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Gender Differences in Perpetuating Factors, Experience and Management of Chronic Insomnia

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Abstract

The higher prevalence of insomnia in women has been attributed to biological factors, which are less likely than cognitive and behavioral factors to play a role in perpetuating insomnia. Gender differences in perpetuating factors have not been extensively examined. This study compared men's and women's self-reports of factors that perpetuate insomnia; experience of symptoms, perceived severity and impact on daytime functioning; and use of strategies to manage insomnia. Data were collected at baseline, using reliable and valid measures, in a project that evaluated behavioral therapies for insomnia. The sample (N = 739) consisted of women (62.4%) and men (37.6%). Gender differences were found in: 1) perpetuating factors: men took more naps and held more unhelpful beliefs about insomnia, whereas women experienced higher pre-sleep arousal; 2) perception of insomnia severity: higher among women; 3) perceived impact of insomnia: higher fatigue among women; and 4) use of strategies (higher in women) to manage insomnia. Gender differences were of a small size but could be associated with women's stress, expression of somatic symptoms, and interest in maintaining their own health to meet multiple role demands.

Keywords

Chronic insomnia; management; perpetuating factors; impact; gender differences

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Introduction

Chronic insomnia refers to sleep disturbances, accompanied by impaired daytime functioning, that are experienced for three or more months (American Academy of Sleep Medicine, 2014). The prevalence of chronic insomnia is on the rise among young, middle-aged, and older adults (Ford, Cunningham, Giles, & Croft, 2015). Results of large scale studies (e.g. Jaussent et al., 2011; Westerlund et al., 2013) and a meta-analysis (Zhang & Wing, 2006) consistently show a higher prevalence of insomnia in women, reaching up to 60% in peri- and post-menopausal women (Hall, Kline & Nowakowski, 2015). Biological and psychosocial factors have been proposed to explain gender differences in the prevalence of chronic insomnia. Biological factors include differences in hormones, hormonal changes over the life course, and comorbid medical conditions (Hall et al., 2015; Zhang & Wing, 2006). Psychosocial factors include anxiety and depression, as well as stress associated with gendered-role expectations; for instance, women are expected to take on a bigger burden of caring for the family, and men are expected to be strong and not to express emotions (Cheung, Bartlett, Armour & Saini, 2013; Hall et al., 2015; Wu, Su, Fang & Chang, 2012).

Biological and psychosocial factors may trigger sleep disturbances but are less likely than cognitive and behavioral factors to perpetuate, that is, contribute to the maintenance of chronic insomnia. As explained by Spielman, Caruso, and Glovinsky (1987) and Schwartz and Carney (2012), persons with chronic insomnia continue to experience the sleep disturbances long after the triggering factors have dissipated; chronic insomnia is perpetuated by cognitive and behavioral factors. There is limited evidence of gender differences in perpetuating factors or in the experience and management of chronic insomnia. Understanding the differences in men's and women's report of: factors that perpetuate chronic insomnia, perception of its severity and impact on various domains of health-related quality of life, and use of management strategies, is necessary to inform the design of new interventions and/or the adaptation of evidence-based interventions in order to enhance the fit of the gender-based interventions with men's and women's needs; this fit would improve the interventions' acceptability, uptake, adherence and outcomes (Cabassa et al., 2014).

This study addresses the above-noted gaps in knowledge related to gender differences in perpetuating factors, and the experience, impact and management of chronic insomnia among persons with chronic insomnia enrolled in a trial evaluating the effectiveness of behavioral therapies. The study was guided by a conceptual framework that we developed based on behavioral models (Spielman et al., 1987; Schwartz & Carney, 2012) of chronic insomnia and relevant literature.

Conceptual Model of Chronic Insomnia

Perpetuating factors:

Two categories of factors perpetuate chronic insomnia: cognitions and behaviors. Cognitions refer to unhelpful beliefs and attitudes about sleep and insomnia (e.g. insomnia ruins ability to enjoy life), as well as worry (e.g. about general life and ability to sleep) around bedtime (Lancee, Eisma, van Straten & Kamphuis, 2015; Schwartz & Carney, 2012). Behaviors

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include unhelpful sleep habits such as taking frequent and long naps that interfere with sleep (Irish, Kline, Gunn, Buysse & Hall, 2015), and physical tension experienced in association with worry around bedtime. Worry and physical tension have been more frequently reported by women than men (Armstrong & Dregan, 2014).

Perception of chronic insomnia:

Chronic insomnia is manifested in three symptoms reflecting disturbances in sleep latency (difficulty falling asleep) and in sleep maintenance (difficulty staying asleep), as well as early morning awakening. Individuals with chronic insomnia may experience any one or a combination of these symptoms, at varying levels of severity. Severity represents the perceived burden of chronic insomnia. A few studies found gender differences in symptom experience and perceived severity of chronic insomnia. Women were likely to experience more than one symptom of insomnia, frequently, at a moderate level of severity (Jaussent et al., 2011; Luo et al., 2013). The results of four studies indicated a higher prevalence of disturbance in sleep latency among women (Armstrong & Dregan, 2014; Ganguli, Reynolds & Gilby, 1996; Jaussent et al., 2011; Luo et al., 2013); two studies found that men experience this symptom of chronic insomnia more than women (Lindberg et al., 1997; Volderholzer, Al-Shawjlawi, Weske, Feige & Riemann, 2003). Variability in measurement of insomnia symptoms could account for the inconsistent findings.

Impact of chronic insomnia:

Chronic insomnia is associated with increased daytime sleepiness and fatigue, as well as altered mood such as depressive symptomatology. These alterations interfere with physical and social functioning (Baron, Reid & Zee, 2013; Cheung et al., 2013; Hayley et al., 2015; Lancee et al., 2015). Gender differences in the impact of chronic insomnia on daytime functioning have received little attention.

Management of chronic insomnia:

Management of chronic insomnia involves the selection and application of strategies to promote a good night's sleep. A range of strategies is available and widely disseminated through the internet or social networks, including over-the-counter remedies (e.g. herbal tea), relaxation tapes, complementary or alternative therapies (e.g. aroma therapy), and sleep hygiene recommendations (e.g. avoid caffeine). The results of two qualitative studies revealed gender differences in the management of chronic insomnia: women, more so than men, tried remedies (e.g. herbal tea) and practices (e.g. pre-bedtime rituals and routines; change in eating and drinking habits) to improve their sleep (Hislop & Arber, 2003; Venn, Meadows & Arber, 2013).

Study Aims

This study examined gender differences in the experience and management of chronic insomnia. The specific aims were to compare men's and women's:

1. Report of cognitive and behavioral factors that perpetuate chronic insomnia;
2. Experience of symptoms, and perceived severity of chronic insomnia;

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3. Perceived impact of chronic insomnia on daytime sleepiness and fatigue; and
4. Use of strategies to manage chronic insomnia.

Materials and Methods

Design:

The data were collected at baseline, in a large project that evaluated the effects of behavioral therapies for chronic insomnia (Sidani, Epstein, Bootzin, Miranda & Cousins, 2015). Eligible consenting participants completed a daily sleep diary over a 14-day period, providing data on sleep parameters indicative of chronic insomnia symptoms and the unhelpful sleep habit of napping. Participants completed the sleep diary upon awakening and called in their responses to the study voice mail service each morning, to reduce the possibility of recall bias. After completing the 14-day diary, participants attended an individual data collection session that was scheduled at their convenience, at the study research office where they responded to self-report instruments measuring the variables of interest. The in-person data collection session lasted 30–45 minutes.

Sample:

Men and women with chronic insomnia were recruited through advertisements in local newspapers; brochures and flyers distributed to community health centers, sleep clinics, and hospital outpatient clinics; and through brief announcements in local TV and radio. Study inclusion criteria were: age ≥ 21 years; English-language proficiency; and self-report of difficulty falling asleep and/or difficulty staying asleep of ≥ 30 minutes per night, on ≥ 3 nights per week, of ≥ 3 month duration. Participants were excluded if they reported having been diagnosed and currently being treated for sleep apnea, or had a score < 27 on the Mini-Mental State Exam (MMSE) which indicated cognitive impairment (Folstein, Folstein & McHugh, 1975). The total number of eligible participants who consented and completed the measures at baseline was 739, which was adequate to address the study aims, providing statistical power (setting β at .80 and p at ≤ .05) to detect small differences (Cohen, 1992) in women's and men's experience and management of chronic insomnia.

Variables and Measures

Screening variables.—Pertinent items of the Insomnia Interview Schedule (IIS) were administered to assess all eligibility criteria except cognitive impairment; the IIS is content valid (Morin, 1993). Cognitive impairment was evaluated with the 11-item MMSE, which has well established psychometric properties (Crum, Anthony, Bassett & Folstein, 1993).

Socio-demographic characteristics.—Standard questions were used to gather information on the participants' age (years), gender (woman or man), marital status, level of education (years of formal schooling), current employment status, and racialized background.

Perpetuating factors.—The cognitive factors that perpetuate insomnia included unhelpful beliefs and attitudes toward sleep and insomnia, and worry around bedtime. Unhelpful beliefs about sleep and insomnia were measured by the original, 30-item version

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of the Dysfunctional Beliefs and Attitudes about Sleep (DBAS) scale (Morin, 1994). The items form five subscales reflecting participants' misconceptions about the cause of insomnia, misattributions of the consequences of insomnia, unrealistic expectations about sleep, control and predictability of sleep, and beliefs about sleep promoting behaviors. High subscale scores indicate high levels of unhelpful beliefs and attitudes. The DBAS scale is reliable and valid (Morin, Vallières & Ivers, 2007). In this study, the DBAS subscales demonstrated good internal consistency reliability, evidenced by Cronbach's alpha coefficients ≥ .72. Worry around bedtime was measured by the cognitive subscale of the Sleep Anticipatory Anxiety Questionnaire (SAAQ) reported by Bootzin, Shoham & Kuo (1994) to be reliable and valid. The SAAQ-cognitive subscale contains five items assessing worry (e.g., mind racing, concerns about inability to sleep and function the next day) and demonstrated good internal consistency reliability (Cronbach's alpha = .81) in this study. High subscale scores indicate high levels of worry around bedtime.

The behavioral factors that perpetuate insomnia included the unhelpful sleep habit of napping and physical tension around bedtime. Participants documented the number of naps taken each day on their daily sleep diary, and the average number of naps per day was computed to quantify this habit. Physical tension around bedtime was measured by the five-item somatic subscale of the SAAQ. Examples of items are: muscles are tense, heart is beating rapidly and short of breath. The items were internally consistent (Cronbach's alpha = .78) in this study. High subscale scores quantify high levels of physical tension around bedtime.

Experience of chronic insomnia.—The experience of the three night time insomnia symptoms was assessed with the corresponding IIS items; participants reported on difficulty falling asleep, difficulty staying asleep, and early morning awakening (yes – no response options). In addition, the sleep parameters were assessed with a daily sleep diary, which included the same items comprising the Core Consensus Sleep Diary (Carney et al., 2012). Four sleep parameters were computed from the daily sleep diary: 1) sleep onset latency (SOL) refers to the amount of time, in minutes, it takes to fall asleep at the beginning of the night and quantifies the symptom of difficulty falling asleep; 2) number of awakenings (NAWK); 3) wake after sleep onset (WASO) is the amount of time, in minutes, spent awake across all awakenings during the night, after initial sleep onset; it corroborates the symptom of difficulty staying asleep; and 4) sleep efficiency (SE), which represents the percentage (%) of the total time in bed actually spent asleep and is a central parameter in the examination of insomnia. The daily sleep diary used in this study did not provide the information required to compute the parameter indicative of early morning awakening. However, the total sleep time (TST) is a sleep parameter that quantifies, in minutes, the amount of time spent asleep per night. All sleep parameters were computed per day, and then averaged across the 14-day period of diary completion. The daily sleep diary has demonstrated test-retest reliability and validity, evidenced by the statistically significant correlations between the sleep parameters computed from the diary and from actigraphy data (Buysse et al., 2011).

The perceived severity of insomnia was measured with the well-established Insomnia Severity Index (ISI) (Morin et al., 2011). The ISI items were internally consistent in this

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study (Cronbach's alpha = .80). A total score of 0–7 represents no clinically significant insomnia, 8–14 sub-threshold insomnia, 15–21 clinical insomnia of moderate severity, and 22–28 clinical insomnia of high severity.

Impact of chronic insomnia.—Daytime sleepiness was measured with the Epworth Sleepiness Scale (ESS) (Johns, 1991), which assesses the propensity to fall asleep during eight usual daytime, sedentary activities such as sitting and reading. High scores indicate high levels of sleepiness. The ESS has demonstrated excellent reliability (Cronbach's alpha = .84 in this study) and validity (Buysse et al., 2008).

Daytime fatigue was assessed with the vitality subscale of the Medical Outcome Study – Short Form 36 (SF36) that has established psychometric properties in various patient populations (Gandek, Sinclair, Kosinski & Ware, 2004) and high internal consistency reliability (Cronbach's alpha = .87) in this study. Low scores on the vitality subscale reflect high levels of fatigue.

Depressive symptomatology was assessed with the Center for Epidemiologic Studies – Depression (CESD) scale (Radloff, 1977) that has demonstrated excellent psychometric properties in various populations (Naughton, Shumaker, Anderson & Czajkowski, 1996) and in this study (Cronbach's alpha = .88). High scores on the CESD indicate high levels of depressive mood.

Physical functioning and social functioning were measured with the respective subscales of the SF36; high scores represent high levels of functioning in these domains. The physical and social functioning subscales demonstrated high internal consistency reliability in this study, indicated by Cronbach's alpha coefficients of .88 and .86, respectively.

Management of chronic insomnia.—For the purpose of this study, a list of strategies for managing chronic insomnia was derived from the empirical (quantitative or qualitative) and clinical (guidelines, case studies) literature. A total of 36 strategies were identified, encompassing: over-the-counter herbal remedies (e.g. herbal tea), sleep hygiene recommendations (e.g. reduce noise and light in the bedroom, avoid caffeine and nicotine before bedtime), relaxation (e.g. muscle relaxation, meditation), and complementary or alternative remedies (e.g. aroma therapy). Participants indicated whether or not they used each listed strategy. The total number of strategies used was also computed.

Data analysis:

Frequency distribution and measures of central tendency and dispersion were used to describe the sample's socio-demographic characteristics. Gender differences in the experience of chronic insomnia, perpetuating factors and impact were examined with the chi-square test for dichotomous and categorical variables, and independent sample t-test for continuous variables. Comparisons on the use of strategies were done with the chi-square test. The p-level was preset at ≤ .05 to avoid type I error. The effect sizes (Cohen's d for continuous variables and Cramer's Phi for categorical variables) were computed to determine the clinical significance of the gender differences.

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Results

Participants' socio-demographic characteristics:

The sample consisted of more women (n = 462, 62.4%) than men (n = 277, 37.6%). On average, participants were middle-aged (53.5 ± 16.3; range: 21–90 years), well educated (15.6 ± 3.7; range: 0–35 years of formal schooling) adults. Slightly more than half (52.6%) of the participants were not married (single, divorced or widowed) and 47.7% were married. Most (59.2%) participants were employed and 40.8% were not (student, retired). The majority self-identified as white (82.4%). Participants reported having insomnia for an average of 11 years.

Perpetuating factors:

Statistically significant gender differences were found in three of the eight variables representing the perpetuating factors: number of naps, beliefs about sleep promoting behaviors, and worry about bedtime (Table 1). On average, men reported taking more naps than women (medium effect size). In general, participants expressed comparable levels in the following domains of unhelpful beliefs about sleep and insomnia: misattributions of the consequences of insomnia, unrealistic expectations about sleep, and control and predictability of sleep; however, men had a slightly higher (small size) level of misconceptions about the cause of insomnia and beliefs about sleep promoting behaviors. In contrast, women reported higher levels of worry around bedtime than men (low-moderate effect size).

Experience of chronic insomnia:

The percentages of men and women who experienced the three symptoms of insomnia are presented in Table 2. There were no statistically significant differences at the preset p-level of ≤ .05; however, slightly more women than men reported early morning awakening. The mean and standard deviation for the sleep parameters and perception of insomnia severity are in Table 2. Statistically significant gender differences were found in two sleep parameters: SOL and TST. On average, it took women about 5 minutes longer than men to fall asleep; and women's total sleep time was around 13 minutes longer than that reported by men. Compared to men, women perceived chronic insomnia as severe. Although statistically significant, the latter difference was of a small size.

Impact of chronic insomnia:

The mean scores on the variables representing the impact of chronic insomnia are presented in Table 3. Men and women reported comparable levels of depressive symptomatology and physical and social functioning. Women reported higher levels of fatigue whereas men reported higher levels of daytime sleepiness. All differences were of a small size. Overall, participants had low levels of daytime sleepiness and depressive symptomatology, moderate levels of social functioning, and rather high levels of physical functioning.

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Management of chronic insomnia.

The percentages of men and women who used the 36 strategies for managing chronic insomnia are in Table 4. Statistically significant differences were found in the use of eight strategies. Five of these strategies reflected relaxation (reading, muscle relaxation, imagery, hot bath, massage); two were related to complementary or alternative therapies (herbal tea, aroma therapy); and one was consistent with a sleep hygiene recommendation (comfortable temperature in bedroom). There was a trend for gender differences ($p > .05$ but $< .1$) in three additional strategies: two reflected sleep hygiene recommendations (avoid rigorous exercise before bedtime, reduce noise in bedroom) and one was a complementary therapy (acupuncture). A larger percentage of women than men used these strategies. Overall, women (13.0 ± 6.3) applied more strategies than men (11.7 ± 6.4), $t(737) = 2.4, p = .013$.

Discussion

The study identified some gender differences in the factors perpetuating chronic insomnia, as well as in the experience and management of chronic insomnia among persons enrolled in a trial evaluating the effectiveness of behavioral interventions. The sample predominantly consisted of well-educated, middle-aged, employed women, who self-identified as white, and reported experiencing insomnia for 11 years. The sample characteristics, particularly gender, are comparable to those of persons seeking treatment for chronic insomnia in research and practice settings; women have a higher prevalence of chronic insomnia (Jaussent et al., 2011; Westerlund et al., 2013) and are more likely to seek help to resolve it than are men (Archer et al, 2009; Cheung et al., 2013).

In regards to gender differences in factors perpetuating chronic insomnia, men reported taking more naps (which is an unhelpful sleep habit) than women. Frequent daytime napping prevents the accumulation of sleep drive and hence, negatively impacts the homeostatic system and alters the circadian rhythm (Schwartz & Carney, 2012). The higher prevalence of napping among men may be related to their beliefs about sleep and insomnia, and possible undiagnosed sleep apnea. Men had higher scores on the DBAS subscale related to unhelpful beliefs regarding sleep promoting behaviors. Although persons with sleep apnea were excluded from the study, it is plausible that men may have had undiagnosed sleep apnea, which is prevalent in men (Hayley et al., 2015). Sleep apnea interferes with sleep, leading to high levels of daytime sleepiness, as reported by our study participants, and forcing them to take more naps. This highlights the importance of screening for sleep apnea, using valid and sensitive measures, in future research and in practice.

Compared to men, women reported high levels of worry around bedtime, which may be related to life stress. Working, middle-aged women are under stress induced by multiple competing demands of work and gendered-based roles and expectations. As explained by Hislop and Arber (2003), women’s attempts to meet their paid work and domestic role expectations increase their distress and restrict their time available for sleep. Worrying about life issues and ruminating or thinking about the day’s events and concerns, around bedtime, may lead to hyper-arousal (Cheung et al., 2013; Hall et al., 2015; Wu et al., 2012) and consequently to disturbances in sleep latency as hypothesized by Schwartz and Carney

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(2012) and found by Armstrong and Dregan (2014). In the latter study, women identified worrying and thinking as the reasons for their sleep problem.

There were gender differences in some aspects of chronic insomnia experience. Comparable percentages of men and women reported experiencing the three symptoms of chronic insomnia, that is, disturbances in sleep latency and maintenance, and early morning awakenings. However, comparisons of the sleep parameters documented in the daily sleep diary showed that women had longer sleep latency and total sleep time, as has also been found in previous research (Armstrong & Dregan, 2014; Ganguli et al., 1996; Jaussent et al., 2011; Luo et al., 2013). Although the gender difference in sleep latency found in this study is of a small size, it may be associated with the higher levels of worry about bedtime reported by women, as explained previously. In addition, a statistically significant difference was found in the perception of insomnia severity. The difference was of a small size and not clinically meaningful, but is consistent with the findings of Jaussent et al. (2011) and Luo et al. (2013). In addition to multiple competing demands experienced by women, socio-cultural perspectives that encourage women to more readily express emotional distress and somatic symptoms could also account for the difference in perceived insomnia severity (Zhang & Wing, 2006).

Despite the severity of their insomnia, both men and women indicated low levels of depressive symptomatology and moderate-to-high engagement in physical and social activities. These findings suggest that chronic insomnia interfered, to a limited extent, with participation in physical and social activities, which contradicts previous results highlighting the negative impact of sleep disturbances on involvement in these activities (Spira et al., 2014). Differences in the target population can explain the inconsistent findings. Spira et al. surveyed older adults having comorbid medical conditions that could have affected their sleep and daytime functioning, whereas participants in our study experienced insomnia that may not have been associated with comorbid conditions. Furthermore, our participants used several strategies to manage insomnia, which may have helped mitigate the impact of chronic insomnia on daytime functioning, a point that requires further investigation.

Our study participants differed in their perceived daytime sleepiness and fatigue. Men had higher levels of daytime sleepiness, which can be related to their reported short sleep duration and their use of only a small number of strategies for managing sleep disturbances, or to possible undiagnosed sleep apnea (as explained previously). Women perceived higher levels of daytime fatigue, which may be associated with the distress felt in response to multiple role demands and reflect the socially accepted expression of symptoms.

Compared to men, women used a larger number of strategies that encompassed relaxation, complementary therapies, and sleep hygiene recommendations, to manage chronic insomnia. Women’s use of a large number of strategies reflects: their general interest in acquiring health-related information to help them care for their family and to maintain their own health so that they can meet their multiple role demands, their willingness to seek help for health problems or symptoms and to try self-care strategies, and their openness and tendency to prefer complementary therapies over medications (Fouladbakhsh & Stommel, 2010; Grywacz et al., 2012; Hislop & Arber, 2003; Szymczyk, Wojtyna, Lukas, Kepa, &

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Pawlikouska, 2013). The types of strategies used by women are consistent with their preference for non-pharmacological treatment and comparable to those reported by Venn et al. (2013).

Study Limitations

The findings should be interpreted with caution in light of the study's limitations. With self-selection into the study, the sample may not be representative of all subgroups comprising the target population, including persons with chronic insomnia with diverse gender and cultural identities who do not seek treatment for their sleep problem. The multiple testing done to compare women and men on several variables of interest could have increased type I error, that is, some of the reported differences may be due to chance. The Cronbach's alpha coefficient for the SAAQ-physical tension subscale was slightly lower than the cut-off value for established measures (.80); although this may be associated with low variability in participants' responses, it may have reduced the power to detect significant gender differences in this behavioral factor known to perpetuate insomnia.

Implications

Overall, our findings suggest gender differences in the experience and management of chronic insomnia. For men, engaging in unhelpful sleep habits and embracing unhelpful beliefs regarding sleep promoting behaviors may have played a role in perpetuating their sleep disturbances, which may not have been well managed, leading to daytime sleepiness. In general, men tend to "keep quiet" about their health problems such as insomnia and to downplay or disregard sleep disturbances if these do not interfere with their ability to function during the day; accordingly, men are reluctant to seek help from clinicians to manage their insomnia (Archer et al., 2009; Venn et al., 2013). Men could benefit from public messages, educational interventions, and/or motivational techniques on the impact of chronic insomnia on their ability to carry out daily activity, work-related productivity, safety and health (e.g. poor sleep has been linked to medical conditions such as diabetes), and to encourage them to seek and initiate treatment to manage their chronic insomnia. Sleep education and hygiene may be recommended as a first treatment in a stepped approach, to assist men with chronic insomnia in understanding the structure and function of sleep, sleep habits that perpetuate insomnia, and to apply sleep hygiene strategies that promote a good night's sleep. Additional behavioral therapies, such as stimulus control therapy and sleep restriction therapy, are provided subsequently, as needed (Holmqvist, Vincent & Walsh, 2014).

For women, worry around bedtime may have played a role in perpetuating chronic insomnia, experienced as disturbance in sleep latency at a moderate level of severity and resulting in daytime fatigue despite using a large number of strategies to manage insomnia. Worry may be linked to the distress resulting from women's attempts to meet multiple role demands. Women could benefit from relaxation therapy that involves the application of a relaxation technique of their choice (e.g. progressive muscle relaxation, meditation) as well as strategies to unwind and to address intrusive thoughts in bed as described by Kuhn et al. (2016). However, recommending relaxation therapy should be done with caution because

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women with chronic insomnia enrolled in our study reported using several relaxation strategies. It is possible that the women may not have implemented the relaxation techniques correctly or may not have been aware of or carried out the strategies to unwind and address intrusive thoughts, and consequently may not have experienced improvement in their sleep. Such unfavorable experiences may have led them to enroll in a study of behavioral therapies with the hope of receiving a more effective treatment. Evidence indicates that previous experience influences treatment perceptions and preferences; specifically, persons who tried a treatment but found it unhelpful, viewed it as unacceptable and preferred alternative treatments; if provided the least preferred treatment, persons may be dissatisfied with treatment and may withdraw from it or do not adhere to it (Sidani, 2015). The implications for practice and research are to assess women's experiences with treatment, explain the benefits and risks of available treatments, inquire about their preferences, and offer them their preferred treatment, which has been found to improve adherence and outcomes (Swift, Callahan, & Vollmer Swift, 2011).

Future directions for research include: 1) further investigation of gender differences in factors that perpetuate and in the experience of chronic insomnia and its impact, using a mix of quantitative and qualitative methods to gain a better understanding of the interrelationships among perpetuating factors, symptom experience, and the impact of chronic insomnia; 2) identification of therapies that are judged as acceptable to men and women for managing their insomnia; and 3) evaluating the effectiveness of gender-based therapies in improving sleep and reducing the impact of insomnia on daytime function.

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Table 1

Perpetuating factors by gender

Factor	Men	Women	Statistical test	Effect size (Cohen's d)
Cognitive factors *Unhelpful beliefs and attitudes* Misconceptions about the cause of insomnia (mean ± SD)	27.1 ± 8.7	26.4 ± 7.7	**t(737) = 0.96, p = .04**	0.08
Misattribution of the consequences of insomnia (mean ± SD)	36.0 ± 12.5	36.5 ± 12.6	t(737) = 0.50, p = .61	−0.04
Unrealistic expectations about sleep (mean ± SD)	21.0 ± 6.3	20.3 ± 5.9	t(737) = 1.64, p = .10	0.11
Control and predictability of sleep (mean ± SD)	29.7 ± 9.5	30.3 ± 9.2	t(737) = 0.81, p = .41	−0.06
Beliefs about sleep promoting behaviors (mean ± SD)	23.6 ± 8.4	21.3 ± 8.0	**t(737) = 3.60, p = .001**	0.28
Worry around bedtime (mean ± SD)	2.7 ± 0.5	2.9 ± 0.6	**t(737) = 3.03, p = .002**	−0.36
Behavioral factors *Unhelpful sleep habits* Number of naps (mean ± SD)	2.2 ± 2.8	1.5 ± 1.8	**t(737) = 3.48, p = .001**	0.50
Physical tension around bedtime (mean ± SD)	1.8 ± 0.5	1.9 ± 0.5	t(737) = 1.48, p = .13	−0.20

SD = Standard deviation

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Table 2

Perception of chronic insomnia by gender

Variable	Men	Women	Statistical test	Effect size (Cramer's Phi or Cohen's d)
Symptoms Difficulty falling asleep (%)	71.7	73.0	$\chi^2(1) = 0.14$, p =.70	0.14
Difficulty staying asleep (%)	93.0	91.9	$\chi^2(1) = 0.33$, p = .56	0.33
Early morning awakening (%)	71.3	77.6	$\chi^2(1) = 3.49$, p = .06	0.53
Sleep parameters SOL (minutes; mean ± SD)	39.1 ± 26.7	43.8 ± 35.5	**t(737) = 2.01, p = .04**	−0.14
NAWK (mean ± SD)	2.0 ± 1.1	2.1 ± 1.4	t(737) = 0.77, p = .44	−0.08
WASO (minutes; mean ± SD)	54.5 ± 39.6	50.3 ± 31.7	t(737) = 1.42, p = .15	0.12
TST (minutes; mean ± SD)	342.8 ± 71.1	355.4 ± 62.3	**t(737) = 2.40, p = .01**	−0.19
SE (%)	70.5 ± 12.1	70.3 ± 11.1	t(737) = .23, p = .81	−0.01
Perceived insomnia severity (0–28; mean ± SD)	17.1 ± 4.4	17.8 ± 4.2	**t(737) = 2.06, p = .03**	−0.16

SD = standard deviation; SOL = sleep onset latency; NAWK = number of awakenings; WASO = wake after sleep onset; TST = total sleep time; SE = Sleep Efficiency

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Table 3

Perceived impact of chronic insomnia by gender (mean ± SD)

Factor	Men	Women	Statistical test	Effect size (Cohen's d)
Daytime sleepiness	7.4 ± 4.9	6.4 ± 4.6	**t(737) = 2.88, p = .004**	0.21
Daytime fatigue (0–100)	45.9 ± 21.3	42.8 ± 21.1	**t(737) = 1.95, p = .05**	0.14
Depressive symptomatology	14.4 ± 9.3	14.6 ± 9.0	t(737) = 0.18, p = .85	−0.02
Physical functioning (0–100)	81.4 ± 21.6	82.9 ± 20.7	t(737) = 0.90, p = .36	0.07
Social functioning (0–100)	75.6 ± 24.8	77.3 ± 23.8	t(737) = 0.88, p = .37	−0.07

SD = Standard deviation

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Table 4

Use of strategies to manage chronic insomnia by gender

Factor	Men (%)	Women (%)	$\chi^2(1)$
Muscle relaxation	26.9	40.5	**14.1, p = .001**
Imagery	36.4	47.6	**8.9, p = .003**
Music	32.7	33.5	0.1, p = .81
Warm milk	21.5	26.0	1.9, p = .16
Herbal tea	24.0	33.5	**7.6, p = .006**
Hot bath	34.2	46.1	**10.1, p = .001**
Reading	64.0	75.5	**11.0, p =.001**
Counting sheep	13.8	18.2	2.4, p = .11
Relaxation tape	16.4	14.5	0.4, p = .49
Autosuggestion	47.5	40.7	0.7, p = .38
Daytime exercise	57.1	60.6	0.8, p = .34
Avoid rigorous exercise around bedtime	40.0	46.8	3.1, p = .07
Reduce noise in bedroom	45.1	52.2	3.4, p = .06
Reduce light in bedroom	57.8	61.3	0.8, p = .35
Have comfortable temperature in bedroom	66.5	73.2	**3.6, p = .05**
Avoid heavy meal around bedtime	60.1	62.1	0.2, p = .59
Have light snack around bedtime	43.6	44.4	0.0, p = .84
Drink alcohol	22.5	20.1	0.5, p = .45
Avoid alcohol before bedtime	38.8	35.9	0.5, p = .44
Avoid caffeine in the evening	71.4	68.6	0.6, p = .42
Avoid nicotine before bedtime	18.8	16.2	0.8, p = .36
Put clock out of sight	21.0	22.9	0.3, p = .54
Avoid long naps	51.1	46.1	1.7, p = .19
Meditation	22.5	25.3	0.7, p = .39
Watch TV	54.7	60.2	2.1, p = .14
Avoid stressful thoughts in bed	43.5	41.3	0.3, p = .57
Use over-the-counter sleep medications	35.1	38.9	1.0, p = .30
Use herbal medications for sleep	19.6	23.2	1.3, p = .25
Vitamins	31.2	34.1	0.6, p = .41
Biofeedback	4.0	2.6	1.0, p = .30
Massage	14.5	22.1	**6.6, p = .01**
Acupuncture	5.1	8.4	3.1, p = .07
Aroma therapy	6.2	11.3	**5.5, p = .01**
Chelation	0.7	1.1	0.2, p = .62
Bright light	2.2	1.5	0.4, p = .52
Regular sleep schedule	40.6	44.4	1.0, p = .31