpersonal events. The list of items presented in Appendix C-2 were

either written for the purposes of this study or were adapted from the Live Events and Coping

Inventory (Dise-Lewis, 1988). Example items include: "Had a fight, conflict or argument with

someone," and "Had a financial problem (e.g., unexpected cost)." All items were rated as either a

0 (*Has not occurred since last survey*) or, if the event did occur, on a 1 (*Not at all distressing*) to

5 (*Extremely distressing*) scale, and participants were specifically asked to refer to events that had occurred within the hours since waking or since the last survey was taken, whichever occurred most recently. The average number of times the respondents endorsed each item with a distress rating of at least 2 (*slightly distressing*) is presented in Figure 2.

Stressful events. A summary score was calculated to represent the occurrence of these stressful events as well as the subjective distress associated with those stressors reported by the participant: each rating (ranging from 0 to 5) of each of 10 items was summed for each survey. The mean stressful events score was 6.35 ($SD = 6.14$, range 0 to 33).

Interpersonal stressors. In addition to the stressful events score, the five items associated with interpersonal stressors (noted in Appendix C-2) were selected out to create an interpersonal stressors subscale. The score is a sum of the number of stressful interpersonal events reported at that survey time: events were rated as a "1" if the participant had rated that item at a distress level of 2 (*slightly distressing*) or higher; because 5 items were included, subscale scores range from 0 to 5. Participants reported an average of .62 stressful interpersonal events per survey ($SD = 1.10$).

Coping behavior. The 12 items on the coping strategies checklist were either written for the purposes of this study or were adapted from the Ways of Coping checklist (Folkman & Lazarus, 1980). Participants were prompted to rate how well the items describe their activities since their last survey response using the following scale: either N/A (*Not applicable, doing this would have been impossible*), or, if the behavior was possible, 0 (*Not at all well*) to 4 (*Extremely well*). Example items include "Spent some alone time," and "Worked on a school- or job-related task"; all items are reproduced in Appendix C-3. These items included cognitive as well as behavioral strategies. In an effort to capture strategies that the participant would not necessarily

describe as purposeful coping, but that are known within the coping literature to be associated with stress and negative emotion (e.g., drinking alcohol), none of the items required the participant to have an active intention to cope using these strategies, and they were not reporting on efforts to cope with a specific stressor. Average item ratings per survey were calculated across all 20 observations, and are presented in Figure 3. The coping behavior checklist was divided into two subscales: *Avoidance* (7 items, mean = 1.34, *SD* = .92) and *Problem-Solving* (4 items, mean = 1.34, *SD* = 1.13). Items associated with these two subscales are noted in Appendix C-3.

Questionnaires

Depressive symptoms. The Center for Epidemiological Studies – Depression Measure (CES-D; Radloff, 1977) is a widely-used 20-item self-report scale of depressive symptoms occurring in the past week. The CES-D has been shown to discriminate depressive symptom severity in an undergraduate population more effectively than the frequently-used Beck Depression Inventory (Santor, Zuroff, Ramsay, Cervantes, & Palacios, 1995). Items include, "I felt depressed" and "My sleep was restless," and are rated on a 0 (*rarely or none of the time [less than one day]*) to 4 (*most or all of the time [5-7 days]*) scale such that higher scores indicate more severe symptoms of depression. The mean summary score in the current study was 13.4 (SD = 8.0, range 0 to 43, α = .88). Previous studies of non-clinical samples (including undergraduate samples) report comparable means from 7.94 (*SD* = 7.53) to 18.0 (*SD* = 12.3) and similar inter-item reliability estimates (α = .84-.90; Radloff, 1977; Santor et al., 1995).

Borderline Personality Disorder (BPD) symptoms. The Borderline Symptom List (BSL)—Short Version is a 23-item list of symptoms associated with BPD. Items include "I was lonely," "Criticism had a devastating effect on me," and "I was afraid of losing control" and were rated on a 0 (*not at all*) to 4 (*very strong*) scale in response to the prompt, "In the course of

the last week, I felt…" In prior studies the scale has shown good internal consistency (α = .94 –

.97), effectively discriminated patients diagnosed with BPD from other psychiatric diagnoses,

and effectively measured symptom change following treatment (Bohus et al., 2009). The average

BSL summary score in this sample was 13.2 (*SD* = 11.1, range 0 to 61, α = .92).

Neuroticism. The NEO-Personality Inventory-Revised (NEO-PI-R) is a questionnaire

measure that assesses the five-factor model of personality (Costa & McCrae, 1992). For the

purposes of this study, only the 48 items pertaining to neuroticism were administered to

participants: examples include "I often feel tense and jittery," and "In dealing with other people,

I always dread making a social blunder." Items are rated on a 0 (*Strongly Disagree*) to 4

(*Strongly Agree*) scale. The neuroticism subscale has shown good long- and short-term test-retest

reliability (6 month retest *r* = .81), consistency between self- and informant-ratings, and internal

consistency (α = .92) in wide-ranging samples, including undergraduates (Kurtz, Lee, & Sherker,

1999). In the current study, participants had a mean summary neuroticism score of 86.2 (*SD* =

23.2, range 20 to 143, α = .92). This study's mean neuroticism score was slightly higher than

previously assessed samples, such as one of working young adults (*M* = 76.5, *SD* = 19.9 in men,

M = 82.4, *SD* = 22.9 in women), although the same study reported that their undergraduate

sample showed higher neuroticism T-scores than the working adults sample (53.5 and 49.1,

respectively; Schinka, Kinder, & Kremer, 1997).

Overall functioning. The Outcome Questionnaire (OQ-45) is a 45-item measure of

overall functioning, and includes items such as "I feel no interest in things," "I feel that I am not

doing well at work/school," and "I feel that my love relationships are full and complete" reverse-

scored on a 0 (*Never*) to 4 (*Almost always*) scale. Three subscales are calculated from the sums

of subsets of these items: (a) *psychiatric symptom distress*, (b) *interpersonal relations*, and (c)

social role functioning (e.g., academic and work). The measure has shown good convergent and

concurrent validity in patient and non-patient populations, including in other undergraduate

samples (Umphress, Lambert, Smart, Barlow, & Clouse, 1997). Internal consistency coefficients

for the total score in another student sample were $\alpha = .93$ and ranged from $\alpha = .70$-$.92$ for the

subscales; test-retest reliability coefficients in the same sample were $\alpha = .84$ for the total score

and ranged from $\alpha = .78$ to $.82$ for the subscales (Lambert et al., 1996). In the current study, the

24 items in the symptom distress subscale had a mean of 29.3 ($SD = 9.3$, range 9 to 55, $\alpha = .86$),

the 11 items in the interpersonal relations subscale had a mean of 11.5 ($SD = 4.8$, range 9 to 55, α

$= .86$, range 0 to 26, $\alpha = .71$), and the 9 items in the social role subscale had a mean of 11.4 (SD

$= 3.0$, range 3 to 18, $\alpha = .50$). The average total overall functioning score in this sample was 52.2

($SD = 14.7$, range 16 to 94, $\alpha = .89$).

Results

Due to the nesting of up to 20 consecutive daily survey responses within individual

respondents, multilevel models were assessed using maximum likelihood procedures in Stata 12

(StataCorp, 2011). Daily survey observations (level 1, t) were nested within individuals (level 2,

i). There were 4 observation times per day. The following models examine predicted effects from

one observation time point to the next; however, effects are expected to occur on a short-term

basis and thus are not expected to cross from one day to the next. For this reason, effects are

examined from one survey to the next survey on the same day: the time at which the outcome is

measured is labeled "*t*," and the time at which the predictor is measured is "*t-1*." To address

moderation and mediation effects, mediating or moderating effects measured between the

outcome and predictor were included in models. In these cases, the predictor was measured at "*t-2*" and the moderator at "*t-1*." A schematic of these two strategies is presented in Figure 4 to

clarify the time-lagged nature of the effects.

Aim 1. Stress kindling was established by testing whether or not the stressful experiences summary score ("stressful events") on survey *t-1* predicted a higher rate of interpersonal stressor occurrence on survey *t*. In the following multilevel model equation, the stressful events reported on survey *t-1* predicts the sum of interpersonal stressors reported on survey *t*, controlling for participant gender:

$$\text{InterpersonalStress}_{ti} = B_{00} + B_{10}(\text{StressfulEvents}_{(t-1)i}) + B_{01}(\text{Gender}_i) + u_{0i}$$

$$+ u_{1di}(\text{StressfulEvents}_{(t-1)i}) + r_{ti} \tag{1}$$

In this equation, the number of interpersonal stressors reported on survey *t* for individual *i* (*InterpersonalStress$_{ti}$*) is a function of the intercept, the stressful events summary score reported on the survey completed immediately prior to survey *t* (*t-1*), participant gender, and between- and within-subjects error. An unstructured and a first-order autoregressive variance-covariance matrix was applied to this model to allow residuals to covary across time points due to non-independence of ratings made closer together in time. In this equation, *B$_{10}$* (the main effect of the stressful events score reported on survey *t-1*) serves as a test of Aim 1.

Higher stressful event scores were indeed predictive of the number of interpersonal stressors rated on the next survey completed that day, such that with each increase in one unit of distress due to stressful experiences, interpersonal stressor ratings increased .02 units, (B = .02, *SE* = .01), *z* = 3.83, *p* < .001. To confirm that there were no major gender differences in the main effect, an interaction between the sum of stressors and participant gender was tested: the main effect remained significant and the interaction with gender was non-significant.

Aim 2a. An identical model was used to examine negative mood reactivity, by determining whether or not the average negative mood score on survey *t* was predicted by the

stressful events score reported on survey *t-1*. An increase in stressful events on survey *t-1* predicted a significant increase in the negative mood rating reported on survey *t*, ($B = .01$, $SE = .005$), $z = 2.47$, $p = .014$). To confirm that there were no major gender differences in the main effect, an interaction between the sum of stressors and participant gender was tested: the main effect remained significant and the interaction with gender was non-significant.

Aim 2b. In models testing emotional reactivity as a potential contributor to stress kindling, interpersonal stressor occurrence reported on survey *t* was the outcome variable, the stressful events score reported on survey *t-2* was the predictor, and the average negative mood reported on survey *t-1* was tested as a mediator. The three models that tested these associations (described below) were bootstrapped with 1,000 replications to obtain estimates of the three effects: the indirect effect of negative mood (independent of the effect of stressful events on survey *t-2*), the direct effect of the stressful events (controlling for negative mood), and the total combined effect of mood reactivity and stress kindling on interpersonal stressor occurrence on survey *t*. Gender was included as a control variable in all three models. The variance-covariance matrix did not have first-order autoregressive features due to limitations associated with bootstrapping.

The three models are depicted in Figure 5. The "c" pathway (direct stress kindling effect, without the mediator) represents the first model. As shown in the first top panel of Table 1, the direct effect of stressful events on the number of interpersonal stressors reported two surveys later, was significant at $p < .001$. This effect was expected based on the association established in *Aim 1*, although the exact values differ due to the change in the variance structure and the movement of the predictor from *t-1* to *t-2* to accommodate the mediator's eventual placement between the predictor and outcome. Next, pathway "a" was tested; results are shown in the

second panel of Table 1, which show that the effect of the predictor (stressful events at *t-2*) on

the mediator (negative mood at *t-1*) was significant at $p < .001$. This was again expected, based

on the negative mood reactivity effect established in *Aim 2b*. Lastly, the "b" and "c'" pathways

indicating the independent effects of negative mood at *t-1* and stressful events at *t-2* on

interpersonal stressor occurrence, respectively, were examined in the final model. In this model

only a random slope for negative mood was included, not the random slope for stressful events,

due to model non-convergence when the stressful event random slope was included. Both *b* and

c' pathways were found to be significant at $p < .001$ (see third panel of Table 1), indicating that

negative mood partially mediates the effect of stressful events on the occurrence of interpersonal

stressors. Bootstrapping these effects generated effect sizes for the indirect effect of negative

mood, the direct effect of stressful events holding negative mood constant, and the total

combined effect of previous stressful events and negative mood on interpersonal stressor

occurrence. These results are presented in the bottom panel of Table 1: all three effects were

significant, indicating that negative mood acts as a partial mediator of stress kindling.

Aim 3a. Avoidance and problem-solving ratings on survey *t-1* were tested as moderators

of stress kindling from the stressful events score on survey *t-2* to interpersonal stressor

occurrence reported on survey *t* using the following equation:

$$\text{InterpersonalStress}_{ti} = B_{00} + B_{10}(\text{StressfulEvents}_{(t-2)i}) + B_{20}(\text{Coping}_{(t-1)i}) +$$
$$B_{30}(\text{StressfulEvents}_{(t-2)i} * \text{Coping}_{(t-1)i}) + B_{01}(\text{Gender}_i) +$$
$$u_{0i} + u_{1i}(\text{StressfulEvents}_{(t-2)i}) + r_{ti} , \qquad (2)$$

where the number of interpersonal stressors reported on survey *t* by individual *i*

(*InterpersonalStress_{ti}*) is a function of the intercept, the stressful events score reported on survey

t-2, the coping behavior (avoidance or problem-solving) reported on survey *t-1*, the interaction

between stressful events on survey *t-2* and coping behavior on survey *t-1*, and within- and between-subjects error. In this equation, the interaction between stressful events and coping behavior (B_{30}) serves as a test of *Aim 3a*. A random slope for stressful events was included, but random slopes for coping behaviors were not due to model non-convergence. Unstructured and first-order autoregressive variance-covariance matrices were applied to these two models.

As can be seen in the top panel of Table 2, avoidance was a significant moderator of stress kindling: the interaction between the stressful events score on survey *t-2* and avoidance on survey *t-1* significantly predicts the number of interpersonal stressors rated on survey *t*. Figure 6 shows graphically that a higher stressful events score on survey *t-2* followed by a higher avoidance rating on survey *t-1* interact to predict a higher number of interpersonal stressors on survey *t*, whereas stressful events scores on survey *t-2* fail to predict the number of interpersonal stressors reported on survey *t* when avoidance on survey *t-1* is low. As indicated in the bottom panel of Table 2, problem-solving was not a significant moderator of stress kindling ($p > .05$). To confirm that there were no major gender differences in these interaction effects, a three-way interaction between the sum of stressors, coping behavior and participant gender was tested in both of the models used to test *Aim 3a*: the interaction effects of interest maintained the levels of significance reported above and the interaction with gender was non-significant.

Aim 3b. The combined effect of the stressful events score at time *t-2* and coping behavior at time *t-1* on negative mood at time *t* was examined using the same model as was described in *Aim 3a* (replacing the number of interpersonal stressors with negative mood as the outcome). Avoidance was a marginally significant moderator of negative mood spillover ($p = .08$), as shown in the top panel of Table 3. Figure 7 offers a visual representation of the marginal interaction between stressful events and avoidance in predicting later negative mood, indicating

that negative mood increases following stressful experiences primarily in the context of avoidance behavior. As shown in the bottom panel of Table 3, problem-solving proved not to moderate negative mood reactivity ($p > .05$), although, as shown in Figure 8, problem-solving did exert a main effect on the negative mood outcome such that problem-solving on survey *t-1* predicted a higher negative mood rating on survey *t*. To confirm that there were no major gender differences in these interaction effects, a three-way interaction between the sum of stressors, coping behavior and participant gender was tested in both of the models used to test *Aim 3b*: the interaction effects of interest maintained the levels of significance reported above and the interaction with gender was non-significant.

  Aim 4a. The moderating effect of intense negative mood on the moderation of stress kindling by avoidance and problem-solving was examined by using a multilevel moderated moderation model. To do this, a three-way interaction among the stressful events reported on survey *t-2*, coping behavior reported on survey *t-1*, and the intense negative mood score also as reported on survey *t-1* (recall that this was scored 1 if an observation's average negative mood was rated 4 or higher, 0 if average negative mood was rated as a 2 or lower, and missing if average negative mood fell between 2 and 4), predicted the number of interpersonal stressors reported on survey *t*. A schematic illustrating the following equation is presented in Figure 9:

$$\text{InterpersonalStress}_{ti} = B_{00} + B_{10}(\text{StressfulEvent}_{(t-2)i}) + B_{20}(\text{Coping}_{(t-1)i})$$

$$+ B_{30}(\text{StressfulEvent}_{(t-2)i}*\text{Coping}_{(t-1)i}) + B_{40}(\text{IntenseMood}_{(t-1)i})$$

$$+ B_{50}(\text{StressfulEvent}_{(t-2)i}*\text{IntenseMood}_{(t-1)i}) + B_{60}(\text{Coping}_{(t-1)i}*\text{IntenseMood}_{(t-1)i})$$

$$+ B_{70}(\text{StressfulEvent}_{(t-2)i}*\text{Coping}_{(t-1)i}*\text{IntenseMood}_{(t-1)i}) + B_{01}(\text{Gender}_i)$$

$$+ u_{0i} + u_{1i}(\text{StressfulEvent}_{(t-2)i}) + r_{ti} , \tag{3}$$

  In this equation, the coefficient B_{70} is a test of *Aim 4a*. Avoidance and problem-solving

were separately examined as coping behaviors using this model. Unstructured and first-order autoregressive variance-covariance matrices were applied to these models.

Problem-solving was not a significant moderator of stress kindling (as was expected based on findings from *Aim 3a*), and neither did intense negative mood moderate the effect of problem-solving on stress kindling. Intense negative mood did, however, significantly moderate the effect of avoidance on daily stress kindling ($p < .05$). Findings from the avoidance model are presented in Table 4. Figure 10 offers a visual representation of this three-way interaction effect: this graph clarifies that the stressful events score reported on survey *t-2* primarily predicts an increase in interpersonal stressors on survey *t* when both avoidance and intense negative mood on survey *t-1* are high. To confirm that there were no major gender differences in these interaction effects, a four-way interaction among the sum of stressors, coping behavior, intense negative mood and participant gender was tested in both of the models used to test *Aim 4a*: the significant three-way interaction present in the model testing avoidance coping behavior was reduced from a significant to a marginal effect ($p = .09$), but the four-way interaction with gender was non-significant. The non-significance of the three-way interaction in the model testing problem-solving remained non-significant with the inclusion of gender, and the four-way interaction with gender was also non-significant.

Aim 4b. Equation 3 was altered such that interpersonal stressors as the outcome were replaced with negative mood reported on survey *t* to test the combined impact of intense negative mood and coping on emotional reactivity. Three-way interactions between the stressful events reported on survey *t-2* and intense negative mood and avoidance or problem-solving reported on survey *t-1* were examined. Intense negative mood did significantly moderate the effect of avoidance on spillover. Table 5 shows that there was a significant main effect of intense negative

mood as reported on survey *t-1* on the average negative mood reported on survey *t,* intense negative mood moderated the spillover effect from stressful events on survey *t-2* to negative mood on survey *t*, and finally, intense negative mood significantly moderated the moderation effect of avoidance on daily negative mood spillover. This significant three-way interaction was independent of main effects of stressful events, coping strategy, intense negative mood, or any two-way interactions between those three variables.

Figure 11 offers a graphical representation of the three-way interaction between stressful events, avoidance behavior and intense negative mood on later negative mood ratings. This graph indicates that an intense negative mood (regardless of avoidance behavior) on survey *t-1* predicts higher average negative mood on survey *t*, even in the context of no stressors reported on survey *t-2*. Additionally, *not* avoiding during the period described in survey *t-1* appears to be associated with decreased negative mood reactivity from a higher sum of stressors on survey *t-2* when an intense negative mood is reported on survey *t-1*, whereas avoiding exacerbates negative mood reactivity in the context of an intense negative mood on survey *t-1*. In other words, avoiding when in an intensely negative mood exacerbates negative mood reactivity, whereas *not* avoiding when in an intensely negative mood actually may help to mitigate negative mood reactivity. Again, to confirm that there were no major gender differences in this interaction effect, a four-way interaction among the sum of stressors, coping behavior, intense negative mood and participant gender was tested as well: the significant three-way interaction present in this avoidance coping behavior model was maintained, but the four-way interaction with gender was non-significant.

There was no significant interaction between intense negative mood and problem-solving in predicting negative mood reactivity ($p > .05$) when Equation 3 was applied. When a four-way

interaction among the sum of stressors, problem-solving, intense negative mood and participant gender was included in the model, however, the four-way interaction was significant (as was the three-way interaction tested previously). The equation testing the four-way interaction was as follows:

$$NegMood_{ti} = B_{00} + B_{10}(StressfulEvent_{(t-2)i}) + B_{20}(ProbSolving_{(t-1)i})$$

$$+ B_{30}(StressfulEvent_{(t-2)i}*ProbSolving_{(t-1)i}) + B_{40}(IntenseMood_{(t-1)i})$$

$$+ B_{50}(StressfulEvent_{(t-2)i}*IntenseMood_{(t-1)i}) + B_{60}(IntenseMood_{(t-1)i}*ProbSolving_{(t-1)i})$$

$$+ B_{70}(StressfulEvent_{(t-2)i}* ProbSolving_{(t-1)i}*IntenseMood_{(t-1)i}) + B_{01}(Gender_i)$$

$$+ B_{11}(StressfulEvent_{(t-2)i}*Gender_i) + B_{21}(ProbSolving_{(t-1)i}*Gender_i)$$

$$+ B_{31}(StressfulEvent_{(t-2)i}*ProbSolving_{(t-1)i}*Gender_i) + B_{41}(IntenseMood_{(t-1)i}*Gender_i)$$

$$+ B_{51}(StressfulEvent_{(t-2)i}*IntenseMood_{(t-1)i}*Gender_i)$$

$$+ B_{61}(ProbSolving_{(t-1)i}*IntenseMood_{(t-1)i}*Gender_i)$$

$$+ B_{71}(ProbSolving_{(t-1)i}*StressfulEvent_{(t-2)i}*IntenseMood_{(t-1)i}*Gender_i)$$

$$+ u_{0i} + u_{1i}(StressfulEvent_{(t-2)i}) + r_{ti} , \tag{4}$$

In this equation, B_{71} serves as a test of the hypothesis. Due to the major change in the findings, results from the four-way interaction model are presented in Table 6 and a graphical representation comparing the three-way interaction of interest in men and in women is presented in Figure 12. This graph suggests that the effect of problem-solving behavior when experiencing intense distress following a stressful event differs in men and women: broadly speaking, among women, problem-solving when extremely distressed led to decreases in negative mood reported a few hours later, whereas not problem-solving when distressed led to higher negative mood reports later in the day. In contrast, among men, problem-solving when distressed led to increases in negative mood, whereas not problem-solving when distressed led to improvements

in negative mood.

Aim 5a. To calculate scores representing the tendency to experience interpersonal stressors in the hours following stressful events, empirical Bayes' (EB) estimates were derived from the multilevel models described in *Aim 1*. EB estimates are calculated as between-subjects weighted sums of the models' intercept and slope estimates. In this case, they indicate the individual's tendency towards stress kindling, or the average magnitude of each individual's change in the number of interpersonal stressors reported on survey *t* associated with each one-unit increase in stressful experiences reported on survey *t-1*, adjusted according to the sample's distribution. Measures of psychological functioning were included as predictors of stress kindling EB estimates in simple regressions, with gender included as a control variable. Results indicated that there was no significant effect of depressive symptoms ($p = .83$), BPD symptoms ($p = .55$), neuroticism ($p = .77$), social role functioning ($p = .74$), or interpersonal relationships ($p = .50$) on the tendency to experience stress kindling. There was, however, a significant negative effect of symptom distress scores ($B = -0.0004$, $SE = .0002$), $t(134) = -2.04$, $p = .04$.

Aim 5b. EB estimates were derived from the multilevel models described in *Aim 2b*, in which stressful events on survey *t-1* predicted negative mood reported on survey *t*. These EB estimates represent each individual's tendency to experience negative mood reactivity following a stressful experience. Regression analyses were conducted in which measures of psychological functioning were included as predictors of negative mood reactivity EB estimates. The following were positively associated with each individual's tendency to experience negative emotions following stressful events: depressive symptoms ($B = 0.001$, $SE = .0001$), $t(134) = 4.62$, $p < .001$, BPD symptoms ($B = 0.0004$, $SE = .0001$), $t(134) = 4.58$, $p < .001$, neuroticism ($B = 0.0002$, $SE = .00004$), $t(134) = 3.42$, $p = .001$, social role functioning ($B = 0.001$, $SE = .0003$), $t(134) = 2.95$, p

= .004, and symptom distress ($B = 0.0003$, $SE = .0001$), $t(134) = 2.52$, $p = .013$. Interpersonal relationships were marginally predictive of the tendency to experience negative mood following stressors, ($B = 0.0004$, $SE = .0002$), $t(134) = 1.86$, $p = .07$.

Aim 5c. Correlations were conducted between each individual's average stressful events score and interpersonal stress ratings per observation, and their psychological functioning scores. The correlation matrix containing results from this analysis is presented in the left-hand panels of Table 7. Consistent with the model of stress generation in which individuals with depressive and personality disorders experience higher rates of interpersonal stress but not necessarily higher rates of stress in general, the average stressful events score was only significantly positively correlated with neuroticism ($p < .05$), whereas average interpersonal stress ratings were significantly positively correlated with depressive symptoms ($p < .01$), BPD symptoms ($p < .001$), neuroticism ($p < .001$), overall functioning ($p < .001$), social role functioning ($p < .05$), and symptom distress ($p < .01$), but, surprisingly, not with the overall measure of interpersonal relationship functioning ($p = .32$).

Correlations were also conducted between each individual's average reports of engaging in avoidance and problem-solving coping behaviors and their psychological functioning scores. The correlation matrix containing results from this analysis is presented in the right-hand panels of Table 7. In contrast with findings reported in previous studies, psychological functioning scores were largely not correlated with average use of avoidance and problem-solving coping behaviors. Depressive symptoms and BPD symptoms were marginally associated with average avoidance ratings ($p = .08$ and .06, respectively). Not shown in Table 7, average use of problem-solving and avoidance behaviors was significantly correlated ($r = .69$, $p < .001$), which is consistent with a model of coping in which some individuals use more coping strategies overall.

Discussion

This study used experience sampling methods to study within-day mood, coping and stressor patterns that were proposed to play a role in the association between psychopathology and stress generation. Specifically, stress kindling—a process by which an initial stressful event increases the likelihood of a later interpersonal problem—was hypothesized to contribute to stress generation patterns observed in depression, personality disorders, and neuroticism. Three daily processes that might drive stress kindling were discussed: emotional reactivity, coping strategy selection, and coping effectiveness.

Negative mood following stressful events partially explained the association between stressful events and later interpersonal stressors, indicating that emotional reactivity may play a role in increasing exposure to interpersonal stressors. Avoidance, but not problem-solving, did increase the likelihood of later interpersonal stressors, and marginally increased negative mood, following stressful events. While at first this seems to indicate that merely selecting avoidance as a coping strategy contributes to stress kindling, this study found that avoidance occurring specifically in the context of intense distress led to stress kindling. In sum, emotional reactivity to stressors and the effect of intense emotions on coping effectiveness are proposed to act as the two primary venues by which stress kindling occurs.

To contextualize these process-oriented findings in the larger cross-sectional psychopathology literature, we also examined individual-level correlations between the tendency to experience stress kindling and psychopathology and functioning. This study replicated studies of stress generation that found that the number of interpersonal stressful events reported over the course of the study was positively correlated with depression, borderline personality disorder and neuroticism. In contrast to our hypothesis that stress kindling is one daily process by which stress

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generation occurs, the likelihood of experiencing interpersonal stressors immediately following a prior stressful experience was not associated with measures of psychological functioning. Emotional reactivity to stressful events, however, was positively associated with these measures, as well as with the number of stressful interpersonal events reported over the course of the study.

Daily Contributors to Stress Kindling

The evidence points to emotion as having a significant role in stress kindling, in two capacities. First, in support of emotional reactivity as a primary contributor to dependent stress, increases in negative mood following a stressful event explained subsequent increases in interpersonal problems. In other words, when individuals experienced a higher angry, sad, anxious or stressed mood in the hours after work or social stressors occurred, they were more likely to experience interpersonal difficulties shortly thereafter.

Second, in reference to the theory that severe distress might affect coping effectiveness, and coping effectiveness might contribute to stress generation, this study found that if avoidance behavior occurred in the context of intense negative mood, stressful experiences were more likely to result in later interpersonal problems. To illustrate how this process might occur, imagine a very distressed individual who shouts at a partner to "Go away! I never want to see you again!" in order to create physical space in which to recuperate from an argument; a less distressed individual may gently ask to take a break from the conversation. The former, distressed, version of avoidance behavior is more likely to create further discord, whereas the latter behavior is more likely to facilitate resolution. Because the contribution of avoidance to stress kindling was limited to episodes of severe emotional distress, neither avoidance or problem-solving seemed inherently maladaptive as far as contributions to stress kindling were concerned. Avoidance only became problematic when it was attendant to intense negative

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emotion. In sum, emotional reactivity appears to be central to daily stress kindling processes, and the additional contribution of avoidance behavior to stress kindling indicates that an interaction between mood reactivity and avoidance best captures the process-level explanation of how stress kindling occurs.

Coping and Stress Kindling

Somewhat discouragingly, neither avoidance or problem-solving seemed to effectively prevent the occurrence of interpersonal stressors after stressful work or social experiences were reported. Thus, it is difficult to know what coping strategies to recommend that might actually limit the damage of stressful experiences. It would be informative for future studies to disaggregate traditional coping categories (e.g., problem-approach, avoidance) into behaviorally specific strategies, to identify particular behaviors that might be more adaptive than others in blocking stress kindling. For example, one study differentiated between two types of work-avoidance behavior: planned breathers, which included leisure activities designed to improve one's mood, and procrastination, which were not associated with an affect-related goal: the authors found that planned breathers were more effective at reducing negative affect and feelings of stress (Patry, Blanchard, & Mask, 2007). It seems particularly important given the findings of this study to identify coping strategies that limit stress kindling specifically in the context of intense negative emotion. One set of coping strategies that was not specifically assessed in this study, and might better target the emotional reactivity processes that appear to drive stress kindling, is emotion-focused coping. These strategies focus on decreasing the individual's distress around a difficult event, rather than attempting to change the nature of the event (e.g., positive reframing; Carver, 1997).

As has been found in previous studies of coping patterns and mental health, avoidance

was generally associated with higher rates of depression and BPD. Across the board, though, avoidance and problem-solving were not strong predictors of psychological functioning. These findings further underscore the importance of context in determining the overall "adaptiveness" of a given coping strategy.

Stress Kindling, Mood Reactivity and Stress Generation

This study did not support the hypothesis that stress kindling processes are associated with poorer psychological functioning. The study did offer evidence to support the role of emotional reactivity in (a) stress kindling, (b) coping strategy effectiveness, and (c) stress generation and depression. Stressful experiences predicted increases in both negative mood and interpersonal stress, and depression was associated with increases in negative mood and higher rates of interpersonal stress over the course of the study—when these findings are put together, it is difficult to explain why depression was not associated with increases in interpersonal stress when in the context of a prior stressful experience. One interpretation of the data is that stress kindling is normative: stressful experiences often trigger problematic interpersonal events, but this kindling process is not responsible for generating higher than the average number of interpersonal stressors (i.e., stress generation), nor is it associated with depression. Characteristics of the sample that might alternatively explain these findings are discussed below.

Limitations

Data generated by a college student sample has limited generalizability to the wider population, particularly in a study describing predictors and correlates of psychiatric conditions like depression. While the depression, BPD and neuroticism scores were wide-ranging in this sample, average psychological functioning scores would be lower in a clinical sample. It is possible that individuals struggling with more severe psychiatric distress are more emotionally

reactive, experience different types of stressors, or engage in coping behavior differently than individuals from a normal population. A clinical sample may show different associations between stress kindling and psychopathology than a college student sample like the one used in this study.

In addition, the vast majority of the participants were female; though gender was included as a moderator in the majority of the analyses, it is possible that a larger male sample would have altered the results. Though the low male sample size indicates that caution should be used in interpretation, differences between men and women in the interaction among problem-solving, intense distress and stressful experiences in predicting later negative mood indicate that continued research on gender differences is warranted. Clearly studies that include a higher proportion of males would be important additions to this literature. Because all data was provided by self-report, it is also possible that biases in reporting stressful events may have occurred due to level of psychopathology, certain personality traits or overall functioning. In a study in which spouses have both reported on daily conflicts, however, high-neuroticism spouses were found not to be more likely to report marital conflicts than their low-neuroticism spouses (i.e., they agreed; Bolger & Schilling, 1991). Thus there is reason to believe that high average levels of negative affect do not systematically bias reports of stressor occurrence.

Ideal strategies for conceptualizing and measuring coping behavior continue to evolve, and this study is no exception to the ongoing discussion in the coping literature about how best to categorize and measure coping. Researchers have increasingly advocated for disaggregated models of coping because behaviors and outcomes vary widely within large categories like emotion-focused and problem-focused coping (Carver, Scheier, & Weintraub, 1989; Skinner, Edge, Altman, & Sherwood, 2003). For example, Carver, Scheier and Weintraub (1989) point

out that "acceptance" and "denial" both fall into "emotion-focused coping," but are essentially contradictory processes. Because in this study several behaviors were combined into the categories of avoidance and problem-solving, our findings may be more heavily influenced by certain items than others, or might differ across items. Future research should examine the role of intense negative mood on behaviorally-specific coping efforts (e.g., coping with interpersonal versus non-interpersonal situations, planned breathers versus procrastination) to identify possible differences in the disruptiveness of negative mood to coping behavior efficacy.

Implications and Future Directions

This study extends the stress generation literature by examining daily processes that were hypothesized to contribute to the higher exposure rate to interpersonal stressors observed in depression. There are a number of ways this literature could be extended further. First, prospective longitudinal studies that use momentary assessment techniques like those used in the current study would have the capability to examine the relative contribution of psychiatric (e.g., depressive) symptoms to stress generation processes versus the contribution of stress generative behaviors to the development of mental illness. Second, the role of negative mood reactivity in promoting stress generation independent of stress kindling processes deserves further attention.

This study has substantial clinical implications. In the context of intense distress, procrastination, avoiding social interaction, and cognitive avoidance contribute to the generation of interpersonal stressors, apparently irrespective of psychological functioning. The data do not, unfortunately, endorse an alternative coping strategy: approaching work-related and interpersonal problems had no significant effect on the associations between stressful experiences and negative mood or interpersonal stressor occurrence. Future research would ideally examine a wider range of coping strategies, such as emotion-focused or cognitive coping.

Further research on the relative impact of negative mood on specific cognitive and behavioral coping strategies would aid clinicians in targeting interventions for individuals who are prone to experience intense negative emotions in stressful situations, so that recommendations can be made for more "robust" or reliably effective coping strategies even under difficult emotional conditions.

As the hallmark symptom of depressive disorders, negative mood clearly plays a strong role in both the development and effects of depression. This study attests to the undeniable impact of emotional distress on daily stress kindling and stress generation processes, both through direct effects of emotional reactivity in response to stressful events as well as indirect effects of intense negative mood on the capacity of coping strategies to improve problems or decrease distress.

Figure 1

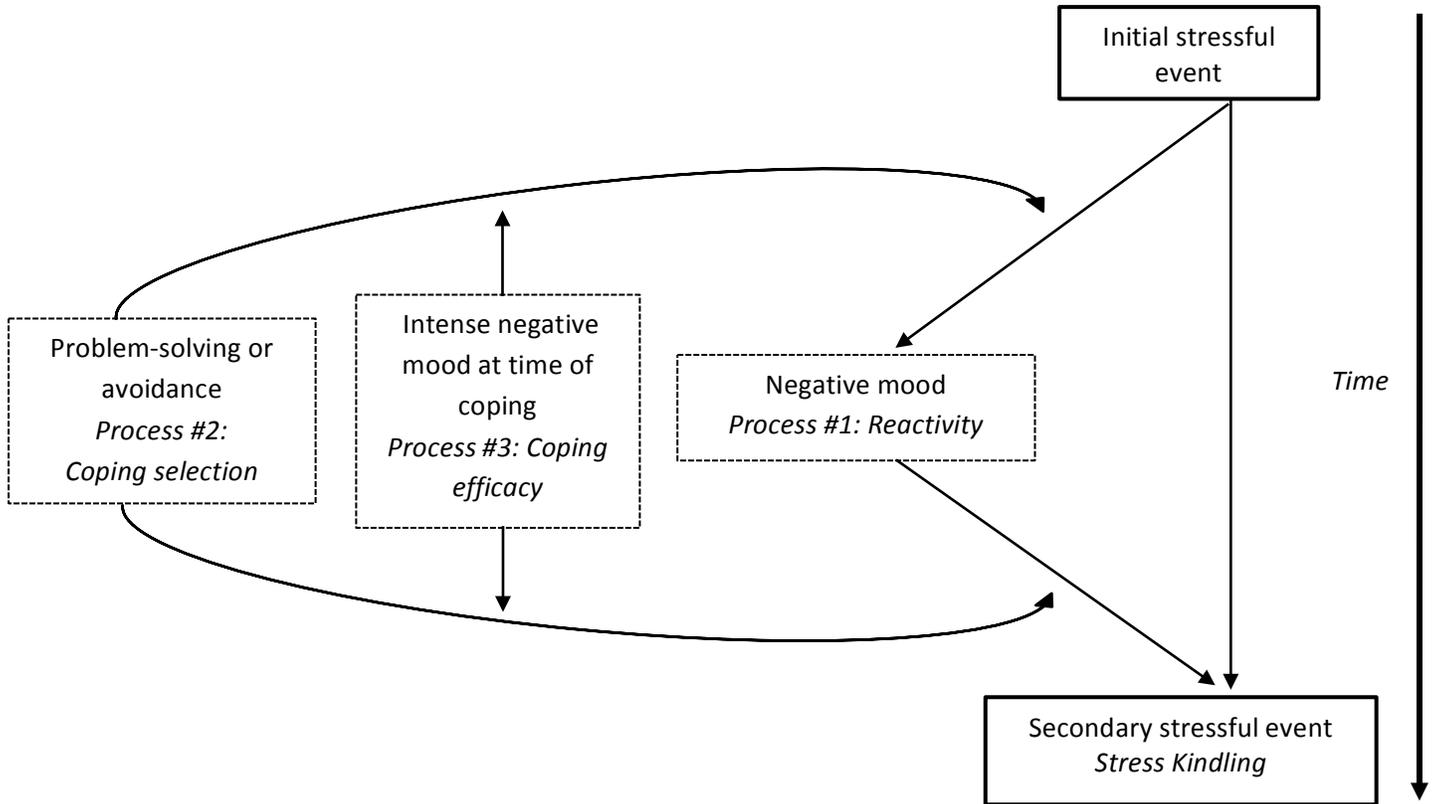*Schematic diagram of three daily processes by which stress generation is hypothesized to occur*

Figure 2

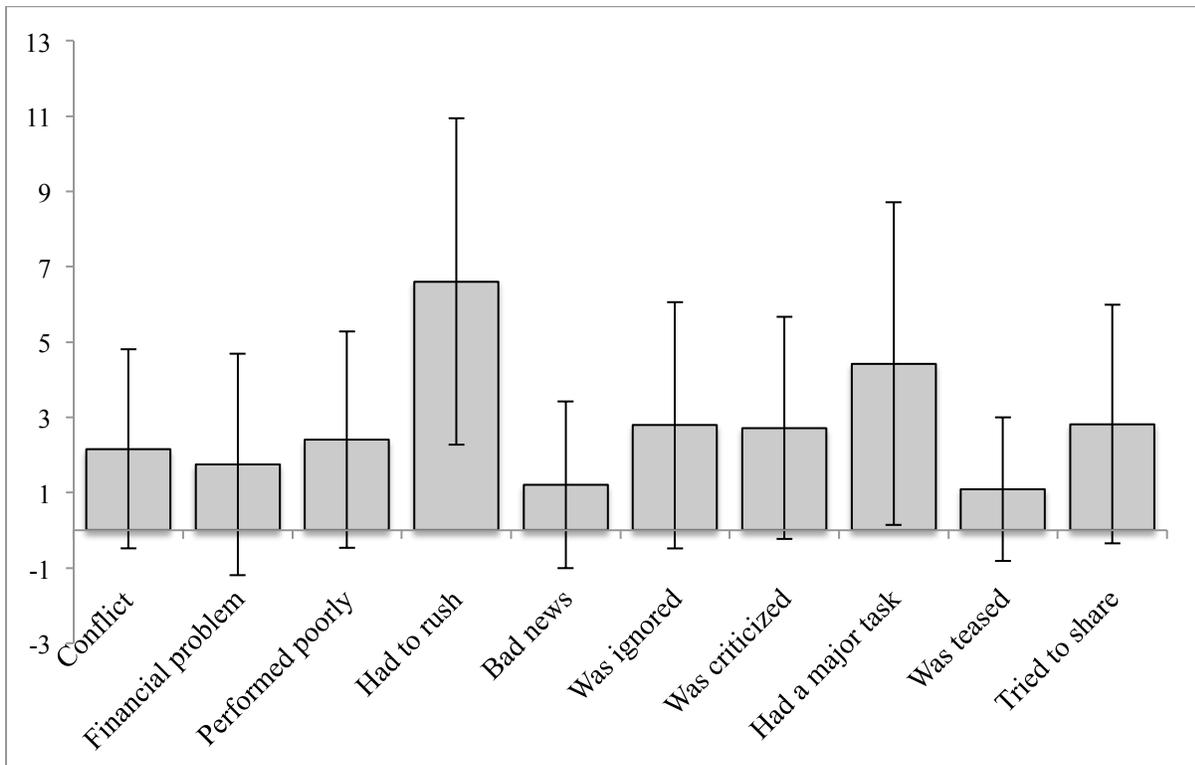*Average number of times the average respondent endorsed each stressful event over 5 days*

Figure 3

Average rating of each coping behavior across individual respondents
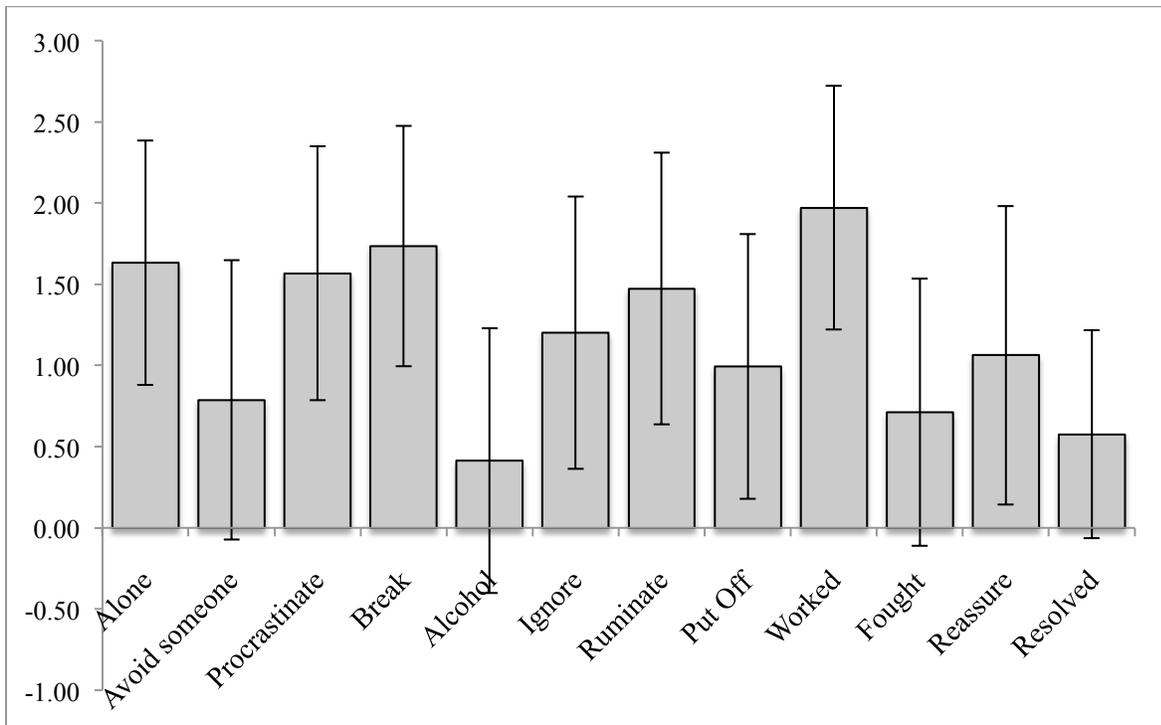
Figure 4

Schematic of time-lapsed multilevel models

$P_{(t-1)}$ $O_{(t)}$ $P_{(t-1)}$ $O_{(t)}$

Morning	Afternoon	Evening	Night

$P_{(t-1)}$ $O_{(t)}$

$P_{(t-2)}$ $M_{(t-1)}$ $O_{(t)}$

Morning	Afternoon	Evening	Night

$P_{(t-2)}$ $M_{(t-1)}$ $O_{(t)}$
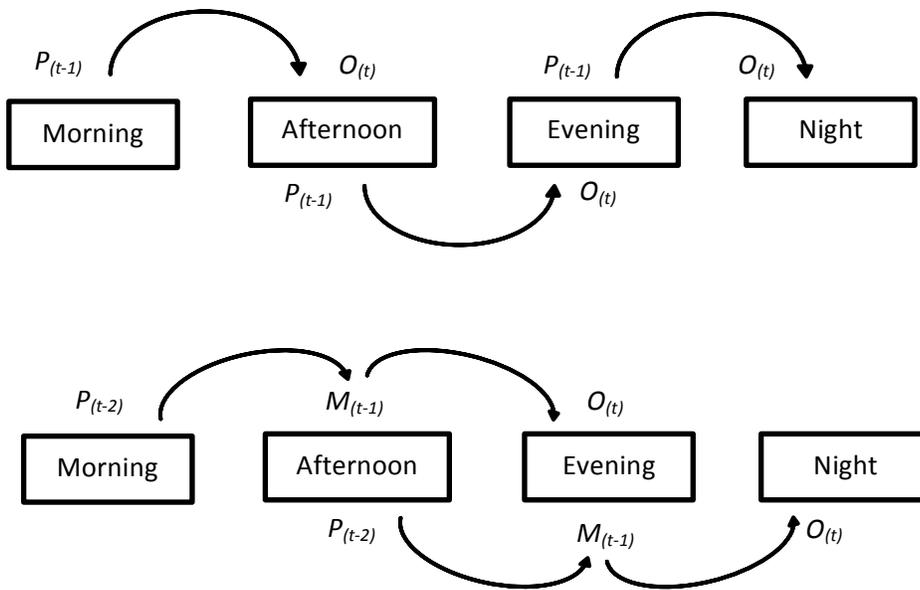
P = Predictor, M = Mediator or Moderator, O = Outcome

Figure 5

Schematic of the multilevel mediation model used to address Aim 2b
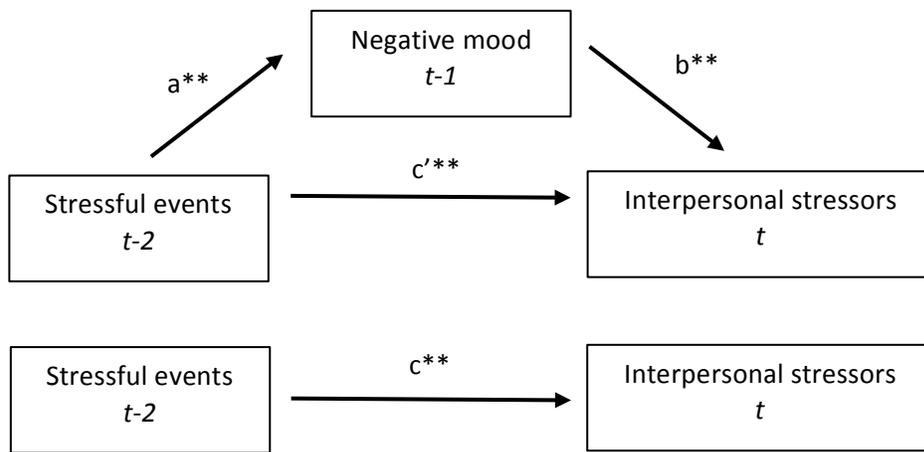
Note: **$p < .01$

Table 1

*Effect of stressful events (*t-2*) on the number of interpersonal stressors reported on survey* t *is partially mediated by negative mood (*t-1*)*

	B	SE	z	*p*	[95% Conf.Interval]	
Path "c"						
Intercept	0.47	0.07	6.89	*<.001*	.33	.60
Stressful events$_{(t-2)}$	0.03	0.01	4.86	*<.001*	.02	.05
Gender	-0.16	0.13	-1.17	*.241*	-.42	.11
Path "a"						
Intercept	1.94	0.08	25.37	*<.001*	1.79	2.09
Stressful events$_{(t-2)}$	0.03	0.01	4.84	*<.001*	.02	.04
Gender	0.06	0.16	.36	*.722*	-.25	.36
Paths "b" & "c'"						
Intercept	0.11	0.09	1.20	*.228*	-.07	.30
Negative mood$_{(t-1)}$	0.18	0.03	5.08	*<.001*	.11	.25
Stressful events$_{(t-2)}$	0.03	0.01	5.25	*<.001*	.02	.04
Gender	-0.16	0.13	-1.24	*.214*	-.42	.09
	Coeff.	SE	z	*p*	[95% Conf. Interval]	
Indirect effect	0.01	0.001	3.91	*<.001*	.003	.01
Direct effect	0.03	0.01	4.13	*<.001*	.02	.05
Total effect	0.04	0.01	4.82	*<.001*	.02	.05

Table 2

Coping behaviors as moderators of stress kindling

	B	SE	z	*p*	[95% Conf.	Interval]
Avoidance						
Intercept	0.54	0.10	5.41	*< .001*	.35	.74
Stressful events$_{(t-2)}$	0.01	0.01	.60	*.551*	-.02	.03
Avoidance$_{(t-1)}$	-0.04	0.05	-.82	*.415*	-.15	.06
Stressful events$_{(t-2)}$	0.02	0.01	2.90	*.004*	.01	.03
× Avoidance$_{(t-1)}$						
Gender	-0.14	0.14	-1.02	*.306*	-.41	.13
Problem-solving						
Intercept	0.43	0.10	4.46	*<.001*	.24	.62
Stressful events$_{(t-2)}$	0.04	0.01	3.69	*<.001*	.02	.06
Problem-solving$_{(t-1)}$	0.03	0.04	.81	*.420*	-.05	.12
Stressful events$_{(t-2)}$	-0.005	0.01	-.89	*.372*	-.02	.01
× Problem-solving$_{(t-1)}$						
Gender	-0.13	0.14	-.95	*.343*	-.41	.14

Figure 6

Avoidance moderates daily stress kindling
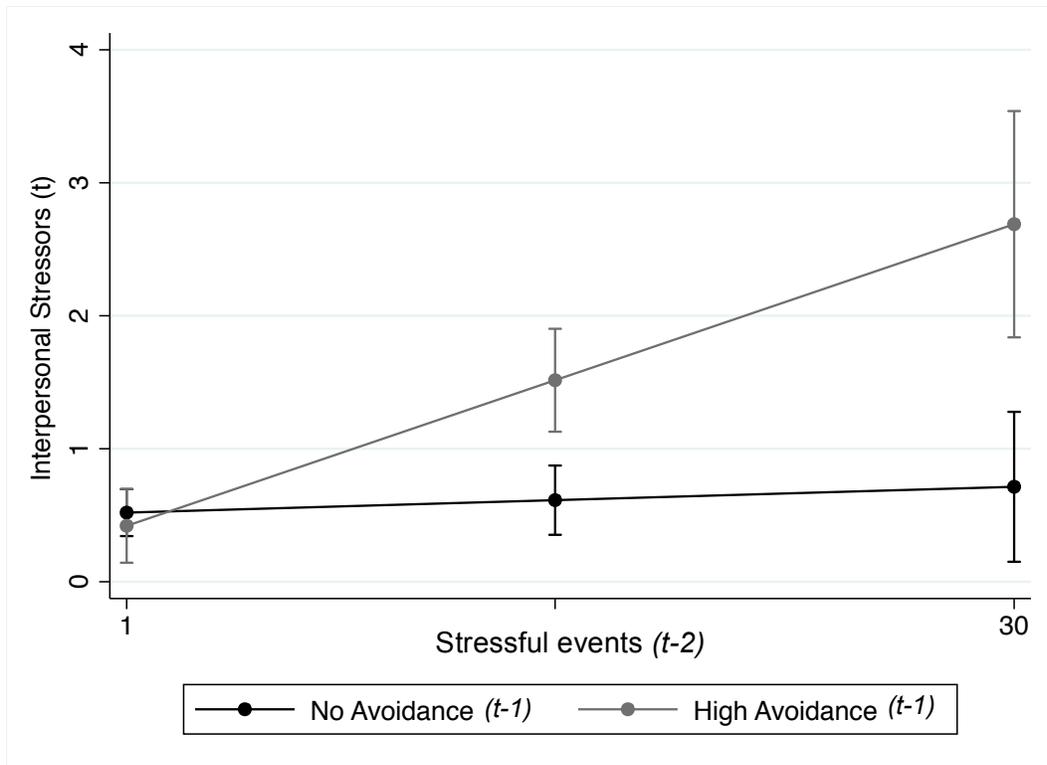
Table 3

Coping behaviors as moderators of daily negative mood reactivity to stressors

	B	SE	z	*p*	[95% Conf.	Interval]
Avoidance						
Intercept	1.99	0.10	18.96	*<.001*	1.78	2.19
Stressful events$_{(t-2)}$	0.01	0.01	.66	*.511*	-.01	.03
Avoidance$_{(t-1)}$	0.03	0.05	.74	*.458*	-.06	.13
Stressful events$_{(t-2)}$	0.01	0.01	1.77	*.077*	-.00	.02
× Avoidance$_{(t-1)}$						
Gender	-0.004	0.16	-.02	*.981*	-.33	.32
Problem-solving						
Intercept	1.92	0.10	18.84	*<.001*	1.72	2.12
Stressful events$_{(t-2)}$	0.01	0.01	1.51	*.132*	-.00	.03
Problem-solving$_{(t-1)}$	0.08	0.04	2.17	*.030*	.01	.15
Stressful events$_{(t-2)}$	0.003	0.005	.73	*.465*	-.01	.01
× Problem-solving$_{(t-1)}$						
Gender	0.02	0.17	.12	*.906*	-.31	.35

Figure 7

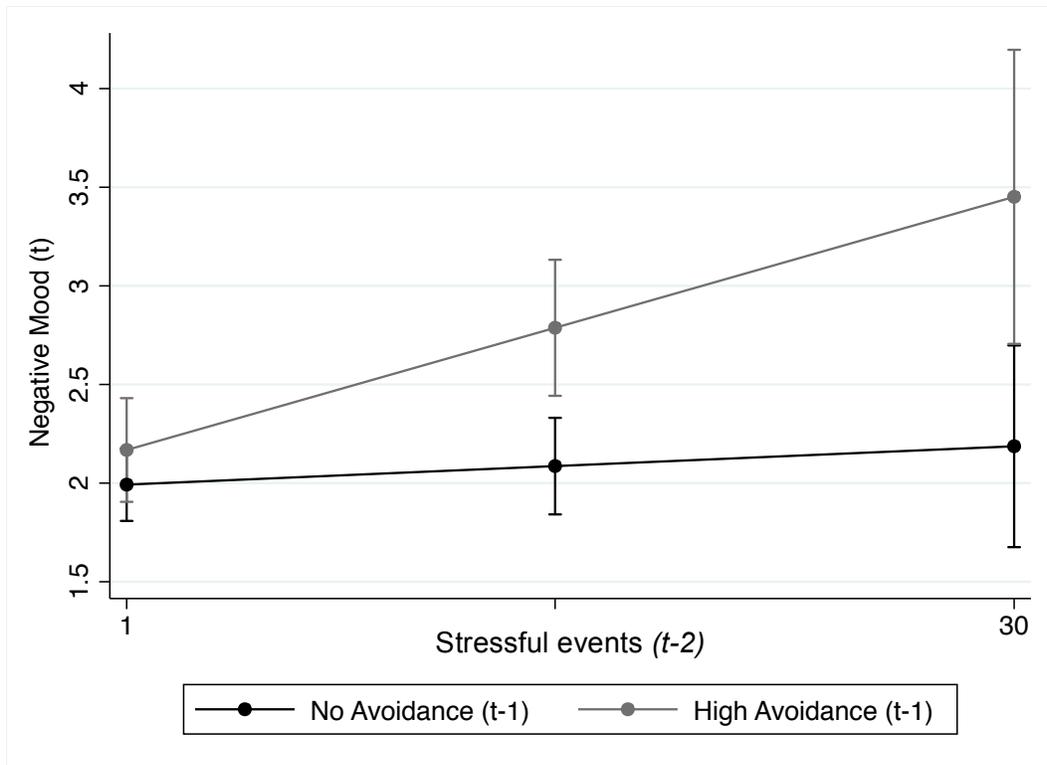*Avoidance marginally moderates daily negative mood reactivity*

Figure 8

Main effect of problem-solving on negative mood increases from survey t-1 *to survey* t
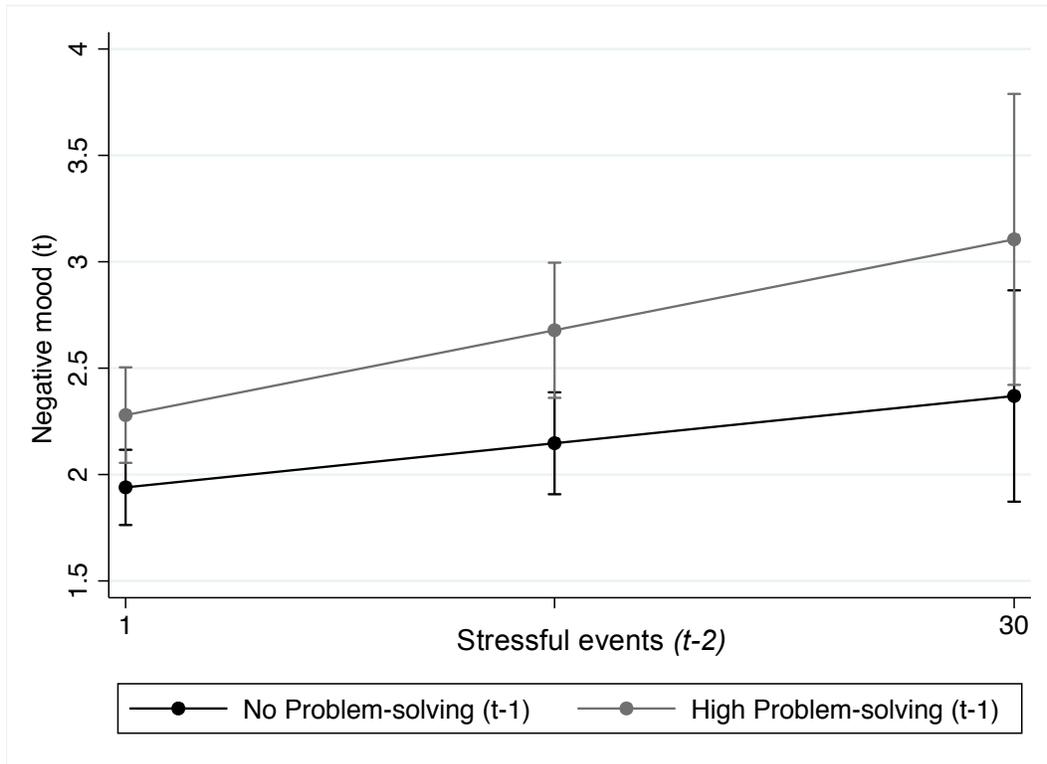
Figure 9

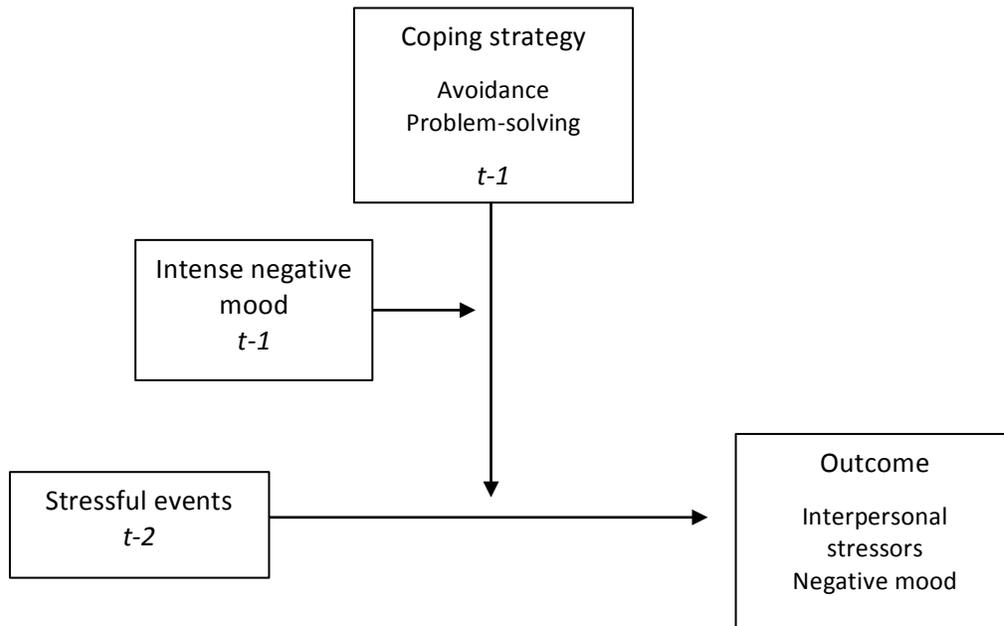*Schematic Diagram of Aim 4: Moderated Moderation*

Table 4

Intense negative mood marginally moderates the effect of avoidance on daily stress kindling

	B	SE	z	*p*	[95% Conf.	Interval]
Intercept	0.37	0.10	3.62	*<.001*	.17	.57
Stressful events$_{(t-2)}$	0.02	0.02	1.22	*.223*	-.01	.05
Avoidance$_{(t-1)}$	-0.04	0.06	-.61	*.540*	-.16	.08
Stressful events$_{(t-2)}$ × Avoidance$_{(t-1)}$	0.01	0.01	.89	*.372*	-.01	.03
Intense negative mood$_{(t-1)}$	1.01	0.37	2.70	*.007*	.28	1.74
Intense negative mood$_{(t-1)}$ × Stressful events$_{(t-2)}$	-0.04	0.04	-1.04	*.300*	-.12	.04
Intense negative mood$_{(t-1)}$ × Avoidance$_{(t-1)}$	-0.26	0.20	-1.27	*.203*	-.66	.14
Intense negative mood$_{(t-1)}$ × Stressful events$_{(t-2)}$ × Avoidance$_{(t-1)}$	0.04	0.02	1.97	*.049*	.00	.08
Gender	-0.16	.12	-1.32	*.188*	-.41	.08

Figure 10

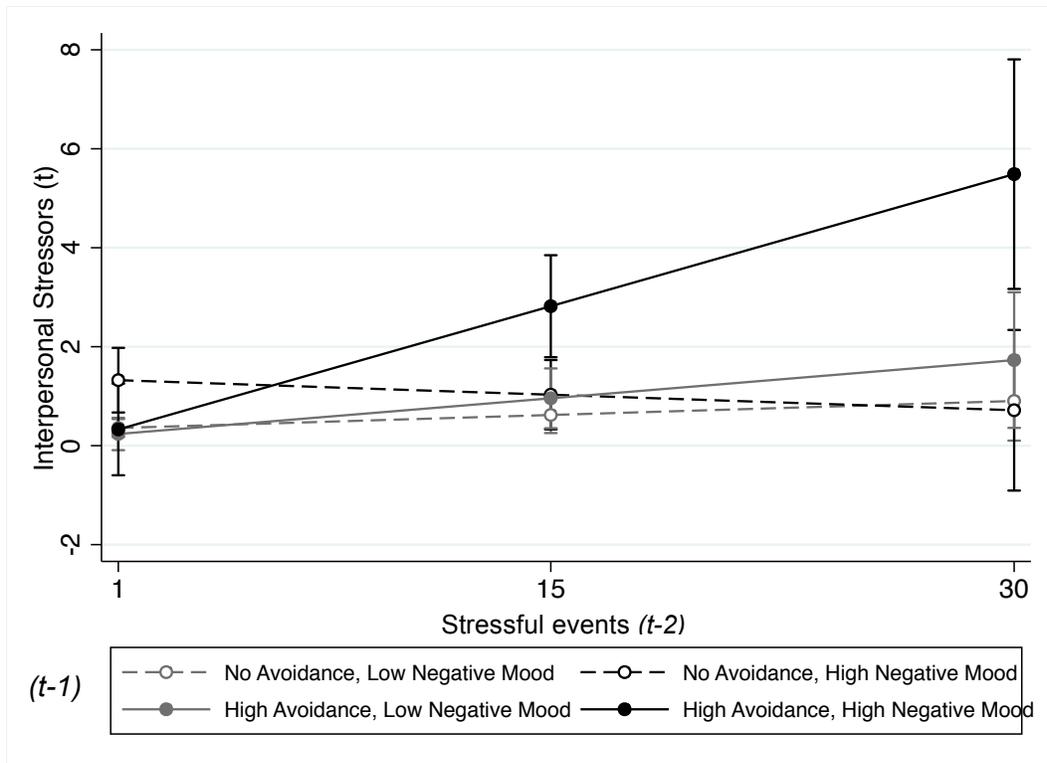*Intense negative mood marginally moderates the effect of avoidance on daily stress kindling*

Table 5

Intense negative mood moderates the effect of avoidance on daily negative mood reactivity

	B	SE	z	*p*	[95% Conf. Interval]	
Intercept	1.64	0.09	17.93	*<.001*	1.46	1.82
Stressful events$_{(t-2)}$	0.02	0.01	1.32	*.186*	-.01	.04
Avoidance$_{(t-1)}$	0.03	0.05	.67	*.502*	-.06	.13
Stressful events$_{(t-2)}$ × Avoidance$_{(t-1)}$	-0.005	0.01	-.69	*.491*	-.02	.01
Intense negative mood$_{(t-1)}$	2.26	0.27	8.29	*<.001*	1.73	2.80
Intense negative mood$_{(t-1)}$ × Stressful events$_{(t-2)}$	-0.13	0.03	-4.54	*<.001*	-.19	-.08
Intense negative mood$_{(t-1)}$ × Avoidance$_{(t-1)}$	-0.18	0.15	-1.21	*.226*	-.47	.11
Intense negative mood$_{(t-1)}$ × Stressful events$_{(t-2)}$ × Avoidance$_{(t-1)}$	0.06	0.02	3.87	*<.001*	.03	.09
Gender	-0.09	0.12	-.72	*.472*	-.32	.15

Figure 11

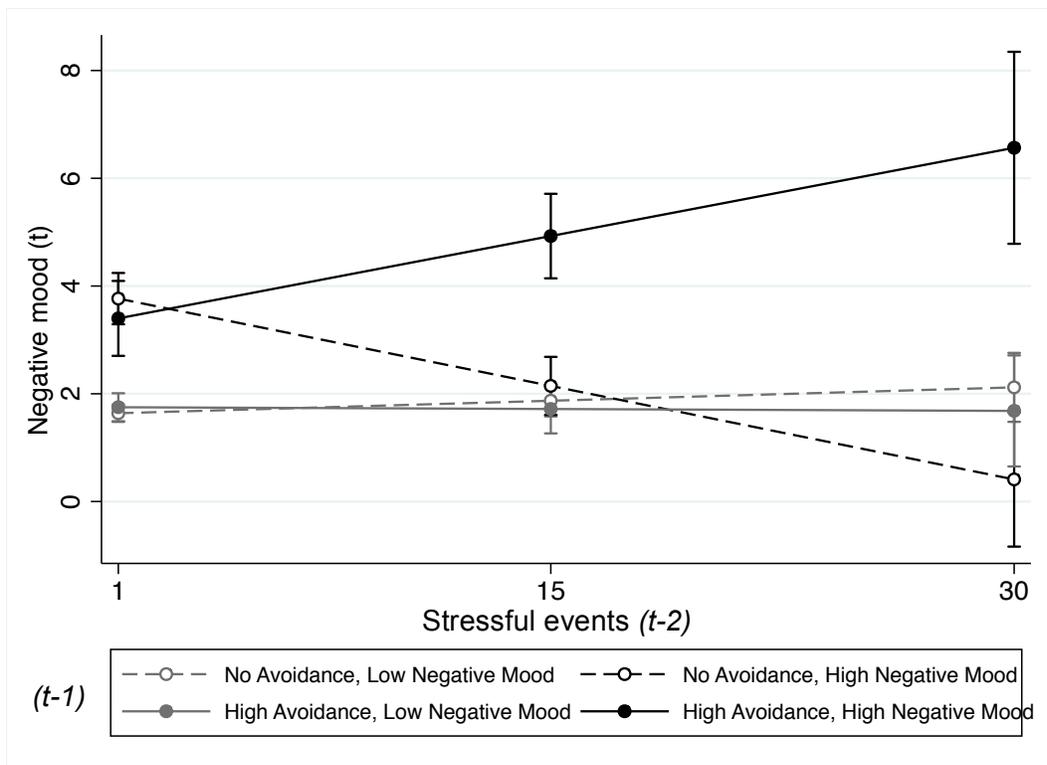*Intense negative mood moderates the effect of avoidance on daily negative mood reactivity*

Table 6

Problem-solving$_{(t-1)}$, intense negative mood$_{(t-1)}$ and gender moderate reactivity from stressful events$_{(t-2)}$ to negative mood$_{(t)}$

	B	SE	z	p	[95% Conf.	Interval]
Intercept	1.61	0.09	17.45	*<.001*	1.43	1.79
Stressful events$_{(t-2)}$	0.003	0.01	.19	*.849*	-.03	.03
Problem-solving$_{(t-1)}$	0.06	0.04	1.50	*.134*	-.02	.14
Stressful events$_{(t-2)}$ × Problem-solving$_{(t-1)}$	0.01	0.01	.92	*.358*	-.01	.02
Intense negative mood$_{(t-1)}$	1.06	0.38	2.78	*.005*	.31	1.81
Intense negative mood$_{(t-1)}$ × Stressful events$_{(t-2)}$	0.04	0.04	.98	*.325*	-.04	.11
Intense negative mood$_{(t-1)}$ × Problem-solving$_{(t-1)}$	0.46	0.19	2.39	*.017*	.08	.84
Intense negative mood$_{(t-1)}$ × Stressful events$_{(t-2)}$ × Problem-solving$_{(t-1)}$	-0.05	0.02	-2.29	*.022*	-.08	-.01
Gender	-0.07	0.20	-.33	*.742*	-.47	.33
Gender × Stressful events$_{(t-2)}$	-0.001	0.03	-.04	*.971*	-.06	.06
Gender × Problem-solving$_{(t-1)}$	-0.11	0.11	-1.03	*.305*	-.33	.10
Gender × Stressful events$_{(t-2)}$ × Problem-solving$_{(t-1)}$	0.01	0.02	.28	*.780*	-.03	.04
Intense negative mood$_{(t-1)}$ × Gender	3.42	.79	4.32	*<.001*	1.87	4.96
Intense negative mood$_{(t-1)}$ × Gender × Stressful events$_{(t-2)}$	-0.27	0.08	-3.44	*.001*	-.42	-.12
Intense negative mood$_{(t-1)}$ × Gender × Problem-solving$_{(t-1)}$	-1.49	0.39	-3.84	*<.001*	-2.24	-.73
Intense negative mood$_{(t-1)}$ × Gender × Stressful events$_{(t-2)}$ × Problem-solving$_{(t-1)}$	0.13	0.04	3.17	*.002*	.05	.21

Figure 12

*Problem-solving (*t-1*), intense negative mood (*t-1*) and gender moderate reactivity from stressful events (*t-2*) to negative mood (*t*)*
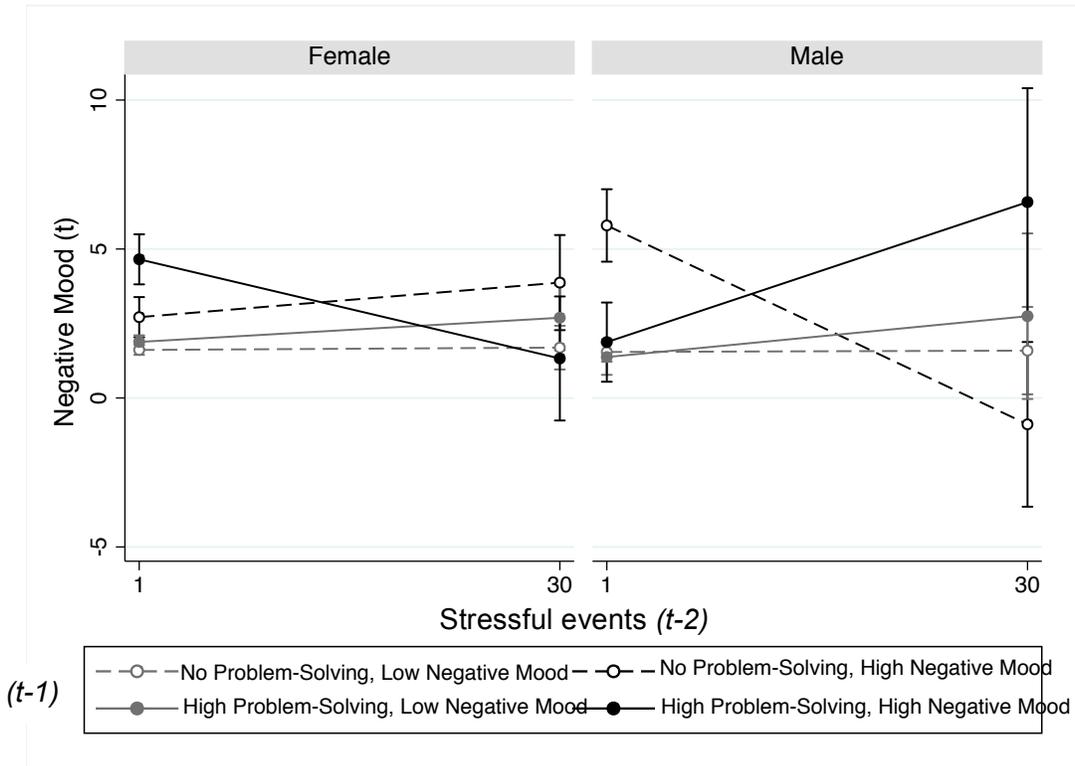
Table 7

Correlations among average stressor and coping behavior occurrence, and psychological

functioning scores

	Stressful Events	Interpersonal Stress	Avoidance	Problem-Solving
Depressive Symptoms	$r = .11$ ($p = .19$)	$r = .22$ ($p = .01$)	$r = .15$ ($p = .08$)	$r = .08$ ($p = .35$)
BPD Symptoms	$r = .15$ ($p = .08$)	$r = .30$ ($p = .00$)	$r = .16$ ($p = .06$)	$r = .06$ ($p = .51$)
Neuroticism	$r = .18$ ($p = .03$)	$r = .33$ ($p = .00$)	$r = .12$ ($p = .15$)	$r = .08$ ($p = .35$)
Social Role Functioning	$r = .11$ ($p = .21$)	$r = .20$ ($p = .02$)	$r = .11$ ($p = .21$)	$r = .02$ ($p = .82$)
Interpersonal Relations	$r = .04$ ($p = .61$)	$r = .08$ ($p = .32$)	$r = .01$ ($p = .89$)	$r = -.12$ ($p = .16$)
Symptom Distress	$r = .12$ ($p = .15$)	$r = .24$ ($p = .005$)	$r = .00$ ($p = 1.00$)	$r = -.04$ ($p = .61$)

Appendix C-1

Daily Survey Mood Items

Instructions: Please rate HOW WELL each of the following adjectives describes how you have felt since you woke up this morning[1]:

1: Not at all
4: Moderate
7: Extreme

Positive Mood

1. Happy	1	2	3	4	5	6	7
2. Cheerful	1	2	3	4	5	6	7
3. At ease	1	2	3	4	5	6	7
4. Calm	1	2	3	4	5	6	7
5. Full of energy	1	2	3	4	5	6	7
6. Lively	1	2	3	4	5	6	7

Negative Mood

7. Sad	1	2	3	4	5	6	7
8. Unhappy	1	2	3	4	5	6	7
9. On edge	1	2	3	4	5	6	7
10. Tense	1	2	3	4	5	6	7
11. Angry	1	2	3	4	5	6	7
12. Hostile	1	2	3	4	5	6	7
13. Stressed	1	2	3	4	5	6	7
14. Overwhelmed	1	2	3	4	5	6	7

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[1] Afternoon, evening and night surveys read "…since you took your last survey."

Appendix C-2

Daily Survey Stressful Event Items

Instructions: Following is a list of events that may be viewed as troubling or unpleasant. Decide whether or not any of these events has occurred since you woke up this morning[2]. If an event has not occurred, rate it as Not Applicable ("N/A"). If an event has occurred, indicate how distressing this event was for you by placing a number from 1 to 5 in the space next to that item.

N/A = Not applicable (has not occurred)
1 = Not at all distressing
2 = Slightly distressing
3 = Somewhat distressing
4 = Moderately distressing
5 = Extremely distressing

1.	Had a fight, conflict or argument with someone*	0	1	2	3	4	5
2.	Had a financial problem (e.g., unexpected cost)	0	1	2	3	4	5
3.	Performed poorly on something (e.g., bad grade)	0	1	2	3	4	5
4.	Had to rush to do something or be somewhere	0	1	2	3	4	5
5.	Heard about something bad that happened to a friend or family member	0	1	2	3	4	5
6.	Something happened that left me feeling ignored, left out or rejected*	0	1	2	3	4	5
7.	Something happened that left me feeling criticized or put down*	0	1	2	3	4	5
8.	Had a major school-related task (e.g., took an exam, gave a presentation)	0	1	2	3	4	5
9.	Was teased or laughed at*	0	1	2	3	4	5
10.	Tried to share something important with someone, but they didn't seem to understand*	0	1	2	3	4	5

*Interpersonal stressors

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[2] Afternoon, evening and night surveys read "…since you took your last survey."

Appendix C-3

Daily Survey Coping Behavior Items

Instructions: Please rate how well the following statements describe what you have done since you woke up this morning[3]. If it would not have been possible to do something listed (e.g., if you could not have resolved a disagreement with someone because you did not have a disagreement to begin with), then select Not Applicable ("N/A").

N/A = Not applicable (doing this would have been impossible)
1 = Not at all well
2 = Slightly well
3 = Somewhat well
4 = Moderately well
5 = Extremely well

1. Spent some alone time*	N/A	1	2	3	4	5
2. Avoided someone I was upset with*	N/A	1	2	3	4	5
3. Procrastinated or avoided doing something I needed to do*	N/A	1	2	3	4	5
4. Took a break or postponed a difficult task by doing something soothing or relaxing*	N/A	1	2	3	4	5
5. Drank alcohol or used other drugs*	N/A	1	2	3	4	5
6. Pushed away or ignored thoughts about a problem I'm having*	N/A	1	2	3	4	5
7. Couldn't stop thinking or worrying about something	N/A	1	2	3	4	5
8. Put off making a difficult decision (e.g., about a relationship or school)*	N/A	1	2	3	4	5
9. Worked on a school- or job-related task[†]	N/A	1	2	3	4	5
10. Stood my ground and fought for myself[†]	N/A	1	2	3	4	5
11. Sought reassurance from someone[†]	N/A	1	2	3	4	5
12. Resolved a disagreement with someone[†]	N/A	1	2	3	4	5

*Avoidance items

[†] Problem-solving items

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[3] Afternoon, evening and night surveys read "…since you took your last survey."

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