

Improving Sleep for Persons with Anxiety and Post-Traumatic Stress Disorder: A Mini Review of Literature

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MINI REVIEW

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ABSTRACT

There is increasing concern by patients and providers seeking help with sleep initiation and maintenance yet little verified evidence on the efficacy of non-medicinal treatments for sleep disorders. Some articles have suggested relationships exist between anxiety, post-traumatic stress disorder (PTSD), body temperature, temperature and sleep quality which suggests measuring heat loss at the peripheral skin level has potential to predict sleep initiation and potentially providing a means of regulating body temperature during sleep. This may help adults achieve more restorative sleep and improvement in overall quality of health. The following is a mini literature review related to sleep disorders and the potential benefit of thermoregulation and other non-medicinal modalities.

Key words: anxiety; veterans; sleep disorders; post-traumatic stress disorder (PTSD); temperature; sleep

A literature search was performed utilizing the key terms: anxiety, veterans, sleep disorders, and post-traumatic stress disorder (PTSD) returning 182 articles. Articles from this sample were examined and reviewed for appropriateness and relation. A snow-ball effect was utilized to find additional articles related to the key terms. A separate literature search utilizing key terms temperature and sleep was performed finding 79 articles. Only 4 principle systematic reviews were found directly relating to the topic. N = 47 articles were determined as directly related.

BACKGROUND AND SIGNIFICANCE

Sleep disorders have previously been declared a public epidemic affecting an estimated 50 - 70 million people as reported by the Centers for Disease Control and Prevention (2015) and the Institute of Medicine [IOM] [1]; [2]. Multiple source have indicated people require 7-8 hours of sleep [3]; [4], but in the U.S., a majority, 53% do not achieve it [5]. Additionally, poor sleep quality has been attributed to multiple adverse effects: stroke, dementia, heart disease, diabetes, and hypertension [6]. More than 100,000 motor vehicle crashes, 71,000 injuries, 1550 deaths and nearly \$12.5 billion dollars lost has been attributed to drowsy drivers each year [7]. In fact, McKibben and colleagues [8] found, in the U.S. (n = 2249), increased odds of disturbed sleep effect on work performance (OR = 3.34), "bad" mental health (OR = 3.34), physical health (OR = 2.01) and impaired daily function (OR = 2.32). Finally, insomnia



has been reported and evidenced as associated with several mental health disorders which is inclusive of post-traumatic stress disorder (Rifkin et al., 2018).

REVIEW OF LITERATURE

The physiologic effects of temperature and sleep has been demonstrated by several authors noting moderate changes in thermoregulation to have significant effect on circadian rhythms [9-13]. The largest reported study on sleep in N = 765,000 individuals in a phone interview comparing self-reported sleep related with determined geo-located temperature noting deviation of 1° C in monthly night temperature resulted in inadequate sleep over 3 nights/100 persons [14]. This has also been repeatedly reported as true among the elderly with frequent awakenings and an inability to go back to sleep [15-18]; Liao (2002). As noted, the hypothalamic suprachiasmatic nucleus (SNS) controls and regulates the body's temperature sleep and wake cycles [19]; [20-22]. These temperatures correlate with the circadian rhythm [23]; [19]; [24], [20-22]. The body's core temperature tends to peak in the afternoon then trough in the very early morning (approximately 04:00 hrs.) and individuals tend to wake as the body attempts to increase its temperature [25]. These findings were also supported by Burgess, Homes and Dawson [26] when comparing heart rate, core and rectal body temperatures while monitoring polysomnography, electrocardiogram and skin foot temperature. Burgess et al. [26] found NREM/REM sleep cycles 4 – 5 times at night; rectal temperature decreased (due to vasodilation) in the first hour with increased skin foot temperature was correlated with NREM sleep; foot temperature remained increased and plateau. According to [27], evidence suggests there are relationships between body temperature, its thermoregulation and sleep with heat loss at the peripheral skin level – and this can help predict sleep initiation.

The most appropriate related article found was a systematic review of N = 16 articles by Rifkin, Long, and Perry (2018) relating “(c)limate change and sleep: A systematic review of the literature and a conceptual framework”. A second systematic review was found by W.

Liao (2002) reporting on N = 3 articles, “(e)ffects of passive body heating on body temperature and sleep regulation in the elder: A systematic review”. Both articles provided evidence and support for the effect temperature on sleep. Additional studies on temperature effect found before-bedtime passive heating with warm showers 1-2 hours before bedtime was also found through systematic review and meta-analysis to enhance a subjective relaxation effect important in to sleep initiation [28].

Two principle cohort studies were found relating to veterans and sleep disorders. Review of the articles led to 16 articles demonstrating background and significance for sleep disorders among veterans. The first was [29], an observational, descriptive cohort study of N = 325 male veterans evaluating “Longitudinal associations between sleep, intrusive thoughts, and alcohol problems among veterans”. Sleep disturbance was defined as “sleep of poor quality, timing, efficiency, or duration” (Buysse, [30], p. 9). This study found sleep disturbance among veterans to be more commonly related to intrusive thoughts correlated with PTSD [29]. Several additional studies also documented in cross-sectional methodology increased odds of sleep disturbance and severity of PTSD among veterans [31-36]. Insomnia, in particular, was noted as common among veterans with PTSD by Pigeon, Campbell, C. E., Possemato, K., and Ouimette [37] as well as Short, Allen and Schmidt [38]. In another example, Brown and colleagues [39] found, in a cross-sectional study of n = 191, sleep disturbances with PTSD and fears of sleeping along following the Katrina hurricane disaster. In so following, sleep disorders in veterans has been known to lead to difficulty in controlling or managing emotions and/or thoughts [40]; [41]. This has been recognized as exacerbating PTSD. While there is support and documented willingness for behavior treatment for sleep disturbance by several authors specializing in PTSD, there is broad support for randomized trials to manipulate and improve sleep in effort to assist with sleep intrusions and disorders [42-45].

There has been limited other research related to sleep and efforts to improve sleep quality with the exception for cognitive behavioral therapy. In a meta-

analysis of 9 studies (n = 1210) by Ya, Zhang, Chen, Liu, Li, Liu, Lang, Lin, Yang, and Jian [46], cognitive behavioral therapy via the internet was effective at improving anxiety and depression which has repeatedly been shown to impact sleep quality. Similarly, cognitive behavior therapy was found to be highly effective towards improving sleep quality in patients with co-morbid psychiatric disorders in systematic reviews of 16 studies (n = 571) [47]. This point has been further supported by Ho, Chung, Yeung, Ng, Kwan, Yung, and Cheng [48] in a meta-analysis of 20 randomized controlled studies relating self-help cognitive behavioral therapy. Other studies interventions include laughter and humour interventions as noted in a 2019 meta-analysis of 10 studies by Zhao, Yin, Zhang, Shang, Wang, and Chen [49]. In these studies (n = 814), laughter was assessed through randomized controlled trials with a positive effect upon Pittsburgh Sleep Quality Index (MD = -1.93, 95% CI (-3.65 to -0.21), p = .03) [50]; [51]; [49]. Contrastingly, exercise before bedtime was not found to have improving effect or enhancing sleep quality, but may have impaired it as noted in a review of 23 studies (n = 275) by Tutz, Ekholzer, & Spengler [52].

CONCLUSION

This brief review of literature related to sleep disorders indicates there are some but limited studies and evidence on the potential for improving sleep initiation and quality through thermoregulation. There is evidence supporting the utilization of cognitive behavioral therapy to improve sleep. Veterans and adults affected by post-traumatic stress disorder and impaired sleep quality, in particular, exhibit impaired physical, emotional and mental health in addition to having multiple adverse effects leading to stroke, dementia, heart disease, diabetes, and hypertension. There is some literature and support for monitoring heat loss via skin temperature which can help predict sleep initiation employing non-invasive thermoregulation to maintain optimal body temperatures during sleep may improve sleep quality, physical, emotional,

and mental health of those affected. However, little evidence comparing thermoregulation to cognitive behavioral therapy alone or combined exists. This brief review of literature suggests additional study is needed to understand non-medicinal sleep interventions which may improve both initiation and quality, particularly in persons affected with anxiety and PTSD.

REFERENCES

1. Institute of Medicine [IOM]. (2006). Sleep disorders and sleep deprivation: An unmet public health problem. National Academies Press: Author.
2. Hafner, M., Stepanek, M., Taylor, J., Troxel, W. M., & van Stolk, C. (2017). Why sleep matters – the economic costs of insufficient sleep: a cross-country comparative analysis. *Rand Quarterly*, 6(4), 11.
3. Ohayon, M. M., Wickwire, E. M., Hirshkowitz, M., Albert, S. M., Avidan, A. Y., Daly, F. J., et al. (2015). National Sleep Foundation's sleep time duration recommendations: First report. *Sleep Health*, 3(1), 6 – 19.
4. Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, et al., (2015). National Sleep Foundation's sleep time duration recommendations: Methodology and results summary. *Sleep Health J National Sleep Foundation*, 1(1), 40 – 43.
5. National Sleep Foundation. (2013). [International bedroom poll first to explore sleep differences among six countries](#). Author.
6. Durgan, D. J., & Bryan, R. M. (2012). Cerebrovascular consequences of obstructive sleep apnea. *J Am Heart Assoc*, 1(4).
7. National Sleep Foundation. (2017). [Facts and stats: Drowsy driving – stay alert, arrive alive](#). Author.
8. McKibben, J. B., Fullerton, C. S., Ursano, R. J. et al. (2010). Sleep and arousal as risk factors for adverse health and work performance in public health workers involved in the 2004 Florida hurricane season. *Disaster*



- medicine and public health preparedness, 4(Suppl1), S55 – S62.
9. Ishiura, D., Karashima, A., Katayama, N., & Nakao, M. (2007). Integrated model incorporating circadian phase dynamics and the thermoregulatory mechanism of sleep. *Sleep Biol Rhythm*, 5(4), 259 – 270.
 10. Mallick, H., N, & Kuar, V. M. (2012). Basal forebrain thermoregulatory mechanism modulates auto-regulated sleep. *Front Neurol*, 3, 102 – 102. [10]
 11. Lack, L. C., Gradisar, M., Van Someren, E. J. W., Wright, H. R., & Lushinton, K., (2008). The relationship between insomnia and body temperatures. *Sleep*, 22, 307 – 317.
 12. Okamoto-Mizuno, K., Mizuno, K., Michie, S., Maeda, A., & Iizuka, A., (1999). Effects of humid heat exposure on human sleep stages and body temperature. *Sleep*, 22, 767 – 773.
 13. Van Someren, E. J. (2006). Mechanisms and functions of coupling between sleep and temperature rhythms. *Prog Brain Res*, 153, 309 – 324.
 14. Obradovich, N., Migliorini, R., Mednick, S. C., & Fowler, J. H. (2017). Nighttime effects of humid heat exposure on human sleep stages and body temperature. *Sleep*, 22, 767 – 773.
 15. Ancoli-Israel, S. (1997). Sleep problems in older adults: putting myths to bed. *Geriatrics*, 52(1), 20 – 30.
 16. Ancoli-Israel, S., Roth, T. (1999). Characteristics of insomnia in the United States: Results of the 1991 National Sleep Foundation Survey. I. *Sleep*, 22(Suppl 2), S347 – 353.
 17. Floyd, J. A., Janisse, J. J., Marshal, Medler, S., & Ager, J. W. (2000a). Nonlinear components of age-related change in sleep initiation. *Nursing Research*, 49(5), 290 – 294.
 18. Floyd, J. A., Medler, S. M., Ager, J. W., & Janisse, J. J. (2000b). Age-related changes in initiation and maintenance of sleep: A meta-analysis. *Research on Nursing Health*, 23(2), 106 – 117.
 19. Dijk, D. J., Duffy, J. F., & Czeisler, C. A., (2000). Contribution of circadian physiology and sleep homeostasis to age-related changes in human sleep. *Chronobiological International*, 17(3), 285 – 311.
 20. Van Someren, E. J. (2000a). Circadian and sleep disturbances in the elderly. *Experimental Gerontology*, 35(9-10), 1229 – 1237.
 21. Van Someren, E. J. (2000b). Circadian rhythms and sleep in human aging. *Chronobiological International*, 17(3), 233-243.
 22. Van Someren, E. J. (2000c). More than a marker: Interaction between circadian regulation of temperature and sleep, age-related changes, and treatment possibilities. *Chronobiological International*, 17(3), 313 – 354.
 23. Czeisler, C. A., Duffy, J. F., Shanahan, T. L., Brown, E. N., Mitchell, J. F., ... Kronauer, R. E., (1999). Stability, precision, and near-24-hour period of the human circadian pacemaker. *Science*, 284(5423), 2177 – 2181.
 24. Hoffman, M. A. (2000). The human circadian clock and aging. *Chronobiological International*, 17(3), 245 – 259.
 25. Lanuza, D. M. (1993). Circadian rhythm disorders. In: Carrieri-Kohlman, L, West (Eds.), *Pathophysiological Phenomena in Nursing*. W. B. Saunders, pp. 50 -76.
 26. Burgess, H. J., Holmes, A. L., & Dawson, D. (2001). The relationship between slow-wave activity, body temperature, and cardiac activity during nighttime sleep. *Sleep*, 24(3), 343 – 349.
 27. Krauchi, K., & Wirz-Justice, A. (2001). Circadian clues to sleep onset mechanisms. *Neuropsychopharmacology*, 25(5 Suppl 1), S92 – S96.
 28. Haghayegh, S., Khoshnevis, S., Smolensky, M. H., Diller, K. R., & Castriotta, R. J. (2019). Before-bedtime passive body heating by warm shower or bath to improve sleep: A systematic review and meta-analysis. *Sleep Medicine Reviews*, 46, 124–135.
 29. Buysse, D. J. (2014). Sleep health: Can we define it? Does it matter? *Sleep*, 37, 9 – 17.
 30. Miller, M. B., Metrik, J., Borsari, B., & Jackson, K. M. (2019). Longitudinal associations between sleep, intrusive thought, and alcohol problems among veterans. *Alcoholism: Clinical and experimental research*, 43(11), 2438–2445.
 31. Cox, R. C., McIntyre, W. A., Olatunji, D. O. (2018). Interactive effects of insomnia symptoms and trauma

- exposure on PTSD: Examination of symptom specificity. *Psychol Trauma*, 10, 508 – 514.
32. Hall, M., Buysse, D. J., Nowell, P.D., Nofzinger, E. A., Houck, P. R., ... Kupfer, D. J. (2000). Symptoms of stress and depression as correlates of sleep in primary insomnia. *Psychosom Med*, 62, 227 – 230.
 33. Kliewer, W., & Lepore, S. J. (2015). Exposure to violence, social cognitive processing, and sleep problems in urban adolescents. *J Youth Adolesc*, 44, 507 – 517.
 34. Swinkels, C. M., Ulmer, C. S., Beckham, J. C., Buse, N. & Calhoun P. S. (2013). The association of sleep duration, mental health and health risk behaviors among U.S. Afghanistan/Iraq era veterans. *Sleep*, 36, 1019 – 1025.
 35. Wallace, D. M., Shafazand, S., Ramos, A. R., Carvalho, D. Z., ... & Wohlgemuth, W. K. (2011). Insomnia characteristics and clinical correlates in Operation enduring Freedom/Operation Iraq Freedom veterans with post-traumatic stress disorder and mild traumatic brain injury: An exploratory study. *Sleep Med*, 12, 850 – 859.
 36. Wright, C. E., Schnur, J. B., Montgomery, G. H., & Bovberg, D. H. (2010). Psychological factors associated with poor sleep prior to breast surgery: An exploratory study. *Behav Med*, 36, 85 – 91.
 37. Pigeon, W. R., Campbell, C. E., Possemato, K., & Quimette, P. (2013). Longitudinal relationships of insomnia, nightmares, and PTSD severity in recent combat veterans. *J Psychosom Res*, 75, 546 – 550.
 38. Short, N. A., Allan, N. P., Schmidt, N. B. (2017). Sleep disturbance as a predictor of affective functioning and symptom severity among individuals with PTSD: An ecological momentary assessment study. *Behav Res Ther*, 97, 146 – 153.
 39. Brown, T. H., Mellman, T. A., Alfano, C. A., & Weems, C. F. (2011). Sleep fears, sleep disturbance, and PTSD symptoms in minority youth exposed to Hurricane Katrina. *J Trauma Stress*, 24(5), 575 – 580. Doi: 10/1002/jts.20680.
 40. Baglioni, C., Spiegelhalder, S., Lombardo, C., Riemann, D. (2010). Sleep and emotions: A focus on insomnia. *Sleep Medicine Reviews*, 14, 227 – 238.
 41. Nilsson, J. P., Soderstrom, M., Karlson, A. U., Lekander, M., Akerstedt, T. ... Axelsson, J. (2005). Less effective executive functioning after one night's sleep deprivation. *J Sleep Res*, 14, 1 – 6.
 42. Germain, A. Shear, M. K., Hall, M., Buysse, D. J. (2007). Effects of a brief behavioral treatment for PTSD-related sleep disturbances: a pilot study. *Behav Res Ther*, 45, 627 – 632.
 43. Gunter, C. A., Pedersen, E. R., & Drummond, S. P. A. (2018). Going direct to the consumer: Examining treatment preferences for veterans with insomnia, PTSD, and depression. *Psychiatry Res*, 263, 108 – 114.
 44. Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Ann rev Clin Psycho*, 3, 1 – 27.
 45. Margolies, S. O., Rybarczk, B., Vrana, S. R., Leszczyszyn, D. J. & Lynch, J. (2013). Efficacy of cognitive behavioral treatment for insomnia and nightmares in Afghanistan and Iraq veterans with PTSD. *J Clin Psychol*, 69, 1026 – 1042.
 46. Ye, Y.-Y., Zhang, Y.-F., Chen, J., Liu, J., Li, X.-J., Liu, Y.-Z., Lang, Y., Lin, L., Yang, X.-J., & Jiang, X.-J. (2015). Internet-Based Cognitive Behavioral Therapy for Insomnia (ICBT-i) Improves Comorbid Anxiety and Depression-A Meta-Analysis of Randomized Controlled Trials. *PloS One*, 10(11), e0142258.
 47. Taylor, D. J., & Pruiksma, K. E. (2014). Cognitive and behavioural therapy for insomnia (CBT-I) in psychiatric populations: a systematic review. *International Review of Psychiatry (Abingdon, England)*, 26(2), 205–213.
 48. Ho, F. Y.-Y., Chung, K.-F., Yeung, W.-F., Ng, T. H., Kwan, K.-S., Yung, K.-P., & Cheng, S. K. (2015). Self-help cognitive-behavioral therapy for insomnia: a meta-analysis of randomized controlled trials. *Sleep Medicine Reviews*, 19, 17–28.
 49. Zhao, J., Yin, H., Zhang, G., Li, G., Shang, B., Wang, C., & Chen, L. (2019). A meta-analysis of randomized controlled trials of laughter and humour interventions



- on depression, anxiety and sleep quality in adults. *Journal of Advanced Nursing*, 75(11), 2435–2448.
50. Ghodsbin, F., Sharif Ahmadi, Z., Jahanbin, I., & Sharif, F. (2015). The effects of laughter therapy on general health of elderly people referring to jahandidegan community center in shiraz, iran, 2014: A randomized controlled trial. *International Journal of Community Based Nursing & Midwifery*, 3(1), 31–38.
51. Ko, H. J., & Youn, C. H. (2011). Effects of laughter therapy on depression, cognition and sleep among the community-dwelling elderly. *Geriatrics & Gerontology International*, 11(3), 267–274.
52. Stutz, J., Eiholzer, R., & Spengler, C. M. (2019). Effects of Evening Exercise on Sleep in Healthy Participants: A Systematic Review and Meta-Analysis. *Sports Medicine (Auckland, N.Z.)*, 49(2), 269–287.

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