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A Longitudinal Study of Depression, Pain, and Stress as Predictors of Sleep Disturbance among Women with Metastatic Breast Cancer

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Abstract

Objective— Sleep disturbances are common among women with breast cancer and can have serious consequences. The present study examined depression, pain, life stress, and participation in group therapy in relation to sleep disturbances in a sample of women with metastatic breast cancer.

Methods— Ninety-three women with metastatic breast cancer participated in a large intervention trial examining the effect of the group therapy on their symptoms. They completed measures of depression, pain, life stress, and sleep disturbance at baseline, 4, 8 and 12 months.

Results— The results showed that higher initial levels of depression at baseline predicted problems associated with getting up in the morning, waking up during the night, and daytime sleepiness. Increases in depression over the course of 12 months were associated with fewer hours of sleep, more problems with waking up during the night and more daytime sleepiness. Higher levels of pain at baseline predicted more problems getting to sleep. Increases in pain predicted more difficulty getting to sleep and more problems waking up during the night. Greater life stress at baseline predicted more problems getting to sleep and more daytime sleepiness.

Conclusions— Depression, pain, and life stress scores were each associated with different types of negative change in self-reported sleep disturbances. Depression, especially worsening depression, was associated with the greatest number of types of negative change. The relationships found between sleep disturbance and depression, pain, and life stress suggest specific ways to address the problem of sleep disturbance for women with metastatic breast cancer and show how different types of disturbed sleep may be clinical markers for depression, pain, or life stress in this population.

Keywords

sleep disturbance; metastatic breast cancer; pain; depression; stressful life events

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Disturbed sleep is common among breast cancer patients (Davidson, MacLean, Brundage, & Schulze, 2002; Koopman, Nouriani et al., 2002; Savard & Morin, 2001) and has been found to be associated not only with poor quality of life (Carpenter & Andrykowski, 1998; Fortner, Stepanski, Wang, Kasprovicz, & Durrence, 2002), depressive symptoms (Koopman, Nouriani et al., 2002), and fatigue (Lichstein, Means, Noe, & Aguillard, 1997), but also with increased breast cancer risk (Davis, Mirick, & Stevens, 2001). Rates of sleep disturbance for women with breast cancer are well above those for the general adult population and higher than the above average rates for cancer patients in general. The prevalence of chronic insomnia in adults overall is about 10% (Roth & Roehrs, 2003), and it increases with age (Ohayon & Roth, 2003) and is higher for women (Martikainen et al., 2003) possibly due to hormonal changes such as those accompanying menopause (Krystal, 2003).

Koopman and colleagues (Koopman, Nouriani et al., 2002) found that 63% of a sample of metastatic breast cancer patients reported one or more types of sleep disturbance. In a sample of 72 breast cancer patients, Fortner and colleagues (2002) found that 61% had significant sleep deficits. In contrast, Degner and Sloan (Degner & Sloan, 1995) found that only 31% of a mixed group of cancer patients reported moderate to severe insomnia.

One of the most compelling pieces of evidence demonstrating the significance of sleep disturbances in relation to breast cancer comes from a study that found an association between disruption of diurnal sleep-wakefulness cycles due to night shift work and an increased risk for breast cancer (Davis et al., 2001). In this study, the risk of developing breast cancer was elevated when sleep patterns did not correspond to nocturnal production of melatonin. Hormones other than Melatonin may play a role in the association between abnormal sleep patterns and breast cancer risk. Disrupted diurnal patterns of cortisol have also been shown to predict early mortality from metastatic breast cancer (Sephton & Spiegel 2003; Sephton, Sapolsky, Kraemer, & Spiegel, 2000).

Thus, sleep disturbance by itself is a significant problem in relation to breast cancer that needs to be better understood so the high prevalence can be reduced. The fact that disturbed sleep may contribute to breast cancer risk is a further reason to identify factors that may contribute to disturbed sleep in the context of breast cancer. In the present study, depression, pain, and life stress were examined as possible predictors of disturbed sleep for women with metastatic breast cancer, and supportive-expressive group therapy was examined as a possible means for alleviating sleep disturbances for this population. In recognition of the multi-faceted nature of sleep disturbance, several distinct dimensions of disturbed sleep were considered: problems getting to sleep at night, problems waking up during the night, problems getting up in the morning, sleepiness during the day, and number of hours slept.

Depression

There are positive, strong, and complex relationships between cancer and depression (Koopman, Collie, Butler, Giese-Davis, & Spiegel, 2004; Spiegel & Giese-Davis, 2003). Depression can be a result of concerns about cancer, its symptoms, and its treatments (Massie & Popkin, 1998). It can predate the onset of cancer and simply be co-morbid with the illness. There is also evidence that depression can be a risk factor for developing cancer (Jacobs & Bovasso, 2000; Penninx et al., 1998; Persky, Kempthorne-Rawson, & Shekelle, 1987; Shekelle et al., 1981; Spiegel & Giese-Davis, 2003).

The relationship between depression and sleep disruption has not been clearly defined. Sleep disturbance is a cardinal symptom of depression, yet it is not clear to what extent sleep disruption may cause depression or that depression may cause disrupted sleep. Depression has been found to be strongly predictive of self-reported sleep quality among people with obstructive sleep apnea (Wells, Day, Carney, Freedland, & Duntley, 2004). There is enough evidence that depression causes disturbed sleep to justify investigating depression as a possible predictor of sleep disturbances among women with breast cancer. Disturbed sleep often precedes mood disorders and is considered a risk factor for depression in the general population (Ohayon & Roth, 2003; Walsh, 2004). Chang, Ford, Mead, Cooper-Patrick, and Klag (Chang, Ford, Mead, Cooper-Patrick, & Klag, 1997) found that insomnia during medical school predicted the development of depression more than 20 years later, suggesting that sleep disturbances represent a biological risk for depression. Conversely, it has been also speculated that alternations in sleep patterns may be a consequence of depressive disorders (Koopman, Nouriani et al., 2002).

Pain

Pain is one of the most frequently identified contributors to insomnia in cancer patients (Davidson et al., 2002) and has been associated with both fatigue and sleep disturbance in breast cancer survivors (Bower et al., 2000; Koopman, Nouriani et al., 2002). Nonmetastatic breast cancer patients have pain prevalence rates of 33% to 52%; the rate increases to 56% – 68% among women with metastatic breast cancer (McGuire & Sheidler, 1992). Pain is a primary symptom of breast cancer when there is bone metastasis (Dow, Ferrell, Leigh, Ly, & Gulasekaram, 1996), and may increase over the course of metastatic illness, particularly in the period prior to death (Butler et al., 2003). Sleep disturbances are almost universal for people with chronic pain (McCracken & Iverson, 2002). Thus, pain is a likely predictor of sleep disturbances for women with metastatic breast cancer.

Life Stress

Stressful life events that can affect sleep can either be negative (*e.g.*, death of a loved one, loss of employment) or positive (*e.g.*, vacation, marriage). The effect on sleep will typically resolve when the stressful event has ended (Roehrs & Roth, 2000). In the case of metastatic breast cancer, however, there generally is an ongoing series of stressors, some residual from previous events, others in the present, and others still anticipated in the future, many of which cannot be resolved (Butler et al., 2004).

There is evidence that stress reduction interventions can alleviate sleep problems for women with breast cancer. Shapiro and colleagues (Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003) examined the effects of mindfulness-based stress reduction on women with breast cancer and found that stress management techniques (mindfulness-based stress reduction and a “free choice” control in which subjects chose their own stress management technique) were effective in improving measures of sleep quality. Thus, life stress may be a predictor of sleep disturbances for women with metastatic breast cancer and may be a psychosocial factor that is amenable to treatment.

In this study, we examined whether changes in sleep disturbance were associated directly with life stress as well as with a psychosocial intervention—supportive-expressive group therapy—that is designed to help women to better cope with their life stress and physical health symptoms. While supportive-expressive group therapy is not designed explicitly to promote better sleep hygiene, we reasoned that it might indirectly promote better sleep because of its demonstrated effects in helping women to better modulate their emotions and reduce their distress and pain (Butler et al., 2001; Classen, Butler, Koopman, Miller, DiMiceli, Giese-Davis,

Fobair et al., 2001; Giese-Davis et al., 2002; Spiegel & Bloom, 1983; Spiegel, Bloom, Kraemer, & Gottheil, 1989; Spiegel, Bloom, & Yalom, 1981).

The present study assessed depression, pain, life stress, sleep disturbances, and participation in group therapy among a sample of women with metastatic breast cancer. We sought to determine the extent to which changes in pain, depression, and life stress and participation in group therapy would predict changes in sleep disturbances. We have previously examined baseline associations between sleep, depression, pain, and life stress (Koopman, Nouriani et al., 2002). The purpose of this study was to extend our cross-sectional findings and to examine relationships over time between psychosocial variables, group therapy treatment, and sleep disturbances in women with metastatic breast cancer.

Method

Participants

Data for the present analyses were drawn from data collected for a larger clinical trial examining the effects of supportive-expressive group therapy on survival, distress, and pain among women with metastatic breast cancer (Butler et al., 2001; Classen, Butler, Koopman, Miller, DiMiceli, Giese-Davis, Fobair et al., 2001). After eliminating 32 participants for whom we had no follow-up assessments, a sample of 93 women remained. Those excluded did not differ significantly from the remainder of the sample on any background variables. The women we included ranged in age from 33 to 80 with a mean of 53.81 ($SD=10.86$). The sample was 90% Caucasian, 6% Asian American, 1% African American, 1% Native American, and 2% identified themselves as 'other'.

Slightly more than half of the women were married (59.1%), 31.3% were separated, divorced or widowed, 8.6% had never been married, and 1 participant described her status as 'other'. The women's education levels ranged from 12 to 26 years ($M = 16.02$, $SD = 2.62$) and the mean household income was approximately \$60,000. All the participants had diagnoses of metastatic or locally recurrent breast cancer. (The inclusion and exclusion criteria are described in detail in (Classen, Butler, Koopman, Miller, DiMiceli, Giese-Davis, Carlson et al., 2001)). See Table 1 for description of medical variables. Informed consent was obtained from all participants according to procedures approved by Stanford University's ethics committee.

Procedure

The data used in this analysis were collected at baseline prior to randomization to the group therapy intervention and every four months thereafter over the next 12 months. With the exception of the medical variables, the data reported here were collected using validated standardized questionnaires.

Group therapy intervention—The participants who were randomized to receive group therapy intervention received weekly sessions of supportive expressive group therapy (SET) for one year. SET is an existentially-based intervention that focuses on encouraging group members to mobilize and benefit from social support, to make use of active coping strategies, and to express painful emotions such as sadness and fear (Classen, Butler, Koopman, Miller, DiMiceli, Giese-Davis, Fobair et al., 2001), (Spiegel & Classen, 2000). Each group was led by two trained facilitators and was composed of 6–10 women. The sessions lasted for 90 minutes and concluded with a self-hypnosis exercise in which women participated in visualization and relaxation for stress management, creative problem solving, and pain management (the intervention is described in detail in Spiegel and Classen (Spiegel & Classen, 2000)).

Demographic and medical variables—Information was collected by self-report about the participants' age, education, household income, marital status. Medical information (number of months since diagnosis of recurrence/metastasis, disease-free interval, metastasis to bone or not, and receipt of chemotherapy in the previous two months) was extracted from medical records.

Sleep—Sleep disturbances were measured with the Sleep Questionnaire, a 6-item version of the 27-item Structured Insomnia Interview (Stanford Sleep Disorders Clinic, 1979). The five questions were: (1) “Do you have a problem getting to sleep at night?” (2) “Do you have a problem because you wake up during the night?” (3) “Do you have a problem with waking up and getting up in the morning?” (4) “Do you have a problem with sleepiness during the daytime (feeling sleepy, struggling to stay awake in the daytime)?” and (5) “How many hours of sleep do you usually get at night?” The first four items have the following response format: 1 = none, 2 = slight, 3 = moderate, 4 = great, or 5 = severe. Item 5 requires an answer in hours and minutes.

Depression—We used the total score from the Center for Epidemiologic Studies Depression Scale (CES-D; (Hann, Winter, & Jacobsen, 1999; Radloff, 1977)) to measure depression. This scale was selected because the content of its items minimize symptoms of medical illness such as weight loss. An example of one of the scale's 20 items is “I felt sad”. Response options range from 0 = rarely/none of the time (less than 1 day), 1 = some or a little of the time (1 or 2 days), 2 = occasionally (3 – 4 days), 3 = most of the time (5 – 7 days). Hann and colleagues (Hann et al., 1999) reported adequate internal consistency for this scale in both healthy controls ($\alpha=.87$) and cancer patients ($\alpha=.89$) and good test-retest reliability in both healthy controls ($r = 0.51; p < 0.001$) and cancer patients ($r = 0.57; p < 0.001$). The measure has one sleep-related item (“My sleep was restless”) and is similar in this way to other depression scales (e.g., Zung Depression Inventory (Zung, 1965); BDI (Beck, 1978))

Pain—In keeping with previous research in our laboratory concerning pain among women with metastatic breast cancer (e.g., (Butler et al., 2001; Koopman, Nouriani et al., 2002; Spiegel & Bloom, 1983)), current pain was assessed using a single item from the Pain Questionnaire (Spiegel & Bloom, 1983): “Please rate your experience of pain at this moment by selecting a number from 1 “not noticeable” to 10 “excruciating – worst ever”.

Stressful life events—Stressful life events were measured using a 37-item checklist developed by Horowitz, Schaefer, Hiroto, Wilner and Levin (Horowitz, Schaefer, Hiroto, Wilner, & Levin, 1977). This assessment was conducted only at baseline. Participants were asked to read a list of events (e.g., death of parent, illness, separation, divorce) and indicate whether or not each event was experienced and how long ago it was experienced, if it was. Each item was assigned a weighted score based on the level of stress associated with the particular stressor and its time frame (Horowitz et al., 1977) and the total weighted sum was used in the analysis.

Data Analysis

We used slope analyses (Gibbons et al., 1993) to test our hypotheses that changes in sleep disturbances would be predicted by baseline levels of self-reported pain, depression, and life stress, by changes in depression and pain over 12 months, and by group therapy participation. Slopes were constructed for each participant who had baseline data and at least one follow-up assessment. These slopes were constructed across assessments and were regressed on time using months as the unit of time. All of the variables were entered into the regression models simultaneously. We created slopes representing the rate of change for the main sleep outcome variables, depression and pain changes from baseline to follow-up. All the other variables were entered into the regression analyses in their original form. The slopes for depression and pain,

life stress values and participation in group therapy were regressed on the slopes of 4 types of sleeping problems: problems getting to sleep, problems waking up during the night, problems getting up, and daytime sleepiness. In addition we examined the relationship between our predictors and the number of hours of sleep achieved per day.

The correlations between measures of changes in sleep disturbance were moderate. Changes in number of hours of sleep was correlated with changes in problems getting to sleep ($r = -.26, p = .01$), changes in problems waking up during the night ($r = -.22, p < .05$), and changes in daytime sleepiness ($r = -.21, p < .05$). Changes in problems getting to sleep were correlated with changes in problems waking up during the night ($r = .32, p = .002$). Changes in waking up during the night were associated with changes in daytime sleepiness ($r = .29, p = .005$). The moderate magnitude of these correlations allowed us to use these sleep variables as independent outcome variables.

The sleep variables at follow-up were correlated with the same variables at baseline. The correlations ranged from .34 to .67 depending on the time of the follow-up. Therefore, we included the baseline intercept of the sleep variables as a covariate in each multiple regression analysis because the intercept is the best estimate of the true baseline value of the variable. Previous research has shown that women with metastatic breast cancer report a significant increase in distress and pain prior to dying (Butler et al., 2003; Classen, Butler, Koopman, Miller, DiMiceli, Giese-Davis, Fobair et al., 2001). Consequently, we dropped assessment that was proximal to death (within 12 months) and recalculated the slopes based on the remaining points. Nine out of 32 women excluded from the study had completed only two assessments with their second one occurring within 12 months of their death and were dropped from the analyses.

Results

Descriptive Statistics

At baseline, 64% of women reported one or more sleep disturbance: 22% reported having moderate to severe problems with getting to sleep, 42.4% of women had moderate to severe problems with waking up during the night, 31.2% reported moderate to severe problems with waking and getting up in the morning, and 23.2% had moderate to severe sleepiness during the day. Table 1 shows means, standard deviations and slopes (where appropriate) for the sleep disruption, depression, pain, and life stress.

Multiple Regression Analyses

Table 2 shows the results and beta weights of the multiple regression analyses for sleep disruption.

Predicting number of hours of sleep—Greater decreases in number of hours of sleep were significantly predicted by increased depression during the study period and by more hours of sleep at baseline. This model accounted for a fifth of the variance in changes in hours of sleep [$F(7, 85) = 4.33, p < .001, R^2 = .26$; adjusted $R^2 = .20$].

Predicting problems getting to sleep—Increased problems in getting to sleep were predicted by higher levels of pain at baseline, increases in pain intensity over time, and higher number of life stressors at baseline. In addition, women who reported fewer problems getting to sleep at baseline showed significantly greater increases in problems getting to sleep over the course of 12 months. This overall model accounted for more than one third of the variance in changes in problems getting to sleep [$F(7, 85) = 9.45, p < .001, R^2 = .44$, adjusted $R^2 = .39$].

Predicting problems associated with waking up during the night—Increases in problems with waking up during the night were predicted by significantly higher depressive symptoms at baseline, significant worsening of depression over time, greater change in intensity of pain, and fewer problems at baseline in waking up during the night. This model accounted for approximately one third of the variance in changes in problems waking up during the night [$F(7, 85) = 7.03, p < .001; R^2 = .37, \text{adjusted } R^2 = .32$].

Predicting problems getting up—Increased problems with getting up in the morning were predicted by greater depression at baseline and fewer problems with getting up at baseline. This model accounted for about half of the variance in changes in problems with waking up [$F(7, 85) = 11.72, p < .001; R^2 = .49, \text{adjusted } R^2 = .45$].

Predicting problems with daytime sleepiness—Increases in daytime sleepiness were significantly predicted by greater depression at baseline, greater increases in depression over the course of study, greater life stress at baseline, and fewer problems with daytime sleepiness at baseline. This model accounted for well over a third of the variance in problems with daytime sleepiness [$F(7, 85) = 8.77, p < .001; R^2 = .42, \text{adjusted } R^2 = .37$].

No other variables were found to be significant in predicting changes in sleep problems. Because the CES-D contains an item pertaining to sleep, we performed a secondary analysis to determine whether the relationship between depression and sleep problems was due to that item. After removing that item from the CES-D we replicated the findings with one exception: we found that baseline levels of depression no longer predicted problems waking up during the night.

Discussion

The results indicate that the psychosocial factors of depression, pain, and life stress predicted sleep disturbances in our sample of women with metastatic breast cancer. The results did not support the prediction that group therapy would result in an improvement in sleep disturbances. The analyses showed that a worsening of sleep disturbances over 12 months was predicted by baseline depression, pain, and life stress scores, and was strongly associated with increases in depression and pain scores over that time.

The baseline values were significantly related to the changes over time on each of the sleep disturbance measures. After controlling for the baseline values of each type of sleep disturbance, we found that depression, pain, and life stress were significant predictors of the worsening of sleep disturbances, even when the sleep item on the depression inventory was removed from the analysis. Depression, pain, and life stress scores were each associated with different types of negative change in self-reported sleep disturbances. Depression, especially worsening depression, was associated with the greatest number of types of negative change.

It is notable that the analyses identified predictors and correlates for five types of sleep disturbance and that these were not the same across types. ‘Number of hours of sleep’ showed a negative relationship to depression (worsening of depression). ‘Problems getting to sleep’ was associated with life stress (baseline scores) and pain (baseline scores and worsening of pain). ‘Problems associated with waking up during the night’ was associated with pain (worsening of pain) and depression (baseline scores and worsening of depression). ‘Problems getting up’ was associated with depression (baseline scores). ‘Problems with daytime sleepiness’ was associated with life stress (baseline scores) and depression (worsening of depression).

The women reported high levels of sleep disturbances. Of the 93 women in the study, 64% reported at least one type of sleep disturbance. The elevated rate of women's sleep disturbance reinforces the importance of addressing this issue as an aspect of care for women with metastatic breast cancer. The relationships found between sleep disturbance with depression, pain, and life stress suggest specific ways to address the problem of sleep disturbance for women with metastatic breast cancer and show how different types of disturbed sleep may indicate the presence of depression, pain, or life stress in this population.

Depression

The women with higher baseline depression scores had a greater worsening of problems related to: waking up in the night, getting up in the morning, and daytime sleepiness than the women with lower baseline depression scores. Worsening of depression was the factor that showed the strongest association with worsening sleep problems, as follows: the women with greater increases in their depression scores had a greater decrease in the number of hours slept per night and had more problems with waking up in the night and with daytime sleepiness. The causal association between baseline depression scores and problems waking up in the night over the study was the only one of these relationships that no longer held when the analysis was repeated excluding the sleep item on the CES-D.

These results suggest that treatment for depression could alleviate problems with getting up in the morning and daytime sleepiness for women with metastatic breast cancer and might also help with problems waking up in the night and not getting enough sleep. Depression is difficult to diagnose in the presence of cancer because of the overlap of the symptoms of the two conditions and because depressive symptoms may be considered normal for people experiencing a life-threatening disease. Depression in people with cancer is often not treated when it should be (Koopman et al., 2004; Spiegel & Giese-Davis, 2003). The results of this study suggest that disturbed sleep may be a clinical indicator of depression for women with metastatic breast cancer that could be used to identify depression that otherwise would be hard to detect.

Pain

The women with higher baseline levels of pain experienced greater increases in problems getting to sleep compared to women with lower baseline levels of pain. In other words, the level of pain at baseline resulted in worsening problems in getting to sleep even when the level of pain did not intensify over time. This is consistent with previous research has shown that problems with disturbed sleep can become chronic once they have begun, even if the original trigger is no longer present (Stiefel & Stagno, 2004). Adequate treatment for pain may prevent both current and future sleep problems for women with metastatic breast cancer.

The women whose pain became more severe experienced worsening problems in getting to sleep and in waking up in the night. Previous research has shown that pain and disturbed sleep can have a circular pattern in relation to each other, with pain triggering disturbed sleep and disturbed sleep increasing perceptions of pain (Latham & Davis, 1994; Stiefel & Stagno, 2004). Women with metastatic breast cancer and high levels of pain may be at risk for problems getting to sleep and staying asleep and those with these types of disturbed sleep may be at risk for even greater pain. Preventative measures could be taken for both possibilities.

The pain questionnaire used in this study was based on a single question and therefore may not be a fully sensitive measure. The fact that the analyses showed three significant relationships between pain scores and reports of sleep problems suggests that a more sensitive measure of pain might reveal more complex and possibly stronger associations between pain

(both amount of pain and increases in pain) and sleep disturbances for women with metastatic breast cancer.

Life stress

Life stress was only measured at baseline. The women who reported higher baseline levels of the life stress reported greater increases in problems getting to sleep and in problems with daytime sleepiness. Thus, high levels of baseline life stress resulted in a worsening of two types of sleep disturbance irrespective of any changes in the level of life stress occurring during the course of the study. It may be that those women with high baseline levels of life stress continued to have high levels throughout the study. They may have been sensitized by previous life stressors to show stronger stress responses to new life stressors, as suggested by evidence among persons living with HIV infection (Koopman, Gore-Felton et al., 2002) or who have endured childhood sexual abuse (Koopman, Gore-Felton, Classen, Kim, & Spiegel 2001). It is also possible that stress at one time had a lingering effect that worsened over time. Regardless of the mechanism, women with metastatic breast cancer who are known to have high levels of life stress could be monitored for sleep disturbances in the form of problems getting to sleep and daytime sleepiness and treated as necessary.

In our previous cross-sectional study of sleep problems among women with metastatic breast cancer (Koopman, Nouriani et al., 2002), we also found correlations between sleep disturbance and both pain and depression. This longitudinal study elaborates these findings. It shows a persistent association between sleep disturbances and both pain and depression and shows pain, depression, and life stress to be predictors of sleep disturbances.

Sleep problems that we describe in this study can conceptually be grouped into two categories. One was associated with insomnia (sleep initiating, continuity and maintenance), consisting of items describing difficulty falling asleep, waking up during the night and numbers of hours of sleep. The other was composed of consequences of insomnia (daytime sleepiness and fatigue), including items that assess difficulty waking up in the morning and daytime sleepiness. We found that pain and life stress are most predictive of items associated with insomnia, while depression was most predictive of insomnia consequences. Why might that be? Some researchers believe that we are generally predisposed to physiologic arousal under threat and that mobilizing our resources by maintaining wakefulness is evolutionary advantageous (Perlis, Smith, & Pigeon, 2005). Although life stress is not necessarily a threat to one's physical well-being, we are still hardwired to respond to life stress and chronic pain with physiological arousal resulting in insomnia. Why do symptoms of depression are more closely predict difficulty waking up and daytime sleepiness? One can observe that these items are closely related to inertia and fatigue, consistent with low arousal.

Although, we expected that the group therapy intervention would have a positive impact on sleep problems, possibly as a result of stress reduction, our analysis did not show that group therapy decreased sleep disturbance for this sample of women. However, it should be noted that we did not directly target sleep problems with the intervention. Any positive effects on disturbed sleep would have been indirect. The lack of a treatment effect in this study does not preclude the possibility of a positive effect on sleep from a group intervention aimed specifically at improving sleep.

The results of this study may be limited by the demographic characteristics of the sample, which was predominantly Caucasian and relatively affluent, and also by the reliance on self-report measures. Also, some investigators criticize self-reported assessments of sleep as unreliable (Hauri, 2000). Nonetheless, the study makes a contribution to the understanding of psychosocial factors that cause and are associated with particular types of sleep disturbance. Knowledge of these factors may be used in the development of prevention strategies that could

protect women with metastatic breast cancer from the deleterious effects of disturbed sleep. Additionally, sleep disturbance can be used as a possible indicator of high levels of pain, depression, and life stress in women with metastatic breast cancer. Clinicians should be aware that different types of sleep disturbance may have different causes and therefore may require different kinds of treatments (e.g., for depression, pain, or stress).

The results of this study may have important implications beyond metastatic breast cancer. The elevated rates of sleep disturbance associated with age, gender, disease, and chronic pain all come into play for women with metastatic breast cancer. This combination of risk factors for sleep disturbances may partially explain the high prevalence of sleep disturbances in this population and makes metastatic breast cancer a useful arena for studying the complexities of sleep disturbances. The concentration of sleep disturbances among women with breast cancer gives a distinctive and perhaps unusually clear view of correlates and predictors of sleep disturbances. Patterns can be identified that might not be perceptible in a population with less extreme levels of sleep disturbance, yet these patterns may apply to sleep disturbance in other groups. Further research is needed to determine the extent to which the patterns that emerged in this study are specific to metastatic breast cancer, or if they would also apply to other populations with the risk factors of advanced age, female gender, serious disease, and chronic pain.

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Table 1
Medical, Sleep and Psychosocial Characteristics of the Sample

Variable	Baseline Mean $\pm$ SD	Baseline Range	Mean Slope	Mean Slope SD
Time from metastatic diagnosis to study entry in months, mean $\pm$ SD	27.10 $\pm$ 41.18	1–244.70		
Disease-free interval in months, mean $\pm$ SD	45.87 $\pm$ 35.92	0–162.30		
Chemotherapy in the previous 2 months, No, (%)	41 (44.1%)			
Metastasis to bone, No, (%)	39 (41.9%)			
CES-D Total score, mean $\pm$ SD	11.14 $\pm$ 9.31	0–41	–0.036	1.08
Pain in the moment, mean $\pm$ SD	2.01 $\pm$ 1.56	1–9	0.042	.22
Life Events Stressors, mean $\pm$ SD	287.46 $\pm$ 105.77	60–675	N/A	N/A
Typical number of hours of sleep, mean $\pm$ SD	7.45 $\pm$ 1.10	4.5–10	–0.007	.11
Problems in getting to sleep, mean $\pm$ SD	1.83 $\pm$ 1.01	1–5	–0.006	.09
Problems with waking up during the night, mean $\pm$ SD	2.32 $\pm$ 1.08	1–5	–0.002	.11
Problems in getting up, mean $\pm$ SD	2.04 $\pm$ 1.07	1–5	–0.011	.09
Problems with sleepiness during the day, mean $\pm$ SD	1.89 $\pm$.93	1–4	–0.018	.02

Results of Multiple Regression Analyses on Changes in Different Types of Sleep Disturbances and Typical Number of Hours of Slee p.

Table 2

Predictors	Amount of Hours			Problems Getting to Sleep			Problems Waking Up During the Night			Problems Waking Up in the Morning			Daytime Sleepiness		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β	B	SE	β
CES-D Change	-.05	.01	-.48***	.01	.01	.14	.03	.01	.32**	.01	.01	.16	.03	.01	.42***
CES-D Baseline	.00	.00	-.17	.00	.00	.02	.00	.00	.22*	.00	.00	.30**	.00	.00	.24*
Pain in the Moment	.00	.06	.00	.08	.04	.22*	.16	.05	.34**	.04	.04	-.13	.02	.03	.06
Change															
Pain in the Moment	-.01	.01	-.09	.01	.01	.25*	.01	.01	.20	.01	.01	.01	.00	.01	-.05
Baseline															
Life Events Stress	.00	.00	-.09	.00	.00	.28**	.00	.00	.09	.00	.00	.08	.00	.00	.21*
Baseline Score of the	-.02	.01	-.21*	-.05	.01	-.60***	-.05	.01	-.53***	.01	.01	-.72***	-.04	.01	-.56***
Dependent Sleep Variable															
Treatment Condition	.00	.02	.02	.02	.02	.09	.01	.02	.04	.02	.02	.05	.00	.01	.00

* p<.05,
** p<.01,
*** p<.001