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Sleeping With One Eye Open: Marital Abuse as an Antecedent of Poor Sleep

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Abstract

In a diverse community sample of 241 married couples, we examined received psychological abuse (PA) as a longitudinal predictor of men's and women's sleep. Participants reported on marital functioning and mental health during three assessments (T1, T2, T3) and sleep problems during two assessments (T2, T3), with 1-year lags between waves. Growth curve analyses revealed that for both spouses, higher initial levels of PA and increases in PA over time predicted greater sleep disturbances at T3. For husbands and wives, anxiety and depression mediated some of the associations between PA and sleep problems. For wives, moderation effects highlighted the importance of violence, anxiety, and depression in exacerbating sleep problems associated with PA. Results build on and contribute significantly to the scant literature implicating the importance of the marital relationship for sleep and suggest that simultaneous consideration of intrapersonal and interpersonal variables is critical when explicating sleep disruptions.

Keywords

sleep; marriage; psychological abuse; violence; mental health

Poor sleep is associated with increased risk for numerous psychological, physical health, and cognitive problems (e.g., Dew et al., 2003; Eguchi et al., 2008). Corresponding with the growing evidence highlighting the importance of sleep for well-being, there is increasing interest in identifying family relationship variables associated with sleep problems (Krueger & Friedman, 2009). We examined a common stressor, namely psychological abuse (PA), in the marital relationship, as a key determinant of the quality of people's sleep over time.

Sleep is an inherently vulnerable state that is facilitated by feelings of safety in one's environment (Dahl & El-Sheikh, 2007; Troxel, Robles, Hall, & Buysse, 2007). For individuals who share this environment, the decrease in vigilance needed for sleep entails a level of trust and security with one's sleep partner. But what if one's partner not only fails to provide a sense of security, but actually increases the individual's anxiety? Recent work suggests that anxiety originating in one's social relationships is linked to sleep difficulties for both men and women (Carmichael & Reis, 2005). The antecedents and correlates of this relationship-centered anxiety and particular relationship factors associated with sleep, however, have not been explicated.

We propose that PA, defined here as the use of intimate knowledge of a person's vulnerabilities or even strengths as a weapon against him or her (Jones, Davidson, Bogat, Levendosky, & von Eye, 2005; Marshall, 1994), is likely to lead to sleep problems for the

recipient of this abuse. PA is employed to heighten a partner's arousal and distress (O'Leary, 1999), which can disrupt an individual's ability to engage in the down-regulation needed for high quality sleep (Dahl & Lewin, 2002). The present study builds on the scant evidence linking intimate partner aggression and sleep (Humphreys & Lee, 2005), and is the first study, to our knowledge, to examine PA as a longitudinal predictor of sleep problems for both spouses.

Marriage and Sleep

Although cosleeping with a partner may be beneficial for one's sleep (Krueger & Friedman, 2009; Troxel, Buysse, Hall, & Matthews, 2009), this can also be detrimental (Dittami et al., 2007), especially if the partner has a history of sleep apnea (Ulfberg, Carter, Talback, & Edling, 2000). Mixed findings may be attributable to the failure of previous research to account for the quality and nature of the partnership of the cosleeping couple. In a community-based sample of 2,148 women, maritally satisfied women reported fewer sleep disturbances than less satisfied women, even after controlling for depressive and anxiety symptoms (Troxel et al., 2009). Although these findings are important, the use of a single-item measure of relationship satisfaction, the cross-sectional approach, and the sole inclusion of women limits the generalizability of these results.

Emerging evidence from cross-sectional studies suggests that intimate partner violence is linked with sleep problems in women. Violence is defined as physical assault on a partner's body and has negative effects on sleep in battered women (Humphreys, Lee, Neylan, & Marmar, 1999). Battered women living in a transitional home had significantly poorer sleep in comparison to healthy controls (Humphreys & Lee, 2005). However, conclusions about the link between violence and sleep cannot be ascertained because of the potential confounds presented in studying battered women residing in shelters (e.g., crowded, uncomfortable beds).

Although these studies indicate that violence may be linked with sleep, there is a need in the literature to examine the effects of more normative and prevalent forms of interspousal conflict on sleep. PA is quite ubiquitous in marital relationships. Lawrence, Yoon, Langer, and Ro (2009) reported a high prevalence of PA during the first year of marriage, when marital quality is typically highest (Kurdek, 1998). Looking at established couples, Vickerman and Margolin (2008) followed a sample of middle-aged spouses and discovered that at least three-quarters of the spouses reported experiencing PA during at least one of the three study waves.

In addition to high prevalence, recent work suggests that in nonbattering, community samples, PA may be more damaging to the victim's well-being than violence. For instance, 72% of women who were physically abused by their husbands reported PA to be more destructive (Follingstad, Rutledge, Berg, Hause, & Polek, 1990). Similarly, in a study using a community sample of nonbattered couples, Lawrence et al. (2009) reported that PA was more strongly linked with depression and anxiety than violence. These findings suggest that PA is a frequently occurring stressor in relationships, and highlight its significance for individuals' health.

Although the literature on violence focuses heavily on men as perpetrators, men are just as likely to be victims of PA as women (Lawrence et al., 2009). Thus, studies of the negative sequelae of PA for both men and women, including changes in PA over time (Fritz & O'Leary, 2004), are critical. We address critical gaps in the literature through assessing various developmental trajectories of PA in relation to the sleep of husbands and wives.

The Roles of Physical Violence, Anxiety, and Depression: Mediation or Moderation?

Despite the growing body of literature linking marriage to sleep, there is little evidence elucidating the mechanisms through which PA may negatively impact sleep. In a recent review, Troxel and colleagues (2007) stated the lack of understanding of mechanisms through which relationships affect sleep precludes any clear conclusions regarding causality. To identify the effects of PA on husbands' and wives' sleep, explication of potential mechanisms of effects as well as vulnerability and protective factors is imperative. We examined violence, anxiety, and depression as potential mediators and moderators of the link between PA and sleep.

Although PA may be more detrimental to mental health than violence for community samples (Lawrence et al., 2009), it is well known that violence has a marked negative impact on health (Haj-Yahia, 1999). Given that PA often precedes violence (O'Leary et al., 1989), it could be that once violence occurs, the impact of PA on sleep is reduced. Alternatively, the finding that PA is more damaging than violence in community samples may suggest that when violence occurs, it magnifies the impact of PA on sleep. Empty threats from a partner may be less detrimental to one's feelings of security than are threats that have been carried out in the past, supporting a moderation effect of violence on the link between PA and sleep. Identifying whether PA is negative for sleep only to the extent that it is a harbinger of violence or whether violence amplifies the effects of PA on sleep has important implications.

The nature and effects of PA may vary from couple to couple, but the intentions of that abuse are fairly clear: to heighten anxiety and negative self-evaluations in the victim (Murphy & Cascardi, 1999; O'Leary, 1999). Consistent links between PA and both anxiety and depression have been reported (Campbell, 2002; Pico-Alfonso et al., 2006), even after controlling for violence (Taft et al., 2006). Given the detrimental effects of anxiety and depression on sleep (Fuller, Waters, Binks, & Anderson, 1997; Heath, Eaves, Kirk, & Martin, 1998), it may be that an individual's mental health, specifically their anxiety or depression, drives the association between their experiences of PA and their sleep problems. Troxel et al. (2009), however, found an effect of marital happiness on sleep even when controlling for anxiety and depression, suggesting that mental health may not fully explain the effects of marital processes on sleep. In addition to functioning as pathways linking PA and sleep problems, anxiety and depression may function as either vulnerability or protective factors in this association. This proposition rests on the premise that individual differences in susceptibility to the effects of abuse are likely present. For instance, in the context of PA, a person with higher levels of anxiety or depression may be more vulnerable to sleep problems than a less anxious or depressed individual. As with violence, it is imperative to determine whether anxiety and depression serve as mediators or moderators of the association between PA and sleep for a better understanding of sleep problems in the context of risk.

The Current Study

Addressing a notable gap in the literature, we examined PA experienced in the marital relationship as a predictor of men's and women's later sleep problems. We addressed this research question via a longitudinal design that enlisted a large community sample of mostly married couples. Using three waves of data collected over 3 years (T1, T2, T3), we investigated growth trajectories of PA experienced by men and women and assessed the effects of initial PA (at intercept) and changes in PA over 3 years (slope) on each partner's sleep during the third wave of data. We expected that higher levels of PA at T1 would

predict greater sleep problems at T3. Furthermore, investigating the effects of rate of change in PA over time in the prediction of sleep problems, we expected that individuals who experienced increases in PA over time would have higher levels of sleep problems at T3 compared with their counterparts who experienced declines in PA over time.

To elucidate mechanisms of effects and variables that can exacerbate or attenuate the connection between PA and sleep, we examined violence, anxiety, and depression as potential mediators and moderators of this link. Examining multiple models is essential for explicating the role of interrelated variables when predicting adaptation in the context of risk. Our assessment of these variables as processes of effects rests on the proposition that links between PA and sleep may be attributable, at least in part, to violence, anxiety, or depression. Conversely, examining violence, anxiety, and depression as moderators in the link between PA and sleep is based on the assumption that the effects of experiencing PA on individuals' sleep are not uniform. Rather, the occurrence of other risk factors at either the intrapersonal (anxiety, depression) or interpersonal (violence) levels may exacerbate or ameliorate the negative effects of experiencing PA on sleep. Important to note is that a variable (e.g., violence) can function as both a mediator and a moderator of risk within a specified context (El-Sheikh, 2005). Because it is plausible that mechanisms and moderators of effects in the PA-sleep link may be different for men and women and because of the lower participation rates of husbands in comparison to wives, we examined our research questions separately for men and women.

Method

Participants

At T1, participants were 251 couples from a semi-rural community in Alabama. Based on inclusion criteria of the larger study, all couples had at least one school-aged child (M number of children per couple = 2.27, SD = 1.24) and were either married or living together for at least 2 years. The mean age was 33.4 years (SD = 6.02 years) for women and 36.38 years (SD = 6.62) for men. Most of the couples were married (88%), with the remaining couples in long standing cohabiting relationships; 23% of women and 22% of men had been previously married. Average duration of cohabitation was 10 years (SD = 6.65 years). Because of miscommunication about the duration of their relationship, 10 couples (4%) had been living together for less than the 2 years (M = 1.09 years, SD = .28) required in the inclusion criteria and were therefore not included in the current study. This resulted in a final sample of 241 couples.

Both European American (64%) and African American (36%) couples were recruited across a wide range of socioeconomic status (SES); ethnic representation is similar to that of the community. Based on Hollingshead (1975) criteria, all SES backgrounds were represented (M at T1 = 3.21, SD = 0.91; range = 1–5). In analyses, the SES raw score was used to examine the variable's full range (M raw score at T1 = 37.30, SD = 9.99; M at T2 = 37.66, SD = 10.13; M at T3 = 37.92, SD = 10.51). The median household income was in the \$35,000 to \$50,000 range. Hollingshead (1975) criteria were used to classify each individual's education (1 = >7th grade, 2 = 9th grade, 3 = 10th or 11th grade, 4 = high school graduate, 5 = partial college or specified training, 6 = standard college or university, 7 = graduate professional training); on average, both wives (M = 4.79, SD = .95) and husbands (M = 4.66, SD = 1.02) had high school diplomas.

Attrition and Missing Data

Couples returned to participate at T2 (M = 12.84 months between T1 and T2, SD = 2.06 months). At T2, 215 couples participated (85% retention). At T3 (M = 11.34 months

between T2 and T3, $SD = 1.62$ months), 183 couples returned for a third wave (T3; 85% retention rate from T2). The rate of retention is good given the diverse nature of the sample in relation to SES and ethnicity (e.g., Calkins, Blandon, Williford, & Keane, 2007). Couples lost to attrition included those who lived together for less time, $t(220) = 2.45, p < .01$, and those with fewer children, $t(237) = 11.37, p < .01$. Retained couples had less PA at T2 than dropped couples for both husbands', $t(171) = -2.12, p < .05$, and wives' reports, $t(188) = -1.66, p < .05$. Retained wives also had greater sleep problems at T3 than dropped wives, $t(195) = 2.06, p < .05$. Retained husbands had less depression than dropped husbands, $t(116) = -2.11, p < .05$. Finally, retained couples demonstrated less violence than dropped couples based on both husbands', $t(211) = -2.40, p < .01$, and wives' reports, $t(228) = -3.04, p < .01$. Dropped couples did not differ from retained couples in anxiety, SES, ethnicity, education, or age.

Procedure

The current investigation is part of a larger study examining the effects of violence on children, and only pertinent procedures are discussed. At all three waves of data collection, families visited our on-campus research laboratory. Consent was obtained from husbands and wives during each visit, when couples completed self-report measures. Procedures and measures were identical across all waves unless otherwise noted. Because of the sensitivity of the questions and to help ensure valid reporting, husbands and wives completed all measures in separate rooms. Men and women were compensated independently for their participation.

Measures

Psychological abuse—PA was measured via the 35-item Subtle and Overt Psychological Abuse of Women and Men Scale (SOPAS; Marshall, 2001). Individuals reported how often their spouse used a list of behaviors in either a loving, joking, or serious manner in the past year (e.g., how often does your spouse get you to question yourself, making you feel insecure or less confident). For each item, Likert-type response choices ranged from 0 (*never*) to 6 (*a great many times*). Items were summed to create a total PA score and higher scores reflected more PA. The SOPAS has demonstrated good psychometric properties (Jones et al., 2005), and has previously been used to measure psychological abuse (El-Sheikh, Cummings, Kouros, Elmore-Staton, & Buckhalt, 2008; Temple, Weston, & Marshall, 2005). Excellent internal consistency was evident across all study waves for men and women and ranged from $\alpha = .96$ to $.98$.

Sleep problems—Husbands and wives reported on sleep problems using the Pittsburgh Sleep Quality Index at the second and the third study waves (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The 19-item PSQI assesses several critical aspects of sleep, including sleep quality, latency, duration, and disturbances. The global composite score (range 0–21) was calculated following standard scoring methods (Buysse et al., 1989), with higher scores reflective of greater sleep problems. A PSQI global score above 5 indicates significant sleep disturbance (Buysse et al., 1989). Cronbach's alphas indicated good reliability at both T2 and T3, ranging from $.85$ and $.86$ for wives, and $.80$ to $.85$ for husbands.

Potential Mediators and Moderators

Violence—During each study wave, husbands and wives reported on their spouse's violent behaviors using the Total Acts of Violence subscale from the Severity of Violence against Men/Women questionnaires (SVAMS and SVAWS; Marshall, 1992), which has established psychometric properties (Marshall, 1992). Individuals reported how often their partner

engaged in a list of violent behaviors towards them during an argument in the past year. Cronbach's alphas ranged from .95 to .97 for wives and .84 to .93 for husbands. As reports of violence are often skewed, we dichotomized the variable to distinguish physically aggressive spouses from nonaggressive spouses (Murphy & O'Leary, 1989). Unconditional growth models for both husbands and wives revealed no change over the waves in the presence of violence in the household. Thus, the average score across all three study waves was calculated and used in analyses to represent the presence or absence of any violence over the study waves.

Anxiety and depression—During each study wave, husbands and wives reported their anxiety and depression symptoms over the preceding two weeks using the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1983). The anxiety scale was composed of 10 items (e.g., “spells of terror or panic”) and the depression scale consisted of 13 items (e.g., “feeling low in energy or slowed down”). Likert type response choices ranged from 1 (*not at all*) to 5 (*extremely*). Internal consistency of the anxiety scale and the depression scale over the three time points was acceptable to good for men and women (α s ranged from .77 to .89 for anxiety and .80 to .93 for depression). Unconditional growth models revealed no change over the three waves in men's or women's anxiety or depression, and an average score across all study waves was calculated for each scale and used in analyses.

Data Analysis Plan

We computed descriptive statistics and intercorrelations among all study variables. Next, we used individual growth curve analysis to assess intraindividual changes in experienced PA over time; this analysis strategy allowed us to examine a spouse's trajectory of change over time in PA as a predictor of T3 sleep problems (Bub, McCartney, & Willett, 2007). Unconditional growth models (centered at the first wave) were fitted for both husbands' and wives' PA. Using Newson's (1998) *parmby* function in Stata version 10.0 (StataCorp, 2007), we then saved two individual growth parameter estimates for each individual's experienced PA trajectories: (1) an intercept parameter representing each spouse's initial level of PA, and (2) a slope parameter representing how each spouse's PA changed over the three waves (Bub et al., 2007).

To determine the effects of spouses' trajectories of experienced PA on their sleep at T3 and the potential mechanisms or moderators that might explain the PA–sleep link, we conducted a series of hierarchical linear regressions using these saved estimates with sleep problems as the outcome (Singer & Willett, 2003). For a conservative examination of this link, we attempted to reduce potential confounds by controlling for variables that may influence PA or sleep: participants' age (Morin & Gramling, 1989), education and socio-economic status (Krueger & Friedman, 2009; Stamatakis, Kaplan, & Roberts, 2007), number of children (Troxel et al., 2009), and duration of cohabitation (Vickerman & Margolin, 2008). For both spouses, age, education, SES, duration of time living together, and number of children were entered in the first step of each regression analysis. To note, we included SES at all three waves because unconditional growth models revealed significant growth over the waves in family's SES ($\beta = .23, p < .05$).

To examine whether changes in experienced PA over time predicted sleep problems at T3, we entered the individual parameter estimates of the PA trajectories as the second step of each analysis. Next, to examine potential mediators of the relationship between PA and sleep problems, violence, anxiety, or depression was entered in the third step of each analysis. Finally, to examine whether violence, anxiety, or depression either jointly or separately moderated the relationship between PA and sleep problems, the product of the respective moderators and the PA trajectories were entered in the fourth step of the analyses.

All possible two-, three-, and four-way interactions were examined. Calculation of simple intercepts and slopes to probe significant interactions was conducted following recommendations by Aiken and West (1991). Because our sample was nonclinical, we used the 10th and 90th percentiles to represent low and high values for the intercepts and slopes across all interactions in accordance with other studies that have examined high risk behaviors (Cooper, Agocha, & Sheldon, 2000). For violence, however, we plotted the slopes for the associations between the predictor (PA) and outcome (sleep problems) at *no violence* (0) and at *any violence* (1).

Results

Table 1 presents the means, *SDs*, and intercorrelations for all variables.

How Prevalent Are Sleep and Marital Problems in a Community Sample?

To first validate our use of a community sample for examining the links between PA and sleep problems, we examined the prevalence of these problems. Regarding sleep problems, at both T2 and T3, mean scores for sleep problems for both spouses were > 5 , which indicates significant sleep disturbances (Buysse et al., 1989); 50% of husbands and 52% of wives exhibited significant sleep problems at T2. At T3, 57% of men and 52% of women had significant sleep problems. Regarding PA, 94% of husbands and 93% of wives reported receiving PA at T1; in comparison, 40% of husbands and 44% of wives reported violence at any wave. We found no significant mean differences between spouses on either marital variables or sleep problems. Instead, spouses only differed on anxiety and depression, with wives reporting greater anxiety, $t(224) = 2.96, p < .01$, and greater depression, $t(198) = 4.58, p < .001$.

Are There Interindividual and Intraindividual Changes in Psychological Abuse Over Time?

Intercorrelations among spouses' PA scores revealed significant interindividual stability in PA, as demonstrated by the strong positive correlations among the scores across the three waves (Table 1). More specifically, husbands and wives appear to have retained their rank order of PA experiences across the 2 years relative to the other same-gendered spouses. It is worth noting that there was greater fluctuation over time in wives' interindividual differences in PA in comparison to husbands ($r_s = .64$ to $.79$ for wives, and $r_s = .68$ to $.73$ for husbands).

To determine whether experienced PA changed over time, we fit an unconditional growth model for husbands and wives. Time was centered at the first wave to allow us to estimate the true initial status and true rate of change of the individual growth in PA. As shown in Figure 1a, there was intraindividual change over time for husbands and wives, with both spouses experiencing a decline in PA across the waves. On average, husbands' experienced PA was 30.77 ($p < .001$) at the first assessment and declined approximately two points per wave thereafter ($\beta = -2.65, p < .05$). Wives' experienced PA was initially lower than husbands at 26.92 ($p < .001$), but they experienced only marginal declines across time ($\beta = -1.42, p \leq .10$).

Do Changes in Experienced Psychological Abuse Over Time Predict Sleep at Time 3?

Hierarchical multiple regression analyses were used to address how the trajectory of experienced PA affected sleep for husbands and wives at T3. For wives, the controls of age, education, SES, living together duration, and number of children were entered in the first step (see Model 1, Table 2). These variables explained 9% of the variance in wives' sleep ($p < .001$). The intercept and the slope for the wives' PA trajectories were then entered (see Model 2, Table 2) and explained an additional 10% of the variance in sleep problems ($p < .$

001). Estimated true initial status in PA predicted sleep problems at T3, such that wives who reported higher levels of PA at T1 had more sleep problems than those who reported lower levels. Estimated true rate of change in PA predicted wives' T3 sleep. On average, wives who reported stability or increases in PA over time had more sleep problems than wives who experienced steady declines in PA.

To examine the effects of changes in PA over time on husbands' T3 sleep, we entered in the same controls as for wives. In addition to these controls, preliminary analyses revealed husbands' sleep at T3 was related to other variables that were not found to be linked to wives' sleep at T3. Thus, to ensure a more conservative estimate of the links between PA and sleep for husbands, we included three additional controls for husbands that were not included in the models for wives. First, given the significant change across waves in husbands' sleep, we also controlled for men's sleep at T2. Second, because initial correlations revealed links between wives' sleep and husbands' T3 sleep (Table 1), we entered wives' T2 and T3 sleep as controls (see Model 1, Table 3). Together, these variables explained 36% of the variance in husbands' T3 sleep problems ($p < .001$). Next, we entered the intercept and slope for husbands' PA trajectories (see Model 2, Table 3), which resulted in a significant increase of 8% in the amount of variance explained in T3 sleep ($p < .01$). Husbands who reported greater initial PA had significantly poorer sleep than husbands who reported less PA at the first wave. The slope of husbands' trajectory strongly predicted their sleep problems at T3; those with more stable or increasing rates of PA had more sleep problems than husbands with sharper declines in PA.

Are the Effects of Psychological Abuse on Sleep Mediated by Violence, Anxiety, or Depression?

Violence—Hierarchical multiple regression analyses were used to test whether the effects of PA on sleep were explained by the presence of violence. The controls were entered in Step 1, the intercept and slope of PA were entered in Step 2, and violence was entered in Step 3 (see Model 3, Table 2). Including violence did not result in a significant increase in the variance explained in wives' sleep. Furthermore, both the PA intercept and slope remained significant predictors of sleep. A similar story emerged when examining husbands' sleep (see Model 3, Table 3). Thus, findings failed to support a mediational model for violence for either spouse.

Anxiety—Using the same analytic approach, we examined whether anxiety might explain the effects of experienced PA on sleep. For wives, the controls were entered in Step 1, the intercept and slope of PA were entered in Step 2, and the anxiety score was entered in Step 3 (see Model 4, Table 2). The addition of anxiety resulted in a significant increase in the amount of variance explained ($\Delta R^2 = .05, p < .01$). Anxiety was a significant predictor of wives' sleep, such that wives who reported greater anxiety also reported more sleep problems ($\beta = .23, p < .01$). Although we found that the initial status in PA continued to predict wives' sleep ($\beta = .02, p < .05$), the effect of the rate of change was only marginally significant once the effects of anxiety were included ($\beta = .04, p = .07$). Thus, we found some evidence for anxiety as a mediator of the association between changes in PA over time and wives' sleep, but did not find evidence for anxiety as a mediator between initial levels of PA and wives' sleep.

For husbands (see Model 4, Table 3), the addition of anxiety resulted in a significant increase in the variance explained ($\Delta R^2 = .06, p < .001$) and the effect of anxiety was highly positively associated with sleep ($\beta = .60, p < .001$). However, once anxiety was considered, the PA intercept no longer predicted sleep ($\beta = .02, ns$), whereas the slope remained a significant predictor ($\beta = .07, p < .05$). Thus, we found evidence for anxiety as a mediator of

the association between initial levels of PA and husbands' sleep, but not for the association between changes in PA over time and husbands' sleep.

Depression—Hierarchical multiple regression analyses were used to examine whether depression might explain the effects of experienced PA on sleep. For wives, the controls were entered in Step 1, the intercept and slope of PA were entered in Step 2, and the depression score was entered in Step 3 (see Model 5, Table 2). The addition of depression resulted in a significant increase in the amount of variance explained ($\Delta R^2 = .06, p < .001$). Depression was a significant predictor of wives' sleep, with more depressed wives reporting more sleep problems ($\beta = .14, p < .001$). Once the effects of depression were taken into account, neither component of the PA trajectory explained unique variance in wives' sleep, supporting a mediational model in which depression is a pathway of effects linking PA and sleep problems for wives.

For husbands (see Model 5, Table 3), the addition of depression significantly increased the amount of explained variance in sleep problems ($\Delta R^2 = .11, p < .001$). Depression itself was strongly correlated with sleep ($\beta = .43, p < .001$), such that men who reported more depressive symptoms also reported more sleep problems. Similar to the analyses examining anxiety, once depression was accounted for, the PA intercept no longer predicted sleep problems ($\beta = .01, ns$), though the slope remained a significant predictor ($\beta = .07, p < .05$).

Are the Effects of Psychological Abuse on Sleep Moderated by Other Risk Factors?

To address interactive effects between experienced PA and other risk factors (violence, anxiety, and depression) in the prediction of sleep problems, we conducted hierarchical linear regressions, building off the previous models. For wives, we found no evidence of three- or four-way interactions, and thus we discuss the significant two-way interactions for PA $\times$ Violence, PA $\times$ Anxiety, and PA $\times$ Depression separately. For husbands, we found no evidence of moderation for either the interpersonal (violence) or intrapersonal (anxiety, depression) variables.

Violence—Violence moderated the link between wives' initial levels of experienced PA at T1 and their sleep problems at T3 (see Model 6, Table 2). Simple slopes analyses revealed no differences in wives' sleep problems if there was any violence in the home (Figure 1b). For women in violent households, however, there were large discrepancies in sleep problems based on how much PA they initially reported, $t = 3.73, p < .001$. Wives who reported higher PA levels at the first wave reported more sleep problems at T3 than wives who initially reported lower PA.

Anxiety—Anxiety moderated the link between wives' initial levels of experienced PA and sleep problems ($\beta = -.01, p < .01$; see Model 7, Table 2). As seen in Figure 2a, simple slopes analyses revealed little variation in sleep based on initial levels of PA for wives who were highly anxious. For less anxious wives, however, there was clear differentiation between wives based on their initial levels of PA, $t = 3.33, p < .01$. Less anxious wives who experienced initially high levels of PA reported more sleep problems at T3 than did less anxious wives who experienced less PA initially, who fell below the clinical cutoff for sleep disturbances of 5.

Depression—A similar story emerged for depression, whereby depression moderated the link between wives' initial levels of experienced PA and their sleep ($\beta = -.00, p < .05$; see Model 8, Table 2). As seen in Figure 2b, simple slopes analyses indicated that wives with greater depressive symptoms reported high levels of sleep disturbances, regardless of their initial experiences of PA. For less depressed wives, experiencing high levels of PA at the

first wave was associated with reporting more sleep disturbances at T3, $t = 2.06$, $p < .05$. Only the less depressed wives with low initial levels of PA did not report significant sleep disturbances.

Discussion

We assessed the role of experienced PA in the marital relationship as a longitudinal predictor of men's and women's sleep. Clarification of marital dynamics that can disrupt sleep is recent in the literature (Krueger & Friedman, 2009) and is critical for understanding sleep, a fundamental facet of an individual's biological regulation and health (Dahl & El-Sheikh, 2007). Growth curve analyses illustrated that for both men and women, higher initial levels of PA predicted greater sleep problems 2 years later. Furthermore, increases in PA over time predicted higher levels of sleep problems over time for both men and women. These findings build substantially on the scant evidence linking relationship dynamics with sleep in couples, and are the first to demonstrate that experienced PA, which is unfortunately very prevalent in American families (e.g., Marshall, 1999), predicts later sleep problems for both men and women.

For an explication of the role of intrapersonal and interpersonal variables in the link between PA and sleep, we also examined marital violence, anxiety, and depression as potential pathways of effects and moderators of these associations. We found that the intrapersonal variables (depression, anxiety) functioned as mediators of the effects of PA on husbands' and wives' sleep; no such evidence was found for violence as a mediator. We further found that violence, anxiety, and depression interacted with wives' initial levels of PA to predict her later sleep problems. Thus, individual differences between wives in relation to interpersonal and intrapersonal functioning served to either exacerbate or protect against sleep problems associated with PA. For husbands, however, the effects of PA on sleep were not moderated by any of the risk variables.

A strong feature of this study relates to the assessment of PA and sleep problems for both husbands and wives. For both spouses, a wide range of both PA and sleep problems was evident in this community sample. Similar to reported findings in the literature (Lawrence et al., 2009), many men and women experienced high levels of PA in their marriage across all assessment periods. Furthermore, significant sleep disruptions were quite prevalent in men and women as indexed by the well-established PSQI, which assesses several critical sleep parameters. Given the links between sleep problems and a wide range of mental and physical health problems (Dew et al., 2003; Eguchi et al., 2008), understanding pathways of risk or protective and vulnerability factors in relation to sleep problems are warranted. We found that PA experienced by either men or women during the first study wave (T1) was predictive of sleep problems 2 years later (T3) in the expected directions. Interestingly, and consistent with our tentative hypothesis, men and women who experienced steady *declines* in PA over time had fewer sleep problems at T3 than those who were subjected to steady levels or increases in PA. Thus, changes in conflict in the marital relationship over time can impact sleep parameters and illustrate the dynamic nature of relations between marital functioning and biological regulation. Of note is that growth curve analyses models including PA at intercept and slope explained substantial amounts of variance in both men's and women's sleep, which is indicative of the importance of the marital relationship for a better understanding of sleep problems.

Anxiety (Fuller et al., 1997), depression (Heath et al., 1998), and violence (Humphreys & Lee, 2005) have been associated with sleep problems; the latter has been investigated almost exclusively in women. Thus, we aimed to clarify whether associations between PA and sleep could be explained or moderated by individual differences in anxiety or depression levels or

the presence of violence. Although we found evidence to suggest that anxiety and depression partially explained the negative impact of PA on sleep problems, in particular for women, we found no evidence of a pathway from PA to sleep through violence. Caution should be exercised though in reaching the conclusion that violence is not likely to function as a pathway of effects in other studies; such effects may be found in different samples with varying characteristics.

We found more compelling evidence for the role of the intrapersonal variables in explaining the relationship between PA and later sleep problems. Underscoring the importance of considering gender in these associations, anxiety explained the effects of different components of husbands' and wives' experienced PA growth trajectories on their sleep. Specifically, anxiety explained the effects of initial levels of husbands' PA on their sleep problems, whereas it only partially explained the effects of change in PA on wives' sleep. Similar differences emerged when examining depression, whereby it only explained the effects of initial levels of PA on husbands' sleep, but acted as a mediator of the effects of experienced PA on wives' sleep problems. The finding that depression better explained the links between PA and later sleep problems for wives in comparison to husbands may be explained by the work of Fincham, Beach, Harold, and Osborne (1997). The authors found a causal path for depression to marital adjustment for husbands, but the opposite causal direction for wives, namely that problems with the marriage led to wives' greater depression. Thus, it may be that we are seeing the effects of these disparate paths, whereby marital processes have a greater influence on women's mental health, and in turn their sleep, in comparison to the direction of effects for men.

Further underscoring the differences between husbands and wives were the analyses examining the risk factors that may exacerbate or ameliorate the negative effects of PA on sleep. We found no evidence of moderation for husbands, suggesting that the effects of PA on sleep were surprisingly uniform. In contrast, the effects of initial levels of PA on wives' later sleep problems appeared to depend on both her relationship with her husband and her mental health. The reason we found such strong interactive effects for wives and not for husbands may be because not only did wives report greater anxiety and depression in comparison to their husbands, as they are often found to (Lawrence et al., 2009), but the distribution of wives' scores was larger. The uniform effects of PA on sleep for husbands may have been a reflection of the relative uniformity of their mental health in comparison to wives, who had much larger discrepancies and variability between those considered more or less anxious or depressed.

Looking first at how wives' relationships with their husbands' affected the link between their experiences of PA and their later sleep problems, we found strong evidence that violence interacted with wives' initial levels of PA to predict sleep problems over time. Violence appeared to suppress the effects of PA on sleep, such that the effects of initial PA on sleep were masked when violence was present. In nonviolent homes, however, we saw negative effects of initially high levels of PA on sleep disturbances. In fact, wives in nonviolent but psychologically abusive homes had the highest rates of sleep disturbances. This finding is disconcerting given the prevalence of PA in couples (Marshall, 1999), but is in line with previous work suggesting that PA may have a more negative effect than violence, especially in community samples (Lawrence et al., 2009). A similar story emerged when examining the effects of wives' mental health on how her experiences of PA affected her later sleep. Women who reported either greater anxiety or depression had more sleep disturbances, regardless of how much PA they initially experienced. This suggests that anxiety and depression may have overridden the initial effects of PA on wives' sleep. It was only when wives were less anxious or less depressed that the effects of PA became apparent. This pattern of results for the moderators is concerning because women who may not feel that

they are distressed over being a recipient of psychological abuse may nevertheless experience significant sleep disturbances, which could pose a risk to their overall health and well-being (Dew et al., 2003; Eguchi et al., 2008). Findings highlight the importance of contemporaneous examinations of multiple risk variables for identifying for whom and under which conditions sleep problems occur, in particular for identifying women who may be at risk for later sleep disturbances even if they do not show outward signs of intrapersonal or interpersonal distress.

These findings should be interpreted within the study's context and limitations. Although there was a wide range of both experienced PA and sleep problems in the sample, findings may not generalize to individuals experiencing more severe abuse or have clinically significant levels of sleep problems. Furthermore, our reliance on single-measure, self-report data may have obscured potential links between marital dynamics and less subjective sleep indices. For example, recent work suggests that both occult sleep disorders and shift work can exacerbate both relationship and sleep problems (Cartwright & Knight, 1987; Virkkula et al., 2005; White & Keith, 1990). In addition, the current study did not assess overall relationship quality, a variable that has been identified as influencing couples' relationship and sleep problems (O'Leary, 1999; Troxel et al., 2009). There is evidence to suggest, however, that PA can be quite prevalent even in happy relationships (Murphy & Cascardi, 1999). Another limitation is that whereas PA was assessed during three time points over a 3-year period, sleep was examined only during the last two waves. Investigations of relationship dynamics and sleep over more numerous time periods could help clarify trajectories of growth in these constructs in relation to one another including nonlinear trajectories. Furthermore, we examined PA as a predictor of sleep. However, relations between sleep and PA are likely reciprocal such that sleep problems can lead to increases in marital problems (Troxel et al., 2007). A more complete understanding of directionality of effects between PA and sleep would be achieved by assessments of models that include PA as a predictor of sleep and vice versa. Finally, although our decision to examine men and women separately maximized our sample size, it did not allow us to address nesting within couples or potential cross-partner effects. Thus, future work should utilize more complete couple data to examine how PA affects the couple at the dyadic level.

In conclusion, results demonstrate that PA and changes in PA over time are significant predictors of men's and women's sleep problems over time. To some extent, these links were explained and exacerbated by individual's mental health, highlighting the complex nature of associations between marital processes, mental health, and sleep. Furthermore, differences in the pattern of results for husbands and wives illustrate the importance of considering gender as a powerful filter through which these associations are experienced. Hopefully, these findings will stimulate further research with the aim of identifying individual, relationship, and familial factors that may explain, ameliorate, or exacerbate risk for sleep problems.

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Figure 1.

(a) Individual growth models for longitudinal changes in husbands' ($N = 155$) and wives' ($N = 177$) psychological abuse. (b) Association of wives' initial levels of psychological abuse and sleep disturbances at no violence and any violence ($N = 170$).

Figure 2.

(a) Association of wives' initial levels of psychological abuse and sleep disturbances at low and high levels of anxiety ($N = 170$). (b) Association of wives' initial levels of psychological abuse and sleep disturbances at low and high levels of depression ($N = 170$).

Table 1
Descriptive Statistics and Correlations Among Study Variables for Husbands ($N = 209$) and Wives ($N = 239$)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. W PA T1	—															
2. W PA T2	.59*	—														
3. W PA T3	.69*	.80*	—													
4. H PA T1	.04	.12	.03	—												
5. H PA T2	.12	.28*	.17*	.74*	—											
6. H PA T3	.14	.19*	.25*	.63*	.71*	—										
7. W sleep T2	.24*	.30*	.41*	.04	.16*	.17*	—									
8. W sleep T3	.22*	.21*	.41*	.03	.10	.18*	.73*	—								
9. H sleep T2	.07	.11	.09	.16*	.32*	.29*	.01	.08	—							
10. H sleep T3	.15	.12	.20*	.07	.23*	.34*	.17*	.14	.51*	—						
11. W violence	.48*	.55*	.47*	.11	.13	.20*	.10	.06	.03	.01	—					
12. H violence	.19*	.13	.09	.37*	.45*	.52*	-.05	-.02	.15	.18*	.30*	—				
13. W anxiety	.39*	.47*	.51*	.01	.05	.23*	.45*	.39*	.01	.10	.30*	.03	—			
14. H anxiety	.17*	.21*	.19*	.21*	.37*	.41*	.03	.08	.42*	.40*	.07	.26*	.12	—		
15. W depression	.44*	.61*	.64*	-.01	.07	.23*	.46*	.43*	.02	.17*	.32*	.03	.81*	.13	—	
16. H depression	.15*	.23*	.17*	.27*	.41*	.41*	.03	.06	.54*	.57*	.11	.19*	.11	.75*	.11	—
<i>M</i>	27.19	25.62	25.18	31.23	28.21	24.75	5.60	5.55	5.45	6.35	.27	.28	2.84	1.92	7.87	4.85
<i>SD</i>	30.26	30.97	33.07	26.06	28.20	27.20	3.57	3.41	3.89	4.26	.35	.39	3.81	2.76	8.35	5.04

Note. W = wife; H = husband; T1 = data collected at Time 1; T2 = data collected at Time 2; T3 = data collected at Time 3. For the violence, anxiety, and depression variables, the scores were achieved by averaging data from T1 through T3.

* $p \leq .05$.

Table 2
Unstandardized Beta Coefficients for Each Fitted Regression Model for Wives' T3 Sleep Disruptions (*N* = 170)

Study variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-.62***	-.32***	-.32***	.70	.13	-.84	.85	.18
Age	.02***	.01***	.01***	.01*	.01*	.01***	.01 [†]	.01*
Education	.46	.22	.23	.25	.35	.27	.27	.36
SES T1	-.04	-.04	-.04	-.03	-.02	-.02	-.03	-.04
SES T2	.09	.12	.12	.09	.07	.08	.08	.07
SES T3	-.08	-.08	-.08	-.06	-.05	-.08	-.05	-.04
Living together duration	-.01	-.01	-.01	-.00	-.01	-.01	-.00	-.01
Number of children	.03	-.10	-.10	-.12	-.17	-.10	-.02	-.15
PA intercept	.04***	.04***	.04***	.02*	.01	.07***	.03*	.03 [†]
PA slope	.06**	.06**	.06**	.04 [†]	.02	.10**	.04 [†]	.02
Violence			.03			2.09		
Anxiety				.23**			.53***	
Depression					.14***			.21***
Violence × PA intercept						-.06*		
Violence × PA slope						-.08		
Anxiety × PA intercept							-.01**	
Anxiety × PA slope							-.01	
Depression × PA intercept								-.00*
Depression × PA slope								.00
<i>F</i> value	2.28**	4.06***	3.63***	4.90***	5.24***	3.55***	4.84	5.22
Δ <i>R</i> ²	.09*	.10***	.00	.05**	.06***	.03 [†]	.03*	.04*
Model comparison		1	2	2				

Note. SES = socioeconomic status; PA = psychological abuse; T1 = data collected at Time 1; T2 = data collected at Time 2; T3 = data collected at Time 3.

[†] *p* < .10.

* *p* < .05.

** *p* < .01.

 $p < .001$

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Table 3
Unstandardized Beta Coefficients for Each Fitted Regression Model for Husbands' T3 Sleep Disruptions (N = 121)

Study variable	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-.22	-.45	-.56	-1.00	.36
Age	-.01	-.01	-.01	-.00	-.01
Education	1.09**	1.10**	1.10**	1.15**	1.24**
SES T1	.01	.02	.02	-.03	.04
SES T2	-.21	-.24	-.23	-.21	-.26†
SES T3	.17	.19	.19†	.20†	.18†
Living together duration	.01	.01*	.01*	.01†	.01*
No. of Children	.16	.09	.08	.05	.07
Husband sleep disruptions T2	.61***	.55***	.55***	.46***	.34**
Wife sleep disruptions T2	.10	.05	.05	.11	.10
Wife sleep disruptions T3	.13	.11	.11	.02	.00
Husband PA intercept		.03*	.03†	.02	.01
Husband PA slope		.10***	.10**	.07*	.07*
Violence			.13		
Anxiety				.60***	
Depression					.43***
F value	6.24***	7.128**	6.52***	8.40***	9.94***
ΔR ²	.36***	.08**	.00	.06***	.11***
Model comparison		1	2	2	2

Note. SES = socioeconomic status; T1 = data collected at Time 1; T2 = data collected at Time 2; T3 = data collected at Time 3.

†
p < .10.

*
p < .05.

**
p < .01.

p < .001.