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CLINICAL REVIEW

The role of sleep hygiene in promoting public health: A review of empirical evidence

Leah A. Irish [a, *], Christopher E. Kline [b], Heather E. Gunn [b], Daniel J. Buysse [b], Martica H. Hall [b]

[a] North Dakota State University, Department of Psychology, Fargo, ND, USA
[b] University of Pittsburgh School of Medicine, Department of Psychiatry, Pittsburgh, PA, USA

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SUMMARY

The ineffectiveness of sleep hygiene as a treatment in clinical sleep medicine has raised some interesting questions. If it is known that, individually, each specific component of sleep hygiene is related to sleep, why wouldn't addressing multiple individual components (i.e., sleep hygiene education) improve sleep? Is there still a use for sleep hygiene? Global public health concern over sleep has increased demand for sleep promotion strategies accessible to the population. However, the extent to which sleep hygiene strategies apply outside clinical settings is not well known. The present review sought to evaluate the empirical evidence for sleep hygiene recommendations regarding exercise, stress management, noise, sleep timing, and avoidance of caffeine, nicotine, alcohol, and daytime napping, with a particular emphasis on their public health utility. Thus, our review is not intended to be exhaustive regarding the clinical application of these techniques, but rather to focus on broader applications. Overall, though epidemiologic and experimental research generally supported an association between individual sleep hygiene recommendations and nocturnal sleep, the direct effects of individual recommendations on sleep remains largely untested in the general population. Suggestions for clarification of sleep hygiene recommendations and considerations for the use of sleep hygiene in nonclinical populations are discussed.

Sleep hygiene is defined as a set of behavioral and environmental recommendations intended to promote healthy sleep, and was originally developed for use in the treatment of mild to moderate insomnia [1]. During sleep hygiene education, patients learn about healthy sleep habits and are encouraged to follow a set of recommendations to improve their sleep (e.g., avoid caffeine, exercise regularly, eliminate noise from the sleeping environment, maintain a regular sleep schedule) [2]. Although research has demonstrated links between individual sleep hygiene components and subsequent sleep, evidence for the efficacy of sleep hygiene education as a treatment for insomnia has been limited and inconclusive [2–5]. Taken together, the lack of supportive data and the availability of effective, empirically supported, behavioral treatment alternatives has led to the conclusion that sleep hygiene education is ineffective as a monotherapy for insomnia [6]. Thus, we turn our attention away from sleep hygiene in the context of clinical sleep medicine, and consider its potential utility in the realm of public health where sleep hygiene is still widely used.

Sleep problems are prevalent in the global population. Throughout this manuscript, the term “sleep problems” will be used to refer generally to any combination of acute or chronic problems with prolonged sleep onset latency (SOL), excessive wake after sleep onset (WASO), short total sleep time (TST), low sleep efficiency (SE), or poor sleep quality based on subjective and/or objective assessments. We specifically do not use “sleep problems” to refer to such difficulties as symptoms of more specific clinical sleep disorders. Recent estimates suggest that over half (56%) of Americans suffered from sleep problems over the previous year, as compared to 31% of Western Europeans and 29% of Japanese [7]. Though the majority of these individuals reported functional impairment as a result of their sleep problems, most (61–79%) did not meet clinical diagnostic criteria for insomnia based on self-reported symptoms [7]. In a similar survey of adults representing 10 countries, 31.6% of participants were classified as having insomnia while an additional 17.5% of participants were classified

* Corresponding author. NDSU Dept. 2765, P.O. Box 6050, Fargo, ND 58108-6050, USA. Tel.: +1 (701) 231 6242; fax: +1 (701) 231 8426.
E-mail address: Leah.Irish@ndsu.edu (L.A. Irish).

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Abbreviations

CBT-I	cognitive behavioral therapy for insomnia
EEG	electroencephalography
GABA	gamma-aminobutyric acid
ICU	intensive care unit
NREM	non-rapid eye movement
PSG	polysomnography
REM	rapid eye movement
SE	sleep efficiency
SOL	sleep onset latency
SWS	slow wave sleep
TST	total sleep time
WASO	wake after sleep onset

with subthreshold insomnia [8]. Sleep problems are of growing concern to global public health because poor sleep is associated with impairments in motivation, emotion, and cognitive functioning as well as increased risk for serious medical conditions (e.g., diabetes, cardiovascular disease, cancer) and all-cause mortality, even when the symptoms are below the threshold for clinical sleep disorders [9–11]. Despite the potential widespread benefit for sleep promotion, established behavioral treatments (e.g., cognitive behavioral therapy for insomnia (CBT-I)) are largely limited to individuals who qualify for, and seek, treatment from sleep medicine professionals. The present review considers the needs of the general nonclinical population, encompassing individuals with intermittent or subsyndromal sleep impairments as well as those who may meet criteria for sleep disorders, but for whom sleep treatments are unavailable or inaccessible. Such individuals may be more likely to seek assistance from primary care providers or self-help materials to manage their sleep problems, and as a result will likely be exposed to sleep hygiene recommendations which are widely used in medical settings [2,3] and are easily accessible on the internet. As described recently [12], greater emphasis on sleep health (rather than clinical sleep disorders) more closely aligns sleep research with current healthcare objectives and broadens our understanding of sleep's full spectrum of influence on population health.

Though the utility of sleep hygiene education may be limited in clinical settings, there are several reasons to consider its potential to improve sleep and promote health in the general population. In addition to being commonly used and readily available, sleep hygiene education does not require the direct involvement of a clinician and therefore can be widely disseminated to individuals not likely to seek medical treatment for their sleep problems. As a relatively inexpensive lifestyle intervention, sleep hygiene education could serve as a first-line intervention in a stepped-care model for adults who want to improve their sleep but are not likely to qualify for, or seek, more substantial clinical treatment. Sleep hygiene recommendations may be delivered via a variety of media (e.g., print- or internet-based), resulting in increased access [13]. In addition, sleep hygiene education may be a more appealing and intuitive option for the general population. For example, examination of a tailored sleep improvement plan in cancer patients revealed that when developing their individual plan, participants preferred sleep hygiene strategies over stimulus control or sleep restriction [14]. Moreover, adherence to the sleep hygiene component was relatively high and increased over time (68–78%) compared to the other treatment components [15]. However, it is important to note that individuals with undiagnosed or untreated sleep disorders may engage in poor sleep hygiene behaviors in an attempt to cope with their poor sleep (e.g., caffeine or alcohol use), and continued efforts should be made to identify these individuals and refer them for more appropriate treatments.

Recent public health campaigns have advanced general knowledge about the importance of good sleep, though they are often focused on adequate sleep duration rather than good sleep quality, and the effectiveness of these campaigns is generally unclear. Less is known regarding scientifically valid strategies by which the average person might effectively improve their sleep. Relatively few studies have investigated the efficacy of sleep hygiene interventions in nonclinical samples [16–20]. Overall, this work has provided some preliminary support for the use of sleep hygiene education in nonclinical populations, but the findings are inconsistent. Taken together with findings in clinical samples, these data raise an interesting question. If it is known that, individually, each specific component of sleep hygiene is related to sleep, why wouldn't addressing multiple individual components (i.e., sleep hygiene education) result in improved sleep? Inconsistent and uncompelling findings may be due, in large part, to the lack of a standardized approach in the application of sleep hygiene principles to clinical practice and research. As reviewed by Stepanski and Wyatt [3], definitions of sleep hygiene are inconsistent across studies, and the individual recommendations vary widely in both content and implementation. Further, these authors recommended that future research focus on establishing clear guidelines for individual behavioral and environmental aspects of sleep hygiene, rather than focusing on sleep hygiene as a comprehensive list [3]. This approach is consistent with Hauri's original recommendations to tailor sleep hygiene recommendations to fit individual needs [1], but is inconsistent with the common public health approach of providing a standard and comprehensive set of recommendations. An important next step is to consider the empirical foundation for sleep hygiene, and identify appropriate modifications to improve its delivery and efficacy in the general population.

More specifically, the current evidence base for each individual sleep hygiene recommendation should be evaluated and expanded to support further clarification of recommendations. With a particular focus on application in nonclinical populations, the present review aims to: 1) critically review the empirical evidence for individual components of sleep hygiene recommendations, identifying inconsistencies and clarifying specific guidelines for optimal sleep promotion; 2) identify gaps in the present understanding of sleep hygiene recommendations and provide suggestions for future research; and 3) identify additional conceptual and methodological issues to consider when utilizing sleep hygiene recommendations in the general population. Particular emphasis was placed on reviewing research that directly manipulated the recommended behavior by either examining the impact of the behavior or environmental factor on sleep by manipulating it (e.g., administering caffeine to a caffeine-naïve individual and observing effects on subsequent sleep) or by observing changes in sleep after the recommended behavior change was made (e.g., asking habitual caffeine users to abstain from caffeine and observing the effects on subsequent sleep). The former strategy allows for a “clean” examination of individual effects while the latter may be confounded by conceptual “noise” (e.g., tolerance, addiction, concurrent risk factors) but more closely approximates realistic circumstances in which individuals may be using sleep hygiene strategies. To maximize its relevance to the general population, when possible, the present review is focused on adults who were not specifically recruited because they suffered from clinically diagnosed sleep disorders.