Published in final edited form as:

Behav Sleep Med. ; : 1–13. doi:10.1080/15402002.2018.1546708.

Cancer Survivors' Beliefs about the Causes of their Insomnia: Associations of Causal Attributions with Survivor Characteristics

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Abstract

OBJECTIVES: Insomnia is common among cancer survivors, yet survivors' beliefs about their insomnia following cancer are largely unknown. This study describes cancer survivors' causal attributions of insomnia and whether these beliefs differ by sociodemographic characteristics.

PARTICIPANTS: 160 cancer survivors meeting diagnostic criteria for insomnia disorder.

METHODS: Survivors endorsed how likely they believed 12 different factors were causally related to their insomnia and self-reported sociodemographics. Multinomial logistic regression tested associations between attribution endorsement and sociodemographics. Latent class analysis (LCA) examined patterns of attribution endorsement and whether sociodemographics were associated.

RESULTS: 154 survivors (96%) endorsed that at least 1 causal attribution was likely related to their insomnia. Most survivors endorsed that emotions (77%), thinking patterns (76%), sleep-related emotions (65%), and sleep-related thoughts (57%) were related to their insomnia, similar to data previously published among healthy persons with insomnia. Younger participants were more likely to endorse that biochemical factors related to their insomnia ($p < .02$); females were more likely to endorse that hormonal factors related to their insomnia ($p < .001$). LCA identified 3

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Patient recruitment and data collection for this manuscript were completed at the Hospital of University of Pennsylvania Health System and Memorial Sloan Kettering Cancer Center; preparation of this manuscript was completed at Memorial Sloan Kettering Cancer Center.

All authors have seen and approved this manuscript.

Clinical Trial Declaration: This manuscript reports data collected from a clinical trial registered with Clinical Trials (service of NIH): <http://www.clinicaltrials.gov>, Identifier: NCT02356575.

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classes (AIC=3209.50, BIC=3485.13). Approximately 40% of survivors endorsed most of the causal attributions were likely related to their insomnia; 13% frequently endorsed attributions were neither likely nor unlikely related. Older survivors were more likely to belong to the 47% who reported most attributions were unlikely related to their insomnia ($p=.03$).

CONCLUSIONS: Cancer survivors with insomnia commonly endorsed that thoughts and emotions contributed to their sleep disturbance. Survivors' sociodemographic characteristics did not meaningfully explain individual differences for most causal attribution beliefs.

Keywords

Causality; Neoplasms; Logistic Models; Sleep Initiation and Maintenance Disorders; Sleep

Insomnia is prevalent and problematic among cancer survivors, with approximately 3 in 5 survivors reporting sleep disturbance (Paleh et al., 2009; Savard, Ivers, Villa, Caplette-Gingras, & Morin, 2011). Clinically disturbed sleep is associated with worse quality of life and more physical comorbidities, distress, and fatigue in cancer survivors (Zhou & Recklitis, 2014). Individuals' beliefs about the causes of their sleep disturbance, known as causal attributions, can affect treatment seeking behavior, treatment engagement, and ultimately treatment success (Siegel, Lekas, & Maheshwari, 2012; Thomson et al., 2014). Causal attributions of insomnia have been characterized among medically healthy people with insomnia (Harvey et al., 2013), yet these might not be directly generalizable to cancer survivors, whose beliefs may be affected by the unique psychological and physiological repercussions of cancer and its treatment. Understanding cancer survivors' causal attributions of insomnia will help efforts to tailor insomnia treatment to enhance its implementation success and efficacy among cancer survivors.

People naturally develop causal attributions, or interdependent beliefs about causes and effects, to explain illness experiences. These beliefs directly affect treatment outcomes: Individuals tend to seek treatments targeting the factors they consider causally associated with their disorder (Andersen et al., 2017; Rief, Nanke, Emmerich, Bender, & Zech, 2004) and report greater satisfaction, adherence, and benefit from such interventions (Proctor et al., 2011; Swift & Callahan, 2009). As such, beliefs about sleep and insomnia are integral to many insomnia treatments, such as Cognitive-Behavioral Therapy for Insomnia, which addresses patients' beliefs about their insomnia by tailoring psychoeducational content to their concerns, as well as working to modify inaccurate or unhelpful beliefs about insomnia (Morin & Espie, 2003). Among medically healthy people with insomnia, emotions and thought patterns, both in general and sleep-specific, are commonly associated with the development and maintenance of insomnia (Harvey et al., 2013). Cancer survivors with insomnia also frequently endorse distress, both about their cancer experience as well as their insomnia, as being related to their insomnia, but also incorporate attributions of physical factors like pain and treatment side effects (Dickerson et al., 2015; Wang, Liu, Su, & Xue, 2016). Characterizing how cancer survivors understand their insomnia will help tailor education and communication strategies to help increase survivors' uptake of and benefit from available insomnia interventions.

Among cancer survivors, beliefs about insomnia may differ according to survivors' demographics. Individuals' causal attributions can be shaped by the differential impacts of illness across groups and by culturally-acceptable illness explanations. Younger people with cancer are more likely to report spending time considering why they developed cancer relative to older people with cancer, which may reflect motivation to explain an illness event perceived as age-inappropriate (Ferrucci et al., 2011). Individuals of non-majority racial backgrounds and non-Western cultures may be more likely to hold fatalistic or chance-related explanations for illnesses (Dumalaon-Canaria, Hutchinson, Prichard, & Wilson, 2014; Wang et al., 2016), and people in the U.S. have reported more dysfunctional beliefs about sleep relative to other Western cultures (Carney et al., 2010). Women tend to endorse more psychological attributions for physical symptoms, while men tend to endorse fewer causal attributions for such symptoms overall (Nykqvist, Kjellberg, & Bildt, 2002).

Given that causal attributions affect treatment success (Siegel et al., 2012; Thomson et al., 2014), better understanding cancer survivors' beliefs about their sleep disturbance, as well as how these beliefs may differ by demographic characteristics, will help to personalize insomnia treatments for cancer survivors. To that end, this study utilized data from the baseline assessment of an insomnia clinical trial among cancer survivors to describe survivors' causal attributions of their insomnia, and compared survivors' causal attribution endorsement to previously published data among medically healthy individuals with insomnia (Harvey et al., 2013). Next, we tested whether endorsement of individual causal attributions of insomnia related to survivors' sociodemographic characteristics. Last, we examined patterns of causal attribution endorsement across survivors, hypothesizing that patterns of causal attribution endorsement would emerge reflecting a more modifiable versus more fixed attributional style, and then tested whether survivor sociodemographic characteristics were associated with these endorsement patterns.

Method

Participants and Procedure

Selected baseline measures were used for this sub-study from a parallel group, randomized comparative effectiveness trial of cognitive behavioral therapy for insomnia (CBT-I) compared to acupuncture for treating insomnia and comorbid symptoms among a heterogeneous sample of cancer survivors ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT02356575) Identifier: NCT02356575). The study protocol has been published (Garland, Gehrman, Barg, Xie, & Mao, 2016); relevant aspects are reviewed here. The study was approved by the Institutional Review Boards of both the Hospital of University of Pennsylvania Health System and Memorial Sloan Kettering Cancer Center. All potentially eligible participants were initially screened for eligibility by trained research staff, then eligibility was confirmed by study investigators (J.J.M. and P.G.).

From March 2015 to February 2017, cancer survivors were enrolled from 2 tertiary cancer centers and stakeholder organizations (see Garland et al., 2016 for details). Eligible survivors: (1) were English-speaking; (2) were 18 years of age or older; (3) had completed active treatment at least 1 month prior to initiating their participation (survivors on continued hormone treatment or maintenance targeted therapies were eligible); and (4) scored >7 on

the Insomnia Severity Index and met Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5; American Psychiatric Association, 2013) criteria for insomnia disorder per clinical interview. Participants using psychotropic or hypnotic/sedative medications were eligible to participate. Survivors were ineligible if they: (1) had another sleep disorder or mental health disorder that was not adequately treated (e.g., unstable or untreated condition, such as daily panic attacks); (2) had previous experience with CBT-I or acupuncture for insomnia; or (3) were employed in rotating shift work that would preclude the establishment of a regular sleep schedule. Of the 604 individuals screened for eligibility, 344 were eligible, and 160 consented to participate (46.5% enrolled from eligible). Reasons for non-participation cited by eligible individuals who did not enroll were disinterest (52%) or time/travel concerns (48%). All who agreed to participate provided written informed consent. Participants completed baseline measures prior to randomization, and all participants who completed baseline measures were included in the present study.

Participant characteristics.—As shown in Table 1, among the 160 participating survivors, the mean age was 61.5 years (SD=11.7). The sample was primarily female (56.9%), white (70.2%), and approximately evenly divided between those with (50.6%) versus without (49.4%) a domestic partner. Most survivors received surgery as part of their cancer treatment (71.9%); roughly half received chemotherapy (48.1%) and/or radiation (49.4%); and about a quarter received hormonal treatments (23.1%). The most common diagnoses were breast (31.2%) and prostate (22.5%) cancer. Mean time since cancer diagnosis was 6.1 years.

Measures

Causal Attributions of Insomnia.—Using the 12-item Causal Attributions of My Insomnia (CAMI) scale (Harvey et al., 2013), survivors were asked: “How likely do you think it is that the following factors contributed to your insomnia?” For each of the 12 listed factors, response options are recorded on a 7-point Likert scale with three anchor points: 1 *Very Unlikely*, 4 *Neither Likely nor Unlikely*, and 7 *Very Likely*. Level of endorsement was collapsed across levels of relative agreement (i.e., 1–3=*Unlikely* [that an attribution relates to his/her insomnia], 4=*Neither likely nor unlikely*, 5–7=*Likely*). At the end of the scale, a free-response question permitted survivors to list any other factors that were not addressed by the scale. This scale was developed using expert consensus and qualitative interviews of individuals with insomnia (who were otherwise medically healthy), and it has demonstrated association with individuals’ perceived efficacy of insomnia treatments.

Survivor Characteristics.—Survivors self-reported their age, sex, race, and marital status. Survivors’ cancer treatment, type, and years since diagnosis were also collected from their medical record.

Analysis Plan

Analyses were conducted using **R** software (version 3.3.3). Statistical significance was determined using $\alpha=.05$ and two-tailed tests. Survivor characteristics are summarized in Table 1. Survivors’ predominant causal attributions for their insomnia were determined by computing frequencies of CAMI endorsement levels (see Figure 1).

Whether survivors' causal attributions related to sociodemographic characteristics was determined using multinomial logistic regression, an analytic strategy that predicts membership in 1 of 3 or more categories. Data were first examined as to appropriateness for logistic regression using crosstabs (i.e., each CAMI item crossed by each survivor demographic variable). It was confirmed that expected cell counts were greater than 1 for each cell, and fewer than 20% of cells had expected cell counts <5. Next, whether survivors' sociodemographic factors differed across cancer treatment type (which may differentially affect sleep) was examined. Likelihood of receiving surgery, chemotherapy, radiation, and/or hormonal therapies as part of cancer treatment varied systematically across survivors' sociodemographic factors ($p < .05$). As such, cancer treatments were included in all models as covariates (data not shown). Survivor sociodemographic factors and treatment covariates were then entered simultaneously into the multinomial logistic regression models to identify which sociodemographic factors were related to endorsing that an attribution was "Likely" associated with their insomnia as opposed to "Neither Likely nor Unlikely" or "Unlikely." Analyses were conducted using the mlogit package in **R** (Croissant, 2012).

Last, latent class analysis (LCA), a data-driven and hypothesis-agnostic analytic strategy appropriate for multivariate categorical data, was used to identify "clusters" of survivors who similarly endorse levels of agreement across CAMI items. Survivor sociodemographic factors and treatment variables were included as covariates (i.e., concomitant variables) to improve model fit and identify factors associated with class membership. Number of CAMI endorsement classes was determined based on statistical (i.e., minimizing Akaike's information criterion [AIC] and Schwarz's Bayesian criterion [BIC], entropy) and conceptual fit. Analyses were conducted using the Polytomous Variable Latent Class Analysis (poLCA) package in **R** (Linzer & Lewis, 2011).

Results

Causal Attributions of Insomnia Endorsed by Cancer Survivors

As shown in Figure 1, survivors commonly endorsed that the causal attributions of emotions (76.9%), thinking patterns (76.3%), sleep-related emotions (65.4%), and sleep-related thoughts (57.0%) were likely related to their insomnia. Survivors least commonly endorsed that developmental factors (18.8%) and genetics (15.7%) were likely related to their insomnia. Survivors endorsed the highest uncertainty (i.e., "neither likely nor unlikely") with the items biochemical factors (22.3%) and lifestyle factors (22.2%). Most survivors (96%) endorsed that at least 1 factor was likely to be causally related to their insomnia. Forty-two (26%) wrote additional factors they believed to be causally related to their insomnia for the free-response item: of those, 13 listed specifically cancer-related side-effects (e.g., "side effects of chemo," "discomfort from surgeries, chemo, and hormone treatment") and 6 others listed pain symptoms that they did not specify as to whether they were related to their cancer (e.g., "pain- joints & knee," "neuropathy").

Independent samples *t*-tests were used to compare item endorsement means between our sample of cancer survivors to the sample of medically healthy individuals with insomnia ($N=69$) from the original CAMI development sample (see Harvey et al., 2013 for comparison sample means and standard deviations). Bonferroni correction was used to

control family-wise Type I error across the multiple comparisons. Overall, the samples reported comparable levels of likelihood that the attributions of sleep-related thoughts, hormonal factors, bodily arousal, lifestyle factors, thinking patterns, and sleep-related emotions were related to their insomnia ($t(227) < 2.50$, $p > .01$). Cancer survivors reported less likelihood that the attributions of genetics, biomedical factors, environmental factors, schedule, emotions, and developmental factors related to their insomnia ($t(227) > 3.01$, $p < .004$).

Factors Related to Survivors' Causal Attribution Endorsement

Results of multinomial logistic regression models are listed in Table 2. Addition of the predictors only explained significant variance beyond an intercept-only model for the causal attributions of hormonal factors ($\chi^2(16, N=158)=48.84$, $p < .001$, McFadden $R^2=0.15$) and biochemical factors ($\chi^2(16, N=155)=30.10$, $p = .01$, McFadden $R^2=0.09$). Only predictors that account for significant variance in responses to hormonal factors and biochemical factors were therefore interpreted.

Younger survivors were more likely than older survivors to endorse that biochemical factors were “likely” related to their insomnia rather than “unlikely” ($b=0.05$, $p=.01$) or “neither likely nor unlikely” ($b=0.05$, $p=.02$). For each year increase in age, participants were 5% more likely to endorse biochemical factors were “unlikely” to be related to their insomnia (as opposed to “likely”), and were also 5% more likely to endorse “neither likely nor unlikely” (as opposed to “likely”). Women were 5.56 times more likely than men to endorse that hormonal factors ($b=-1.73$, $p < .001$) were “likely” related to their insomnia as opposed to “unlikely,” and women were 12.5 times more likely than men to endorse “likely” rather than “neither likely nor unlikely” for hormonal factors ($b=-2.53$, $p < .001$).

Factors Related to the Patterns of Causal Attribution Endorsement

The LCA with 3 causal attribution endorsement groups was selected given its optimized model fit (AIC: 3209.50, BIC: 3485.13) and conceptual advantage relative to models with 2 (AIC: 3238.47, BIC: 3413.04) or 4 classes (AIC: 3190.87, BIC: 3567.57). Entropy value of 0.86 indicated good separation of classes (Celeux & Soromenho, 1996). The 3 groups that emerged were termed: (1) “Broad Agreement,” encompassing individuals who more frequently endorsed that causal attributions were “likely” to be related to their insomnia, representing an estimated 39.5% of the population; (2) “Unsure,” encompassing individuals who frequently responded “neither likely nor unlikely” (13.0%); and (3) “Broad Disagreement,” encompassing individuals who tended to endorse that the listed causal attributions were “unlikely” related (47.5%). Group names demonstrate the central tendency of each group in terms of agreement endorsement (see Table 4); however, it is important to note that participants in the Broad Disagreement group still tended to endorse several attributions “likely” contributed to their insomnia, although fewer items than those in the Unsure or Broad Agreement groups. Figure 2 further illustrates this issue: the proportion of survivors’ responses to each causal attribution can be compared between groups. For example, for the item “Emotions,” which was endorsed as “likely” by 76.9% of the entire survivor sample, among the subset of survivors likely to belong to the “Broadly Agree” group, 100% endorsed emotions as likely related to their insomnia (compared to survivors

likely belonging to the “Broadly Disagree” group, of whom 57.4% endorsed emotions as “likely” related to their insomnia).

Controlling for cancer treatment modalities, no sociodemographic factors were associated with the probability belonging to the Unsure class versus Broad Agreement class. In contrast, the probability of belonging in the Broad Disagreement class relative to the Broad Agreement class was related to survivors’ age ($p=.03$): older survivors were more likely to belong to the Broad Disagreement class (see Table 3).

Discussion

This study provides the first characterization of causal attributions that cancer survivors use to explain their insomnia, as well as to examine patterns of these beliefs and how these patterns relate to sociodemographic characteristics. Survivors most commonly endorsed that emotions and thoughts, both general and sleep-related, were causal agents of their insomnia. Survivors were less likely to report that several of the causal attributions were related to their insomnia as compared to medically healthy people with insomnia (Harvey et al., 2013). Several survivors (12%) indicated that cancer- and pain-related factors, not specifically addressed by the causal attribution measurement, affected their sleep. Overall, survivors’ demographic characteristics did not widely explain individual differences in their causal attributions, although age related to both endorsement of the specific attribution of biochemical factors and related to the overall patterns of causal attribution endorsement across survivors.

For most of the individual causal attribution items, survivor sociodemographic characteristics did not help to explain variability in responses across survivors, except for the causal attributions of hormonal and biochemical factors. Younger survivors were more likely to endorse that biochemical factors – examples listed by the CAMI instrument are chemical imbalance or neurotransmitter levels – were likely related to their insomnia. Findings warrant further investigation as to why younger survivors were more likely to endorse such findings, especially considering age-related physiological changes, medical comorbidities, and polypharmacy all contribute to the approximately two-fold higher incidence of insomnia among older individuals (Ancoli-Israel & Martin, 2006). Women were more likely to endorse hormonal factors – examples listed by the CAMI instrument are aging, menstrual cycle changes, or menopause – were causally related to their insomnia, even when controlling for receipt of hormonal treatments, which may be due in part to the effects of menopause on sleep (Freedman & Roehrs, 2007). Hormonal factors can also be relevant among men, too, however: Among prostate cancer survivors specifically, common hormonal therapies like androgen deprivation therapy have been linked with substantial increases in insomnia symptoms (Koskderelioglu, Gedizlioglu, Ceylan, Gunlusoy, & Kahyaoglu, 2017), although such factors were not specifically listed as examples in the CAMI instrument. Overall, however, the limited explanatory power of the survivors’ sociodemographic characteristics (and treatment information, controlled in all analyses) suggests that other factors, such as insomnia and somatic symptom severity or distress (Rief et al., 2004), may be more closely related to survivors’ beliefs about their insomnia development and maintenance.

We also demonstrated differences between survivors based on their overall propensity to agree, disagree, or equivocate on whether causal factors were likely related to their insomnia, using the inductive methodology of LCA. Causal attributions have been described in terms of locus of causality, stability, and controllability (Roesch & Weiner, 2001; Weiner, 1985); however, our results demonstrated that overall frequency of endorsed causal attributions, rather than the nature of those attributions, differentiated the clusters of survivors. Response bias should be considered as contributing to this pattern of results, although study procedures were designed to limit such bias (e.g., blind assessment, attention to questionnaire length to minimize response fatigue) and only 5 participants (3.1%) responded to all items with the same response (all “likely” $n=2$; all “neither likely nor unlikely” $n=1$; all “unlikely” $n=2$). Moreover, results that roughly 40% of our sample believed that most of the 12 possible causal attributions were likely related to their insomnia fits with prior work demonstrating that individuals commonly hold multiple causal explanations of distressing symptoms (Lundh & Wångby, 2002), especially as symptom severity increases (Rief et al., 2004). Just under half of the sample, however, frequently disagreed with the causal attributions. This pattern may suggest that these individuals have a narrower conceptualization of the etiology of their insomnia, or that many cancer survivors, particularly older survivors, may have other prominent beliefs about the causes of their insomnia not addressed by the CAMI.

Although representing only 13% of our sample, survivors in the “Unsure” group who demonstrated frequent ambivalence (i.e., neither endorsing agreement nor disagreement) about causal attributions of their insomnia warrant special consideration. Such ‘not knowing’ reasons are also common among cancer survivors when considering possible factors associated with their cancer, suggesting that individuals may be knowledgeable about risk factors generally but unsure about the cause(s) of their diagnosis specifically (Dumalaon-Canaria et al., 2014). Confusion is understandable given the multidimensional and complex etiology of insomnia, but may suggest that these survivors might particularly benefit from treatment modalities that include a strong psychoeducational component. Among chronically ill individuals, those who spoke with their doctors about their illness beliefs were less likely to ascribe their illness to “chance,” (Grayson et al., 2014) and educational interventions are capable of shifting individuals’ causal attributions of illness (Abood, Black, & Feral, 2003; Boling, Laufman, Lynch, & Weinberg, 2005). Future research is warranted to understand whether these “unsure” individuals demonstrated better treatment response to CBT-I, which heavily emphasizes education, or acupuncture, which does not rely on individuals’ understanding of their insomnia.

Only age differentiated survivors across these endorsement patterns, where older survivors were more likely to be members of the Broad Disagreement relative to Broad Agreement class. Younger people with cancer have been shown more likely to report spending time considering why they developed cancer relative to older people with cancer, possibly due to the age-discordant nature of the illness (Ferrucci et al., 2011). This may also be true in the context of insomnia, given sleep disturbance is more common among older individuals (Ancoli-Israel, 2005; Morin et al., 2009). An alternative explanation, however, is that psychiatric distress may function as a third variable: Younger cancer survivors typically report higher distress (Acquati & Kayser, 2017; Burgoyne et al., 2015; Linden, Vodermaier,

Mackenzie, & Greig, 2012), and anxiety and depression have been independently associated with endorsing more causal attributions for somatic symptoms (Rief et al., 2004). Future research should examine how such comorbid psychiatric symptoms interrelate with cancer survivors' causal attributions of insomnia.

Limitations and Future Directions

Ultimately, given that a substantive proportion of the cancer survivors felt most of the attributions were unlikely to relate to their insomnia, future qualitative research may be useful to allow survivors to detail a more comprehensive explanation of their beliefs about their insomnia and ideal treatment practices to target those causes. One area notably missing from the CAMI are somatic symptoms, such as pain, nausea, dyspnea, or nocturia, which frequently affect cancer survivors' sleep, although only 12% of survivors volunteered these symptom-related attributions on the free-response item. Moreover, survivors' attributions were only assessed after their experience with cancer, so it is unknown whether their cancer experience altered their beliefs about their insomnia (which participants also may or may not have had experience with prior to their diagnosis), or whether these beliefs change as duration of insomnia increases. Findings that the present sample of survivors tended to report differently from medically healthy participants from the validation sample suggests cancer experience may affect beliefs, although potential demographic differences between samples may also explain these differences, so this should be more rigorously compared with matched samples and longitudinal studies.

The primary limitation of this study is that data were collected as part of the baseline time point from a clinical trial of non-pharmacological insomnia interventions. As such, all participants were treatment-seeking for their insomnia and amenable to both non-pharmacological interventions and participation in clinical research. Given that causal attributions affect treatment-seeking behavior, the patterns of causal attributions reported by our sample should not be directly generalized to cancer survivors not seeking treatment or seeking pharmacological treatment only. Future research should examine how causal attributions of insomnia differ between cancer survivors who 1) are vs. are not seeking treatment, 2) want non-pharmacological vs. medical management for their insomnia, and 3) are using multiple treatment modalities (e.g., concurrent CBT-I and medication) vs. using a single modality. This may provide important information relevant to public health interventions that encourage more survivors to seek treatment for their insomnia. Moreover, cancer survivors in the present study participated on average 6.1 years after their diagnosis, so findings may not be directly generalizable to patients currently undergoing treatment. However, findings are the first to detail attributions among long-term survivors with insomnia, an important population given the persistence of their symptoms. The inductive approach of the LCA is a strength of our analyses, protecting against confirmation bias and generating novel hypotheses about how individuals' attributional styles may relate to other psychosocial factors, such as distress, or treatment outcomes.

Conclusions

In our novel examination of causal attributions that cancer survivors use to explain their insomnia, emotions and thoughts were commonly agreed upon as causal factors related to

insomnia. Survivors were less likely to believe many of the causal attributions were related to their insomnia relative to a medically healthy sample, yet few survivors independently offered causes related to their cancer. Survivors' sociodemographic characteristics were of limited utility in explaining individual differences in causal attribution beliefs. Survivors were differentiated in terms of their agreement, disagreement, or ambivalence towards causal attributions of their insomnia as a whole, with younger survivors more likely to agree that multiple factors were causally related to their sleep disturbance. Findings are relevant to both better matching available treatments and tailoring treatments to meet cancer survivors' beliefs about their insomnia, with the promise of improving patients' satisfaction, adherence, and clinical outcomes.

Acknowledgments

Funding: This work was supported by a Patient-Centered Outcomes Research Institute (PCORI) Award (CER-1403–14292, PI: Jun Mao) and by the Translational Research and Integrative Medicine Fund at the Memorial Sloan Kettering Cancer Center. Writing of this manuscript was supported by NIH/NCI Cancer Center Support Grant P30 CA008748 (PI: Craig Thompson). Dr. Shaffer was supported by the NIH/NCI T32 CA009461 (PI: Jamie Ostroff).

Disclosures: The authors have no conflicts of interest. Research reported in this publication was funded through a Patient-Centered Outcomes Research Institute (PCORI) Award (CER-1403–14292). The statements presented in this article are solely the responsibility of the authors and do not necessarily represent the views of the Patient-Centered Outcomes Research Institute (PCORI), its Board of Governors or Methodology Committee.

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Figure 1.
Percentage of Survivors' Endorsements of Causal Attributions for their Insomnia

Figure 2.
Proportion of Survivor Responses of Causal Attributions by Latent Class Membership

Table 1:

Demographic and Clinical Characteristics of Survivors

	M (SD)	N	%
Total		160	100
Age	61.5 (11.7)		
Sex			
Male		69	43.1
Female		91	56.9
Race			
White		111	70.2
Non-white		47	29.8
Marital Status			
Married/Living with Partner		81	50.6
Single/Divorced/Separated/Widowed		79	49.4
Cancer Treatments*			
Surgery		115	71.9
Chemotherapy		77	48.1
Radiation		79	49.4
Hormonal		37	23.1
Cancer Type			
Breast		50	31.2
Prostate		36	22.5
Colon/Rectal		10	6.2
Head/Neck		11	6.9
Hematologic		13	8.1
GYN		7	4.4
Other Cancer**		23	14.4
More than one cancer		10	6.2
Years since Cancer Diagnosis	6.1 (5.4)		
Years experiencing Insomnia	9.2 (9.1)		

* Subjects can have more than 1 type of cancer treatments

** Other Cancer includes: skin, lung, other gastrointestinal, other genitourinary

Table 2:

Demographic Correlates of Causal Attribution Endorsement by Survivors

	Model Fit Indices		Agree vs. Disagree		Agree vs. Neither Agree nor Disagree	
	χ^2	McFadden R^2	Odds Ratio	95% CI (Lower, Upper)	Odds Ratio	95% CI (Lower, Upper)
Emotions	19.62	0.09				
Age			1.06 [*]	1.01, 1.12	1.01	0.95, 1.06
Gender			0.50	0.17, 1.48	0.41	0.10, 1.65
Race			2.55	0.82, 7.88	0.75	0.17, 3.35
Marital status			0.81	0.32, 2.08	0.68	0.20, 2.28
Thinking Patterns	16.44	0.07				
Age			1.03	0.98, 1.07	1.04	0.98, 1.10
Gender			1.36	0.46, 4.01	0.92	0.26, 3.28
Race			1.44	0.50, 4.19	0.61	0.16, 2.41
Marital status			0.81	0.32, 2.07	1.67	0.52, 5.35
Sleep-Related Emotions	18.80	0.07				
Age			1.02	0.98, 1.06	1.06 [*]	1.00, 1.12
Gender			0.38 [*]	0.15, 0.93	0.82	0.25, 2.70
Race			1.03	0.40, 2.66	1.56	0.45, 5.36
Marital status			0.82	0.37, 1.82	0.85	0.30, 2.35
Sleep-Related Thoughts	15.16	0.05				
Age			1.00	0.97, 1.04	1.00	0.96, 1.04
Gender			0.54	0.23, 1.29	0.54	0.19, 1.55
Race			0.61	0.24, 1.54	0.61	0.20, 1.89
Marital status			1.35	0.62, 2.93	1.38	0.55, 3.45
Lifestyle	14.57	0.04				
Age			1.02	0.98, 1.05	1.00	0.96, 1.04
Gender			0.80	0.35, 1.84	0.37	0.13, 1.06
Race			1.14	0.49, 2.68	1.74	0.63, 4.78
Marital status			0.77	0.37, 1.60	0.60	0.25, 1.43
Schedule	15.74	0.05				
Age			1.02	0.99, 1.05	1.03	0.98, 1.08
Gender			1.49	0.65, 3.38	0.60	0.16, 2.16
Race			0.36 [*]	0.16, 0.81	0.51	0.13, 1.94
Marital status			0.63	0.31, 1.29	0.68	0.23, 2.01
Bodily Arousal	22.96	0.07				
Age			1.03	1.00, 1.06	1.01	0.96, 1.05
Gender			0.50	0.22, 1.14	0.55	0.17, 1.82
Race			1.76	0.78, 3.97	0.27	0.05, 1.36
Marital status			1.34	0.66, 2.73	0.92	0.33, 2.55
Hormonal	48.84 ^{***}	0.15				
Age			1.01	0.98, 1.05	1.01	0.97, 1.06

	Model Fit Indices		Agree vs. Disagree		Agree vs. Neither Agree nor Disagree	
	χ^2	McFadden R^2	Odds Ratio	95% CI (Lower, Upper)	Odds Ratio	95% CI (Lower, Upper)
Gender			0.18***	0.06, 0.49	0.08***	0.02, 0.28
Race			1.04	0.42, 2.55	1.49	0.49, 4.53
Marital status			1.67	0.74, 3.79	2.25	0.84, 6.05
Environmental	15.47	0.05				
Age			1.02	0.99, 1.05	1.03	0.98, 1.08
Gender			0.89	0.39, 2.04	0.63	0.19, 2.09
Race			0.79	0.35, 1.83	1.09	0.34, 3.46
Marital status			2.14*	1.04, 4.41	1.69	0.62, 4.59
Biochemical	30.10*	0.09				
Age			1.05**	1.01, 1.09	1.05*	1.01, 1.10
Gender			0.48	0.19, 1.23	0.50	0.16, 1.58
Race			1.09	0.43, 2.78	2.72	0.91, 8.07
Marital status			1.68	0.75, 3.77	0.45	0.17, 1.24
Developmental	18.54	0.07				
Age			1.03	0.99, 1.07	1.04	0.98, 1.09
Gender			0.67	0.24, 1.85	0.38	0.09, 1.50
Race			1.07	0.41, 2.78	0.72	0.17, 2.96
Marital status			0.60	0.25, 1.43	0.43	0.13, 1.47
Genetic	17.52	0.07				
Age			1.02	0.98, 1.06	1.00	0.95, 1.05
Gender			0.66	0.23, 1.89	0.60	0.16, 2.29
Race			7.18*	1.51, 34.15	6.30*	1.09, 36.25
Marital status			0.93	0.38, 2.33	1.19	0.38, 3.71

*
 $p < .05$ **
 $p < .01$ ***
 $p < .001$

Note: Models adjusted for cancer treatment receipt. CI: Confidence interval. Bolding denotes associations that are significant in the context of a model that predicts significant variance in the causal attribution.

Table 3.

Survivor Demographic Correlates of Causal Attribution Endorsement Class

	<u>Unsure vs. Broad Agreement</u>		<u>Broad Disagreement vs. Broad Agreement</u>	
	B	SE	B	SE
Intercept	−6.04	7.15	−2.22	1.67
Age	0.09	0.11	0.05*	0.02
Gender	−1.45	2.32	−0.78	0.64
Race	−0.41	2.77	−0.18	0.74
Marital status	0.23	1.79	0.26	0.59

*
 $p < .05$ *Note:* Models adjusted for cancer treatment receipt. SE: Standard error.

Table 4.

Descriptive Statistics of Agreement with Causal Attributions by Survivors Across Latent Classes

Class	Estimated Population Share	Agree		Neither Agree nor Disagree		Disagree	
		Median	Range	Median	Range	Median	Range
Broad Agreement	40%	8	(5, 12)	1	(0, 4)	2	(0, 5)
Unsure	13%	5	(0, 7)	5	(2, 12)	2	(0, 5)
Broad Disagreement	47%	3	(0, 7)	1	(0, 4)	7	(5, 12)