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Marital Happiness and Sleep Disturbances in a Multi-Ethnic Sample of Middle-Aged Women

Wendy M. Troxel, Daniel J. Buysse, and Martica Hall
Department of Psychiatry
University of Pittsburgh

Karen A. Matthews
Department of Psychiatry, Psychology, and Epidemiology
University of Pittsburgh

Previous research suggests that divorced individuals, particularly women, have higher rates of sleep disturbances as compared to married individuals. Among the married, however, little is known about the association between relationship quality and sleep. The present study examined the association between marital happiness and self-reported sleep disturbances in a sample of midlife women drawn from the Study of Women's Health Across the Nation (SWAN), a multi-site, multi-ethnic, community-based study ($N = 2{,}148$). Marital happiness was measured using a single item from the Dyadic Adjustment Scale, and sleep disturbance was assessed using 4 items from the Women's Health Initiative Insomnia Rating Scale (WHIIRS). After controlling for relevant covariates, maritally happy women reported fewer sleep disturbances, with the association evident among Caucasian women and to a lesser extent among African American women.

Sleep has profound effects on physical health and well-being (Dew et al., 2003; Hajak & Group, 2001; Irwin, Wang, Campomayor, Collado-Hidalgo, & Cole, 2006). Given that, for most adults, sleep is typically "shared" between one and one's spouse or bed partner (National Sleep Foundation, 2005), the quality of close relationships may have important implications for sleep (Troxel, Robles, Hall, & Buysse, 2007). For instance, epidemiological studies have shown that divorced individuals have higher rates of sleep disturbance and insomnia, particularly among women (Hale, 2005). However, divorce is an imperfect proxy for marital functioning. Clearly, not all marriages are equal, but scant research has investigated links between marital quality and sleep.

Correspondence should be addressed to Wendy M. Troxel, Department of Psychiatry, University of Pittsburgh, 3811 O'Hara St., Pittsburgh, PA 15213. E-mail: troxelw@upmc.edu

In the close relationships literature, the subjective experience of the relationship is typically referred to as "marital/relationship quality" or "marital/relationship functioning" (Snyder, Heyman, & Haynes, 2005) and can encompass a broad spectrum of positive and negative dimensions of the relationship (e.g., happiness, level of conflict, satisfaction, etc.), which can be assessed at the individual or dyadic level. The present research sought to examine the association between one important aspect of marital functioning, marital happiness, and sleep in women.

There are a number of reasons to consider marital happiness in the context of sleep, in general, and women's sleep, in particular. First, sleep is a physiologically vulnerable state that optimally occurs when one feels sufficiently secure to down-regulate vigilance and alertness—a felt experience that is largely derived from the social context (Dahl & El-Sheikh, 2007). From an evolutionary perspective, women's sleep may be particularly responsive to the social environment, given women's traditional reliance on the larger, more dominant males to ward off potential predators. Second, women consistently report more sleep problems than men (Akerstedt, Fredlund, Gillberg, & Jansson, 2002), despite the fact that women generally sleep longer and have better polysomnographically measured sleep profiles as compared to men (Krishnan & Collop, 2006). This apparent paradox may reflect the contribution of gender-based psychological and sociocultural factors to sleep disruption, in addition to genetic and biological factors (Dzaja et al., 2005). In particular, previous research suggests that women display greater levels of relational interdependence, as well as greater emotional sensitivity and physiological reactivity to marital problems or negative marital interactions (Kiecolt-Glaser & Newton, 2001). Women's sleep may similarly show greater sensitivity to relational factors, such as marital happiness, or the competing demands of social roles both within the home and outside of the home. Third, life events, such as the transition to parenthood (Shapiro, Gottman, & Carrere, 2000) or adjustment to illness (Mitropoulos et al., 2002), are known to be related to sleep impairments and precipitous declines in marital quality, suggesting that sleep may play a critical role in the trajectory of marital functioning. For instance, a recent study showed that infant sleep variables, particularly crying at night, was associated with declines in parental marital satisfaction (Meijer & van den Wittenboer, 2007). Finally, examining the association between marital quality and sleep may elucidate a key mechanism linking previously documented associations between marital quality and mental and physical health outcomes (Kiecolt-Glaser & Newton, 2001).

A small but growing literature suggests that relationship quality covaries with sleep; however, the bulk of the existing literature has focused on the effects of the husband's obstructive sleep apnea (OSA) or sleep-disordered breathing (SDB) on his or his wife's marital satisfaction (Troxel, Robles, et al., 2007). For instance, in a controlled prospective trial of psychosocial functioning, including marital satisfaction, prior to and following continuous positive airway pressure (CPAP) treatment for OSA, McFadyen and colleagues (2001) found that marital satisfaction scores increased from pre- to posttreatment in couples' randomized to the CPAP, whereas marital satisfaction scores deteriorated in the wait-list control condition. Consistent with these findings, a large population-based study of 405 couples from the Alameda County Study showed that spouses' sleep problems were associated with higher levels of marital unhappiness, even after controlling for one's own sleep problems (Strawbridge, Shema, & Roberts, 2004).

Whereas the extant literature shows fairly consistent findings suggesting that sleep disorders (primarily OSA and snoring) may adversely affect relationship functioning, only a handful of studies have investigated the association between relationship quality and other types of

sleep disturbance. In particular, three studies have shown that greater attachment anxiety, an important dimension of relationship quality, is associated with poorer subjective sleep quality (SQ; Carmichael & Reis, 2005; Scharfe & Eldredge, 2001) and lower percentages of Stages 3 to 4 sleep (Troxel, Cyranowski, Hall, Frank, & Buysse, 2007) in predominantly Caucasian populations. In addition, a longitudinal, community-based study of successful aging found that higher levels of marital satisfaction were prospectively linked with fewer sleep problems over a 3-year follow-up period (Prigerson, Maciejewski, & Rosenheck, 1999).

Importantly, the existing literature on marital quality and sleep has focused on predominantly Caucasian populations or has not examined ethnic differences in the association. Given evidence of ethnic differences in subjective and objective measures of sleep quality (Lauderdale et al., 2006; Stepnowsky, Moore, & Dimsdale, 2003), as well as ethnic differences in the dynamics and experiences of marriage (Dillaway & Broman, 2001), it remains to be seen whether the association between marital quality and sleep generalizes across ethnic groups or whether the pattern of results differs by ethnicity.

The primary aim of the present study is to examine the association between marital happiness and subjective sleep disturbances across multiple ethnic groups of women. The Study of Women's Health Across the Nation (SWAN) cohort of midlife women is a large, multi-site, multi-ethnic study involving extensive psychosocial and physiological assessments, including measures of marital happiness and self-reported sleep disturbances. The SWAN cohort includes women representing five ethnic backgrounds—non-Hispanic White, African American, Hispanic, Chinese, or Japanese, which allowed us to examine the association between marital happiness and sleep disturbances in distinct ethnic groups. In addition, the rich dataset, which includes measures of demographic indicators, social roles (i.e., occupational status, children in the home), general health status and medication usage, health behaviors, and psychological functioning, allows for examination of the unique association between marital happiness and sleep disturbances. Indeed, a key issue in understanding this relationship is evaluating whether marital happiness is merely a proxy for other variables known to covary with both marital happiness and sleep disturbances such as depressive symptoms (Perlis et al., 1997), health behaviors (Wickrama, Lorenz, Conger, & Elder, 1997), or social roles (Hislop & Arber, 2003). In addition, it is well-established that higher levels of marital satisfaction or happiness are associated with greater frequency of sexual activity (Avis et al., 2005), and there is a widely held belief (although with little consistent empirical support) that sexual activity promotes sleep (Brissette, Montplaisir, Godbout, & Lavoisier, 1985). Thus, the current study affords the possibility to disentangle the unique association between marital happiness and self-reported sleep disturbances in midlife women and to determine whether the association is consistent across different ethnic groups. We hypothesize that women who report greater marital happiness will report fewer sleep disturbances, independent of other relevant psychosocial, demographic, and general health characteristics. Given the lack of prior data to inform specific hypotheses concerning ethnic differences in the association between marital happiness and sleep disturbances, we consider the analyses stratified by ethnicity to be exploratory in nature.

METHOD

SWAN is a national study of midlife women designed to characterize biologic and psychosocial changes occurring during the menopausal transition conducted at seven U.S. sites: Los Angeles,

Oakland, Chicago, Detroit, Pittsburgh, Newark, and Boston. Details of the SWAN study design and recruitment procedures have been previously reported (Sowers et al., 2000). In brief, at each of the study sites, investigators recruited Caucasian women and a predetermined minority group sample (African Americans in Boston, Chicago, Detroit, and Pittsburgh; Chinese in Oakland; Japanese in Los Angeles; Hispanics in Newark). To obtain large numbers of women from diverse backgrounds, investigators at the Los Angeles, Newark, and Pittsburgh sites used random digit dialing sampling from banks of telephone numbers; and investigators at the Boston, Chicago, and Detroit sites used random selection from lists of names or household addresses. To obtain adequate numbers of minority participants, most sites supplemented their primary sampling frames. All study participants provided written informed consent, and each site adhered to its Institutional Review Board's guidelines for conducting human research. Seventy-three percent of the women selected were contacted and provided sufficient information for determination of study eligibility.

Baseline eligibility criteria for the SWAN study included the following: age 42 to 52, menses within the previous 3 months, not pregnant or breastfeeding, having an intact uterus and at least one ovary, no use of oral contraceptives or hormone replacement therapy within the previous 3 months, and initiation of the baseline interview within 3 months of the cross-sectional interview. Baseline SWAN assessments were conducted between 1996 and 1997. Of the eligible women, 51% ($n = 3{,}302$) enrolled in the SWAN study.

The present study reports data collected from the baseline SWAN assessment. Given that relationship quality and stability differs for married versus cohabiting partners (Brown, 2003; Brown & Booth, 1996; Skinner, Bahr, Crane, & Call, 2002), our analyses are restricted to the married women from the SWAN cohort ($N = 2{,}148$). Five percent of the total sample ($n = 106$) reported being unmarried but living with a partner and were thus excluded. A greater percentage of African American women were excluded based on this criteria (10%; $n = 52$) as compared to Caucasians (4%; $n = 35$), Hispanics (6%; $n = 6$), Chinese (3%; $n = 5$), and Japanese (5%; $n = 8$).

Of the married women, 64 women who were missing data on the relationship happiness measure were excluded from this analysis. In addition, among the married women, we further excluded those who reported that they worked night shifts ($n = 146$), as previous research has documented the adverse effects of night shiftwork on sleep and close relationship functioning (Smith & Folkard, 2004; Watanabe et al., 2004). Thus, our final sample consisted of 1,938 married women from the SWAN baseline cohort. Married women with missing data were more likely to be Hispanic ($p < .001$), to be unemployed ($p < .001$), have less than a high school education ($p < .001$), have difficulty paying for basics ($p < .001$), be depressed ($p < .05$), and have fewer social supports ($p < .001$) as compared to the married women included in the analyses.

Measures

Marital quality. A single-item measure drawn from the Dyadic Adjustment Scale (DAS; Spanier, 1976) asked participants to rate their degree of happiness in their current relationship on a 7-point Likert scale, with higher values indicating greater happiness. This single item has been shown to provide a good global assessment of marital quality (Sharpley & Rogers, 1984; Spanier, 1976), with excellent discriminant validity and reliability as compared to the full DAS (Sharpley & Cross, 1982). The single-item measure of marital happiness has been used

extensively in epidemiologic studies of married and cohabiting adults (Brown & Booth, 1996; King & Scott, 2005). Mean marital happiness scores in the current sample were comparable to prior reports (Bulanda & Brown, 2007). The marital happiness item was distributed normally in the current sample and was thus analyzed as a continuous variable.

Sleep disturbances. The baseline interview included four questions assessing sleep disturbances that were adapted from the Women's Health Initiative Insomnia Rating Scale (Levine, Kaplan, et al., 2003; Levine, Kripke, et al., 2003): difficulty falling asleep (DFA), difficulty staying asleep (DSA), early morning awakenings (EMAs) with an inability to return to sleep, and typical sleep quality (SQ). For the first three of the sleep items (DFA, DSA, and EMA), participants were asked if they had experienced any of these sleep problems and the frequency with which they had experienced any of these sleep problems ("sleep habits") in the past 2 weeks, on a scale ranging from 1 (*no, not in the past 2 weeks*) to 5 (*yes, 5 or more times a week*). Consistent with frequency criteria typically used in insomnia research (Edinger et al., 2004; Lichstein, Durrence, Taylor, Bush, & Riedel, 2003), each of these items was dichotomized as 0 if they occurred less than three times per week and 1 if they occurred three or more times per week. The fourth item asked participants to rate their "typical night's" SQ on a scale ranging from 1 (*very restful*) to 5 (*very restless*). Participants who rated their sleep quality as restless or very restless were coded as 1, and the remainder were coded as 0. Given that sleep disturbances are highly prevalent in midlife samples, and given that each of these individual sleep items were significantly correlated (with Pearson *r*s ranging from .43 to .54; *p*s $< .05$), we created a summary measure of sleep disturbances by summing each of the four binary sleep outcomes into a single composite score ranging from 0 to 4. This summary sleep disturbance measure, which captures both the number of symptoms and their severity, served as the primary dependent variable in the analyses. The alpha for the summary score was .75, indicating adequate internal consistency. In further support of the validity of the sleep disturbance measure, women reporting night sweats reported significantly more sleep disturbances, $\chi^2(12, N = 1993) = 165.31$, $p < .001$.

Covariates

To examine the independent association between marital happiness and sleep disturbances, we considered a large number of potential covariates that have been previously associated with sleep disturbances, as well as theoretically relevant variables that may account for the relationship between marital happiness and sleep (e.g., social roles, sexual activity). Variables that were associated with the summary sleep disturbance score at $p < .10$ in univariate ordinal regression models were retained as covariates to be included in the final statistical model.

Ethnicity. Women were categorized as Caucasian, African American, Hispanic, Chinese, or Japanese based on their self-identification. Ethnicity was dummy coded in the analyses, with Caucasian women representing the referent group in all models.

Sociodemographics. Age at baseline and educational level (dummy coded with <12th as referent compared to those with a high school diploma or equivalent, or some college or beyond) were assessed by self-report. To assess economic hardship, a single item asked participants to rate how difficult it is to pay for "basics" like food, housing, medical care, and heating. The response format is a 3-point scale ranging from 1 (*very hard*) to 3 (*not very hard at all*). Analyses from the CARDIA study revealed that difficulty paying for basics independently predicted incident hypertension over a 10-year follow-up period (Matthews et al., 2002).

Based on the item's distribution, a dichotomous code was created such that participants who endorsed "very hard" or "somewhat hard" received a code of 1, and participants who endorsed "not very hard at all" were coded as 0 (referent).

Social roles. Social roles included having a child in the home and occupational status. Participants reported the number of children currently living in the household. For the present analyses, this variable was coded dichotomously, to indicate presence or absence of children in the home. Participants reported whether they worked outside of the home, which was coded dichotomously to indicate current employment status.

Sexual intercourse. A self-administered questionnaire derived from several sources (Avis et al., 2005) assessed sexual activity and function. The present analyses only included the item assessing frequency of sexual intercourse, given that intercourse is the primary sexual activity assessed in the literature (Christopher & Sprecher, 2000). Participants were asked to rate on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*daily*) how often they had engaged in sexual intercourse in the past 6 months. Based on the distribution, we re-coded the measure such that women who reported having sexual intercourse "not at all" or "Once or twice a month" were coded as 0, those reporting having intercourse "about once a week" as 1, and those reporting having intercourse "more than once per week" or "daily" were coded as 2. In the analyses, the measure was dummy coded with those reporting sexual intercourse "not at all" or "once or twice a month" serving as the referent.

Psychosocial functioning. Given robust associations between clinical depression and sleep disturbance (Buysse & Kupfer, 1993), depression was assessed as a binary outcome reflecting the presence or absence of significant depressive symptoms using the clinical cutoff score of 16 or greater on the Center for Epidemiologic Studies–Depression Scale (Radloff, 1977). Anxiety symptoms were assessed as a continuous measure consisting of the sum of four items (irritability–grouchiness, tense–nervous, heart pounding–racing, fearful), which were scored based on the frequency (number of days) with which each symptom was experienced in the previous 2 weeks. Overall social support was assessed using four items drawn from the RAND Medical Outcomes Study (MOS) social support survey (Sherbourne & Stewart, 1991), which is an instrument designed to tap perceived emotional and instrumental support. Participants were asked how often each type of support is available to them, with 5-point response choices ranging from 0 (*none of the time*) to 4 (*all of the time*). Each item has been shown to have an item-scale correlation of >.72 in the SWAN cohort.

General health status. Participants' reported their current use of medications that could affect sleep, including psychiatric or sleep medications, and reported their history of taking sedatives or hypnotics. Participants who endorsed current use of psychotropic or sleep medications or who had a history of sedative or hypnotic use were coded as 1, and those who did not take any of these medications were coded as 0. One item derived from the MOS SF–36 assessed the participant's perceived health on a 5-point scale ranging from poor to excellent (Ware & Sherbourne, 1992). Based on the distribution of the measure, this measure was dichotomized such that participants who reported their health as "poor" or "fair" were coded as 1, and the remaining categories ("excellent," "very good," and "good") were coded as 0. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m^2) and analyzed as a continuous variable. All women included in the baseline cohort were premenopausal (normally cycling) or early perimenopausal (menstrual cycle in past 3 months but change in regularity) as assessed by self-report (Sowers et al., 2000). Pre- or perimenopausal status and history of taking hormone medications were included as potential covariates.

Health behaviors. Health behaviors were assessed via self-report. Current smoking status was coded as a binary variable (yes–no). A continuous physical activity score was derived from a modified version of the Baecke scale (Baecke, Burema, & Fritjers, 1982), which assesses domains of activity (sports, leisure, and household activities). We excluded the work component of the physical activity measure because 21% of the women were unemployed. Alcohol consumption was analyzed as ≤ 1 or >1 serving per day, based on the food guide pyramid (United States Department of Agriculture, 2005) definition of a serving (1 serving = 12 oz of beer, 5 oz of wine, or 1.5 oz of hard alcohol). Caffeine intake was measured in milligram equivalents of cups of coffee per day, and was analyzed as a continuous variable using a square root transformation.

Statistical Analyses

Preliminary analyses. Pearson chi-squares and analyses of variance (ANOVAs) were used to examine ethnic group differences in demographics and the primary study variables (marital happiness and sleep disturbances). ANOVAs were used to examine the univariate associations between marital happiness and the summary sleep disturbance score for the total sample and within each ethnic group, without covariate adjustment.

Primary analyses. Age, ethnicity, and SWAN study site were included as covariates in the fully adjusted model. In addition, potential covariates that were associated with the summary sleep disturbance measure at $p < .10$ in univariate ordinal regression models were included in the final multivariable ordinal regression model. These covariates were difficulty paying for basics, presence of children in the home, employment status, menopausal status, depressive symptoms, anxiety symptoms, social support, perceived health, use of sleeping or psychotropic medications, and BMI. The following variables were not associated with the sleep disturbance measure at $p < .10$ in univariate models and were, thus, not included as covariates in the full model: education, frequency of sexual intercourse, alcohol or caffeine use, smoking status, history of hormone use, and physical activity.

Ordinal logistic regression analysis was used to model the association between marital happiness and the four categories of the summary sleep disturbance score (0, 1, 2, or 3 to 4 symptoms). Age, study site, ethnicity (dummy coded with Caucasian as the referent), marital happiness, and the covariates were entered simultaneously. Results are presented as the odds ratios (ORs) and 95% confidence intervals (CIs) of having increasing numbers of sleep disturbances according to increasing levels of marital happiness.

To further explore whether the association between marital happiness and sleep disturbances was similar in different ethnic groups, we conducted ethnicity-stratified models for those groups in which there were significant univariate associations between marital happiness and sleep disturbances.

RESULTS

Participant Characteristics

Descriptive statistics for demographics and primary study variables (marital happiness and summary sleep disturbance score) are summarized for the total sample and by ethnicity in Table 1. The average age of the sample at baseline was 45.8 years ($SD = 2.71$) and was similar across ethnic groups. There were statistically significant ethnic group differences in all sociodemographic characteristics ($ps < .05$). In addition, the ethnic groups differed in marital happiness ($p < .001$). Post hoc analyses showed that Caucasian women reported higher marital happiness compared to all groups, except for the Japanese. There were also statistically significant ethnic differences in the summary sleep disturbance score ($p < .01$). The pattern of results showed that Caucasians and African American women tended to have more sleep complaints as compared to the other groups.

Univariate Associations Between Marital Happiness and Sleep Disturbances

Table 2 shows the mean levels of marital happiness according to each number of sleep complaints for the total sample and by ethnicity in the unadjusted models. Higher average levels of marital happiness were associated with fewer sleep disturbances, $F(3, 1{,}938) = 14.56$, $p < .001$, in the total sample. Ethnicity-stratified analyses showed that the statistically significant association between average marital happiness level and number of sleep disturbances was evident in the Caucasians, $F(3, 995) = 9.12$, $p < .001$; and the African Americans $F(3, 385) = 5.19$, $p < .01$ only. The association was not significant for the Japanese, $F(3, 207) = 2.56$, $p = .06$; Hispanics, $F(3, 162) = 1.90$, $p = .13$; or the Chinese, $F(3, 185) = .87$, $p = .46$. Notably, the cell sizes for increasing sleep disturbances were particularly small in these groups, which may have limited power to detect statistically significant differences.

Multivariable Model of Marital Happiness and Sleep Disturbance

The multivariable ORs showing the relationship between marital happiness and the summary sleep disturbance score is presented in Table 3. Higher levels of marital happiness were

TABLE 1
Descriptive Statistics for Sample Demographics and Primary Study Variables for the Total Sample and by Ethnicity

	Total Sample (N = 1,938)		*Caucasian (n = 996)*		*African American (n = 385)*		*Hispanic (n = 163)*		*Chinese (n = 186)*		*Japanese (n = 208)*	
Variable	*M*	*SD%*	*M*	*SD%*	*M*	*SD%*	*M*	*SD%*	*M*	*SD%*	*M*	*SD%*
Age in years: $F(4, 1{,}937) = 2.1$	45.8	2.7	45.7	2.7	45.8	2.6	45.7	2.8	46.0	2.6	46.3	2.7
Marital happiness: $F(4, 1{,}938) = 8.9^{**}$	4.7	1.2	4.9	1.2[a]	4.5	1.3[b]	4.5	1.2[b]	4.4	1.1[b]	4.7	1.1[a,b]
Education: $\chi^2(8) = 481.4^{**}$												
<High school	7		2		3		43		16		1	
High school graduate	17		15		21		26		17		19	
Some college or less	76		84		76		31		68		81	
Somewhat or very hard to pay for basics: $\chi^2(4) = 180.6^{**}$	33		27		34		80		29		29	
Has child(ren) in the home: $\chi^2(4) = 26.4^{**}$	79		77		76		80		92		84	
Currently working outside the home: $\chi^2(4) = 74.7^{**}$	79		82		81		58		86		66	
Summary sleep score: $\chi^2(12) = 24.8^{*}$												
0 symptoms	67		64		68		67		72		74	
1 symptom	17		18		17		18		15		16	
2 symptoms	10		12		7		7		8		8	
≥3 symptoms	6		6		8		8		6		2	

Note. Differing superscripts indicate statistically significant post hoc comparisons at the $p < .05$ level using Bonferroni adjustments in analyses of variance.
$^{*}p < .05$. $^{**}p < .001$.

TABLE 2
Marital Happiness Scores According to the Number of Sleep Disturbances for the Total Sample and by Ethnicity

	Total Sample (N = 1,938)		*Caucasian (n = 996)*		*African American (n = 385)*		*Hispanic (n = 163)*		*Chinese (n = 186)*		*Japanese (n = 208)*	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Number of sleep disturbances												
0	4.8	1.2	5.0	1.1	4.7	1.3	4.6	1.10	4.5	1.1	4.7	1.00
1	4.7	1.3	4.8	1.3	4.4	1.3	4.6	1.50	4.3	1.4	4.8	1.30
2	4.4	1.3	4.4	1.3	4.4	1.3	3.8	0.75	4.5	1.2	4.5	1.50
≥3	4.2	1.5	4.6	1.4	3.7	1.3	4.2	1.70	3.9	1.4	3.4	0.89

Note. Values in table represent marital happiness according to each number of sleep disturbances. Higher values indicate greater marital happiness.

associated with lower risk of sleep disturbances (OR = .90; 95% CI: .83, .98) while controlling for other covariates. In addition, the following covariates were significantly associated with the outcome in the full multivariable model: the ethnic contrasts comparing Caucasians to Hispanics and Chinese, anxiety symptoms, depressive symptoms, perceived health, BMI, and the use of sleep or psychotropic medications ($ps < .05$).

Next, we repeated the ordinal logistic regression model in the Caucasians and African Americans separately, as these two groups showed statistically significant univariate associations between marital happiness and sleep and had sufficient sample sizes within which to conduct the multivariable analyses. In the Caucasian sample, marital happiness was associated with sleep disturbances in the expected direction (OR = .86; CI: .76, .97). In the African American sample, there was no statistically significant association between marital happiness and sleep disturbances, although the size of the OR was similar (OR = .84; CI: .69, 1.03).

DISCUSSION

The present findings show preliminary support for the hypothesis that marital happiness is an important correlate of self-reported sleep disturbances in women. Specifically, we found that happily married women report fewer sleep disturbances including difficulty falling asleep, nighttime awakenings, early morning awakenings, and restless sleep, as compared to women reporting lower marital happiness. This association persisted in the fully adjusted model that controlled for factors that have shown previous associations with sleep (e.g., age, ethnicity, medication use, depressive symptoms, and anxiety symptoms), as well as theoretically relevant pathways that may account for observed associations between marital happiness and sleep (e.g., having children in the home and overall social support). Moreover, the use of ordinal logistic regression models allowed us to examine whether level of marital happiness was associated with increasing levels of sleep disturbance, rather than the presence or absence of any sleep disturbance, as minor or infrequent sleep disturbances are relatively common in midlife women.

TABLE 3
Multivariable Ordinal Logistic Regression Model Predicting the Odds of Having Increasing Numbers of Sleep Complaints in the Total Sample ($N = 1{,}868$) and in the Caucasian ($n = 966$) and African American ($n = 369$) Groups[a]

	Total Sample		*Caucasians*		*African Americans*	
Variable	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Ethnicity						
Caucasian	1.0	referent				
African American	0.91	0.68, 1.23				
Hispanic	0.31	0.17, 0.57**				
Chinese	0.70	0.43, 1.15				
Japanese	0.72	0.44, 1.16				
Marital happiness[b]	**0.90**	**0.82, 0.98***	**0.86**	**0.76, 0.97***	**0.84**	**0.69, 1.03*****
Sociodemographics						
Age[b]	1.03	0.99, 1.07***	1.00	0.96, 1.06	1.01	0.93, 1.11
Difficulty paying for basics						
Not very hard	1.0	referent	1.0	referent	1.0	referent
Somewhat or very hard	1.01	0.80, 1.27	0.91	0.66, 1.25	0.81	0.48, 1.35
Social roles						
Presence of children in the home						
No	1.0	referent	1.0	referent	1.0	referent
Yes	0.77	0.61, 0.99*	0.70	0.51, 0.97*	0.65	0.38, 1.11
Currently employed						
No	1.0	referent	1.0	referent	1.0	referent
Yes	1.02	0.80, 1.31	1.05	0.73, 1.51	1.06	0.58, 1.93
Psychosocial functioning						
CES–D < 16	1.0	referent	1.0	referent	1.0	referent
CES–D > 16	2.44	1.90, 3.12**	2.75	1.98, 3.82**	1.63	0.66, 2.47
Anxiety[b]	1.28	1.04, 1.58*	1.46	1.10, 1.94**	1.21	0.92, 2.88***
Social support[b]	0.99	0.95, 1.02	1.01	0.96, 1.07	0.95	0.87, 1.03
General health status						
Body mass index[b]	1.02	1.01, 1.04**	1.03	1.01, 1.05**	1.01	0.98, 1.04
Perceived health						
Good to excellent	1.0	referent	1.0	referent	1.0	referent
Fair to poor	1.58	1.16, 2.15**	2.36	1.32, 4.21**	1.81	0.94, 3.49***
Menopausal status						
Pre-menopausal	1.0	referent	1.0	referent	1.0	referent
Early peri-menopausal	0.90	0.74, 1.10	0.94	0.72, 1.24	1.13	0.72, 1.79
Use of psychotropic or sleeping medications						
No	1.0	referent	1.0	referent	1.0	referent
Yes	1.96	1.54, 2.49**	1.55	1.14, 2.12**	4.09	2.29, 7.30**

Note. OR = odds ratio; CI = confidence interval; CES–D = Center for Epidemiologic Studies–Depression Scale.

[a]Results are adjusted for study site. Ethnicity-stratified analyses restricted to Caucasians and African Americans due to insufficient sample sizes for the other minority groups. [b]Continuous variable with higher scores indicating higher values.

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

Findings are consistent with marital happiness being associated with both the presence and severity (as indicated by number of symptoms) of sleep disturbances.

Marital Happiness, Sleep Disturbance, and Key Covariates

In order to gain a better understanding of the relative magnitude of the association between marital happiness and the summary sleep disturbance score, it is important to consider the effects of the other variables that were included in the model. Consistent with previous epidemiological research (Kutner, Bliwise, & Zhang, 2004; Lauderdale et al., 2006), the strongest correlates of sleep disturbance were depressive symptoms, use of sleeping or psychotropic medications (likely an indicator of illness severity), and perceived health status. The fact that use of sleeping medications was a highly significant correlate of sleep disturbance in African Americans (OR = 4.09) suggests that prescribed medication usage is a particularly strong indicator of diease severity in traditionally underserved populations. Overall, social support was not associated with sleep disturbances, which suggests that there may be something specific about happiness in one's marriage that is associated with better sleep, rather than a general reflection of one's support network. On the other hand, given that the sample was restricted to married women (i.e., all women had at least one member in their support network), this may have limited the heterogeneity in the measure of social support. Age and hormonal status were not significant predictors in the multivariable model, which is likely due to the constraints imposed by the inclusion criteria at study baseline (i.e., participants were restricted in age to 42–55 years and had to be pre- or early perimenopausal). Economic hardship and employment status were also not significant predictors in the multivariable model. Alcohol and caffeine consumption were not associated with sleep disturbance in the univariate models, which is consistent with previous epidemiological literature showing that moderate use of alcohol or caffeine in the naturalistic environment has modest, if any, effects on subjective sleep quality (Roehrs & Roth, 2001; Sanchez-Ortuno et al., 2005). Finally, it is commonly believed that sexual activity promotes sleep. However, we found no association between reported frequency of sexual intercourse and sleep in the univariate model, although it is possible that the relationship is nonlinear. The relationship between sexual behavior and sleep has been poorly studied in humans (Brissette et al., 1985) in large part due to the difficulty of assessing this behavior in a laboratory setting. Future research using ambulatory polysomnography or actigraphy may be useful to further explore the relationship between sexual behavior and sleep. Thus, although the association between marital happiness and sleep appears to be relatively small in magnitude, it is striking that these associations would persist even after adjusting for variables that are known to covary with both sleep and marital functioning (e.g., psychosocial functioning and general health characteristics). These findings suggest that feeling happy in one's marriage may confer benefits for sleep that go beyond simply being a "happy" or well-adjusted person, although the cross-sectional nature of the work precludes conclusions regarding causality or the directionality of the relationship.

Ethnic Differences

Our findings also highlight the importance of considering ethnic differences in the relationship between marital happiness and sleep disturbance. In particular, the association between marital

happiness and the summary sleep disturbance score was evident in the Caucasian women and to a less extent in the African American women. However, we were unable to make direct comparisons between the Caucasian women and the Hispanic, Chinese, or Japanese women in multivariable models because the cell sizes across all levels of the sleep disturbance measure were small in these minority groups. Similarly, inspection of the univariate results suggests that there was no evidence or even a trend toward an association between marital happiness and sleep disturbances in the Hispanic or Chinese women. Indeed, even if we dichotomized the sleep measure to indicate the presence or absence of any sleep disturbance, there was still no association with marital happiness in these ethnic groups. These findings are preliminary in nature, and require further investigation with adequate sample sizes; however, they are also consistent with prior research that suggests relatively greater emphasis on broader kinship ties, in Hispanic and Asian populations, compared to the traditionally Western emphasis on the marital relationship *per se* (Bulanda & Brown, 2007; Oropesa & Landale, 2004). Future research could examine whether factors such as degree of acculturation or kinship ties modulates the association between marital happiness and sleep in different ethnic groups.

Limitations

In addition to the cross-sectional nature and reduced statistical power due to smaller sample sizes in the Hispanic, Chinese, and Japanese groups, several other methodological limitations must temper the results of this study. First, despite the face validity of the measure and previous research showing that it discriminates between high- and low-functioning couples (VanLaningham, Johnson, & Amato, 2001), the single-item measure of marital happiness is a relatively crude measure of marital happiness, and may reflect ethnocentric biases favoring the Caucasian women. More important, this measure reflects the individual's perception of his or her marital happiness, and may or may not reflect the dyadic functioning of the couple. The fact that our sample was limited to married women also may have introduced sampling bias, given that a relatively greater percentage of African Americans in our sample and in the population at large are unmarried or cohabiting. Future research should examine whether maritally happy women have fewer sleep disturbances as compared to maritally unhappy or unmarried women, to disentangle the influence of marital status versus marital quality.

Similarly, the subjective measure of sleep disturbances has several limitations including (a) the inability to rule-out undiagnosed sleep disorders, including sleep apnea; (b) the lack of a direct measure of whether participants were actually sleeping with their spouse on a regular basis; and (c) the lack of data on sleep problems or diagnosed sleep disorders in the partner. Previous evidence suggests that a sleep disorder in one spouse not only has adverse effects on the partner's marital happiness (Strawbridge et al., 2004) but may also increase the partner's risk of developing a sleep disorder (Ulfberg, Carter, Talback, & Edling, 2000). On the other hand, as a measure of subjective sleep disturbances, the measure used herein has well-documented reliability and validity (Levine, Kripke, et al., 2003), and is consistent with frequency and symptom criteria used for the diagnosis of insomnia, with the exception that it does not assess daytime dysfunction (Edinger et al., 2004).

Although the demographics and recruitment criteria for the SWAN cohort are notable in that they increase the likelihood that findings will generalize to women in the population at large, the question remains whether the findings will also generalize to men. However, given

previous research that shows that women are more emotionally and physiologically sensitive to both the "highs" and "lows" or marital functioning (Cross & Madson, 1997), women's sleep may similarly show greater sensitivity to relationship dynamics. Thus, future research that examines whether the magnitude of the association between marital happiness and sleep is similar in men and across different ethnic groups will elucidate whether this is essentially a human phenomenon or whether it reflects ethno- or gender-centric biases with regard to marital happiness.

Future Directions

Taken together, these findings, and the remaining unanswered questions, highight the importance of future research that specifically examines the couple as the unit of the analysis and incorporates methodologies that allow for the examination of the dynamic relationship between marital functioning and sleep. For example, studies utilizing actigraphy methods or in-home polysomnography, as well as daily diary assessments of marital interactions in both spousal members, would permit a more direct assessment of the temporal ordering between day-to-day marital functioning and night-to-night sleep parameters. In addition, experimental studies that manipulate sleep could examine the influence of sleep deprivation on a couple's marital functioning. Alternatively, treatment studies may examine whether successful marital therapy has positive effects on the partners' sleeping behaviors, as well as their marital functioning. Finally, studies that seek to understand the mechanisms underlying the association between marital functioning and sleep could inform our understanding of the directionality of the relationship and may elucidate opportunities for intervention (for a review of the literature and proposed mechanisms, see Troxel, Robles, et al., 2007).

The preliminary nature of this study, and limitations notwithstanding, the present study also has several strengths. First, the diverse demographics of this sample of midlife women, across a range of ethnic groups and socioeconomic strata, are a particular strength given that the majority of research thus far on the association between sleep and marital functioning has included women as the "collateral damage" of her husband's sleep apnea (Ashtyani & Hutter, 2003). The present study's focus on women from five different ethnic groups affords the opportunity to investigate the association between the woman's own experience of her marriage and of her sleep, and further allows for the investigation of ethnic differences in the association. Our findings are also notable in that we statistically controlled for a wide range of psychosocial, sociodemographic, and general health covariates that could account for the association.

Marital quality is an important predictor of a diverse array of physical and mental health outcomes including risk for psychiatric disorders, cardiovascular diseases, and mortality (Kiecolt-Glaser & Newton, 2001). However, relatively little research has considered the association between relationship quality and sleep, despite the fact that sleep is an important health outcome in its own right, and it may serve as a key mechanism linking relationship quality with mental and physical health outcomes. In this vein, Friedman, Hayney, Love, Singer, and Ryff (2007) found that the combination of social isolation with poor sleep was associated with the highest levels of the inflammatory marker IL-6 in a sample of women. Taken together, the present findings suggest that evaluating the bidirectional association between relationship quality and sleep may have important implications for physical and mental health.

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Clinical centers: University of Michigan, Ann Arbor—MaryFran Sowers, PI; Massachusetts General Hospital, Boston, MA—Robert Neer, PI, 1994 to 1999 and Joel Finkelstein, PI, 1999 to present; Rush University Medical Center, Chicago, IL—Lynda Powell, PI; University of California, Davis/Kaiser—Ellen Gold, PI; University of California, Los Angeles—Gail Greendale, PI; University of Medicine and Dentistry–New Jersey Medical School, Newark—Gerson Weiss, PI, 1994 to 2004 and Nanette Santoro, PI, 2004 to present; and the University of Pittsburgh, Pittsburgh, PA—Karen Matthews, PI.

NIH program office: National Institute on Aging, Bethesda, MD—Marcia Ory, 1994 to 2001 and Sherry Sherman, 1994 to present; National Institute of Nursing Research, Bethesda, MD—Program officers.

Central laboratory: University of Michigan, Ann Arbor—Daniel McConnell (Central Ligand Assay Satellite Services).

Coordinating center: New England Research Institutes, Watertown, MA—Sonja McKinlay, PI, 1995 to 2001; University of Pittsburgh, Pittsburgh, PA—Kim Sutton-Tyrrell, PI, 2001 to present.

Steering committee: Chris Gallagher, Chair; Susan Johnson, Chair

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