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Domains included in multidimensional sleep health composite scores: A scoping review

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ABSTRACT

While the SATED/Ru-SATED sleep health framework is well-recognized, there is no consensus for how many or which domains should be included in the construct of a multidimensional sleep health composite score. Therefore, the purpose of this scoping review is to determine what domains are included in multidimensional sleep health composite scores and how those domains are assessed. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) and the Joanna Briggs Institute's (JBI) updated methodology for scoping reviews were used. Two authors independently reviewed titles/abstracts, full texts, and performed data extraction, and one author resolved discrepancies with discussion as needed. The search strategy generated 1879 references, 130 underwent a full-text screening, and 45 were eligible for inclusion. Five and six domains were the most common number of domains included in the multidimensional sleep health composite scores (n = 20 each). Articles mainly included only self-report measures (n = 21) or a mix of self-report and objective measures (n = 21). Twelve unique domains were identified with Duration being the most common (n = 45), followed by Alertness/Sleepiness (n = 42), Satisfaction/Quality (n = 39), and Timing (n = 37). In conclusion, while the domains most often included in the multidimensional sleep health composite scores followed the SATED/Ru-SATED framework, there was variability in the domains included as well as variability in how the domains were assessed. Consensus is needed on the definition of sleep health domains or, at a minimum, clear reporting on the definitions used. Further research is needed to determine which multidimensional sleep health domains are most associated with health outcomes.

Introduction

Sleep medicine has historically focused on the identification and treatment of sleep disorders, such as insomnia and sleep apnea. *Sleep health* is a newer term that focuses on sleep as a multidimensional health behavior along a continuum with excellent sleep health on one end of the continuum and very poor sleep health on the other end, and sleep health exists in the presence *or absence* of a sleep disorder. For example, chronic insomnia occurs in approximately 10% of the US adult population,[1] whereas approximately 60% of adults have short sleep duration (< 7 hours).[2] Also, about 50% of adults report not feeling well-rested, and approximately 70% have inconsistent bedtime and waketime.[3] Importantly, various dimensions of sleep health have been associated with adverse health consequences,[4] including increased risk of Alzheimer's disease[5–8] and decline in cognitive function.[9]

When first introduced as a construct,[4] sleep health was proposed to consist of five domains or core dimensions that represent specific, theoretically distinct, measurable aspects of sleep health: Satisfaction with sleep, daytime Alertness, Timing of sleep within 24-hour period, sleep Efficiency, and sleep Duration (acronym SATED). Regularity was added as a proposed domain shortly thereafter (acronym Ru-SATED).[10] However, there is no consensus for how many or which domains should be included in the construct of sleep health.[11]

Because sleep health is a multidimensional construct, it is not intended to be measured by a single domain (such as sleep quality)

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What was known

Sleep research has broadened from a focus on sleep disorders to include a more positive frame of multidimensional sleep health. Multidimensional sleep health has been associated with many health outcomes across a spectrum of clinical and demographic cohorts. However, no consensus exists regarding the domains and assessment of multidimensional sleep health making the comparison and generalizability of findings across studies difficult.

What this study adds

This scoping review examined the literature on assessing multidimensional sleep health. A great amount of heterogeneity was found in the domains included and assessment of multidimensional sleep health across studies, though common themes were found. Suggestions were made on how to improve reporting to help propel the field toward better generalizability of findings.

but rather a combination of multiple domains, frequently reported as a multidimensional sleep health (MDSH) composite score. While the Ru-SATED sleep health framework is perhaps the most recognized framework, there is no consensus on the domains included in a MDSH composite score or the sleep characteristics used to define the domains.[11] In addition, the sleep characteristics included in each domain can be measured in different ways (i.e., self-report, actigraphy, and polysomnography).[11] This has resulted in variable MDSH constructs and scoring techniques that make it difficult to compare research results. Therefore, the objective of this review is to answer the questions, "What are the domains included in multidimensional sleep health (MDSH) composite scores, and how are those domains assessed?" A scoping review design was chosen to answer this question since this is an emerging field with limited literature, and the primary purpose was to clarify concepts and research methods for assessing MDSH.[12]

Methods

This scoping review was reported as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR)[13] standard and the Joanna Briggs Institute's (JBI) updated methodology for scoping reviews.[14] A protocol was developed and registered in the Open Science Forum (https://osf.io/zhfya) for conducting this scoping review.[15]

The research librarian (PV) developed a pilot search strategy on the following databases: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, and Daily and Versions. To construct the search strategy, the key concept identified was sleep health as the phenomena (P) of interest and multidimensional measures of sleep as the measurement properties as the outcome (O).[16] The pilot search was completed on June 18, 2024. Additional searches were completed on July 25, 2025, to encompass any newly published articles. Additional resources including PsycINFO, Embase, and Web of Science were searched along with selected cited references search and gray literature. To retrieve the most results on the topic, both keywords and the database-supplied controlled vocabularies were used, along with various search techniques, and the results were filtered to the date range January 1, 2014 to July 25, 2025. Because of the nature of the topic, the search parameters followed were based on the results retrieved from databases. Example keywords include sleep, sleep deprivation, sleep quality, sleep health multidimensional index, composite score, measurements, surveys, questionnaires, and so on. The search strategy is available in Supplementary File 1.

Criteria for study inclusion were: (1) Included human participants, (2) Included ≥ 4 sleep health domains in a multidimensional sleep health composite score (the study did not have to use the term "sleep health" to describe the composite but the term used must be in the spirit of sleep health; studies that assessed domains separately but did not calculate a composite were not included nor were studies that only included a questionnaire to assess sleep health that did not evaluate separate domains (e.g., SATED/Ru-SATED questionnaires); the study was included if they defined the domains to be included in the composite a priori), and (3) Utilized an observational or interventional study design assessing sleep health through a composite score. Studies were excluded if they: (1) Included animals, (2) Were written in a language other than English, (3) Were published prior to 2014, (4) Were published as an abstract or in non–peer-reviewed sources (i.e., conference proceedings, preprint), (5) Were irrelevant to the study question.

Citations generated from the search strategy were exported to EndNote (version 21), and duplicates were removed. Citations were then imported to Covidence (Veritas Health Innovation, Melbourne, Australia; www.covidence.org) to review and perform data extraction. Each article title and abstract were independently reviewed by two reviewers (AB, JR, and KB) to determine eligibility based on the inclusion/exclusion criteria, and discrepancies were resolved by a third reviewer (CS). The full-text articles were then reviewed independently by two of four reviewers (AB, KB, JR, or CS) to determine eligibility, and discrepancies were resolved by CS.

A standard data extraction form was built in Covidence by CS. All study personnel involved in data extraction reviewed and approved the data extraction form prior to the start of data extraction. Data were independently extracted from eligible articles by two of four reviewers (AB, KB, JR, or CS). CS then reviewed the data extraction for accuracy, completeness, and to reach consensus. Extracted data were reviewed for accuracy by the primary reviewer, and a third reviewer was used to resolve discrepancies in data when needed. Data extracted included last name of first author, publication year, country study was conducted, study purpose/aim, the name of each sleep health domain, if each domain was assessed using self-report or objective means, how each domain was assessed (i.e., question or questionnaire used, objective device used), possible responses for each domain, how each domain was defined as "good" sleep, how the sleep health composite was calculated, description of the MDSH scale, details about the study sample (i.e., pertinent comorbid conditions, targeted age group, location of participants living/residing, sample size, age, ethnicity, race, and sex), and main sleep health results.

Descriptive statistics (i.e., number and percentage) were calculated, including the number of domains included in the MDSH composite score. Studies were described as using self-report only, objective measures only, or a mix of self-report and objective measures to calculate the MDSH composite score. Reviewers used the author- designated domain labels during data extraction, and similar domain terms were grouped into one domain (e.g., "Insomnia," "Sleep disturbances," "REM sleep behavior disorder," "Symptoms of sleep disorders," "Snoring," "Sleep Medication Use," and "Average Oxygen Saturation" were grouped into the "Sleep Disorders" domain). Original domain names and how they were grouped into domains for this scoping review can be found in Supplementary File 2. The domain naming framework by Wallace et al[17] was referenced in creating the groupings for the domains, though some discrepancies were necessary to both uphold the SATED/Ru-SATED framework and best represent the original data. For instance, Wallace et al[17] included continuity as an umbrella domain over latency

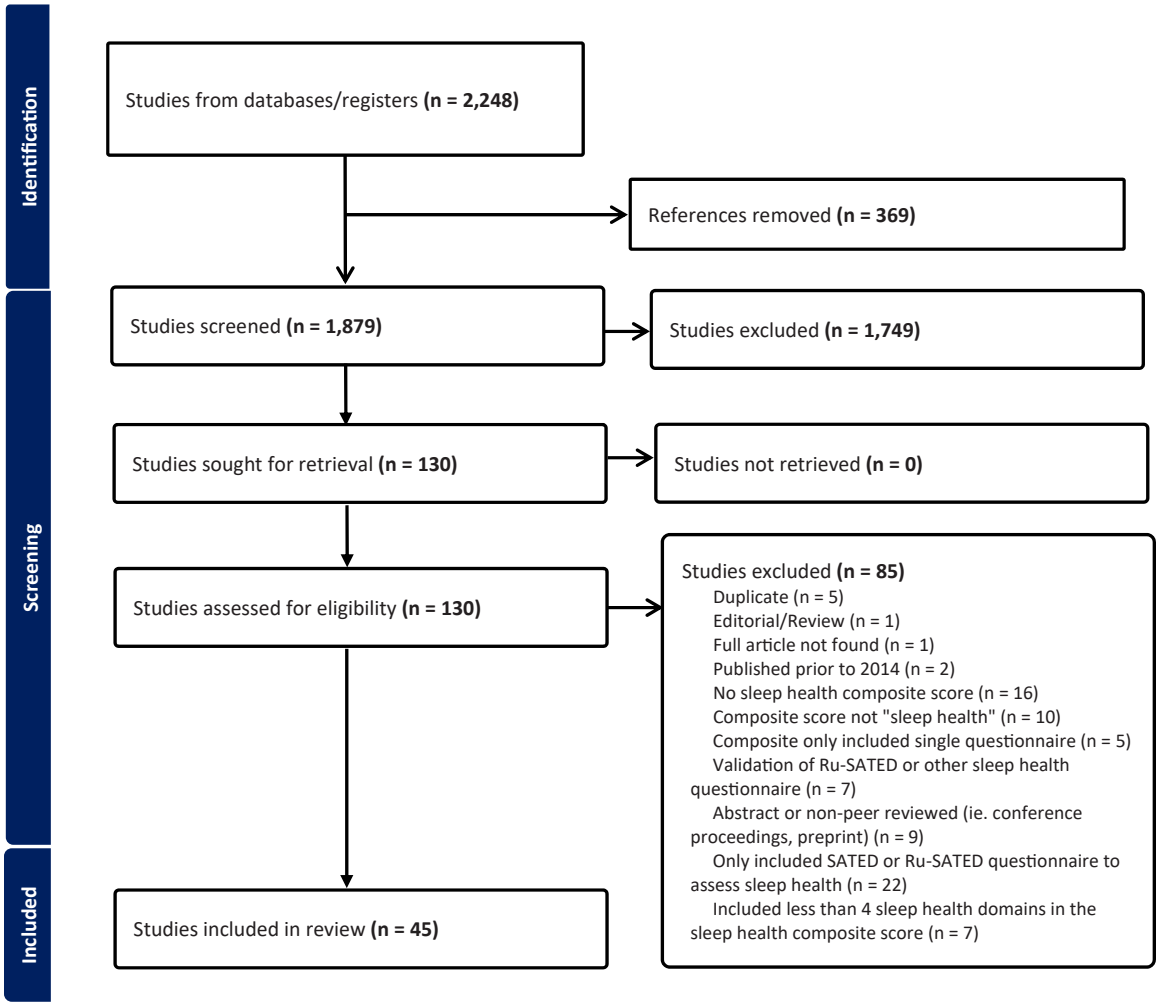

Fig. 1. PRISMA diagram

and efficiency subdomains, but the study team maintained these as discrete domains when extracting data. Further, Wallace et al[17] separated insomnia, sleep apnea, sleep medication use, sleep disturbances, and general sleep disorders into separate categories, but the reviewers coalesced these terms into the general domain "Sleep Disorders" because limited sleep disorder domains were included in the MDSH composite scores due to sleep disorders typically not being included in sleep health frameworks. Two domains not included in Wallace et al[17] were considered unique (i.e., Chronotype and Rhythmicity) and thus were included as distinct domains in our review.

Results

The search strategy generated 2248 references, and 369 duplicates were removed. The 1879 titles/abstract were reviewed; 1749 did not meet eligibility and were excluded. In total, 130 full-text articles were reviewed, and 85 were excluded due to not meeting eligibility. Thus, 45 eligible articles were included in the scoping review (Fig. 1; Supplementary File 3). One study[18] contained two eligible MDSH composite scores: both are reported in this scoping review for a total of 46 MDSH composite scores. All except two composite scores consisted of dichotomizing domains into binary codes of good or bad sleep health and then summing those scores (n = 44). Of the 44 dichotomized MDSH composite scores, 29 reported higher sleep scores indicated better sleep health, while 15 reported higher sleep scores indicated poorer sleep health. One MDSH composite score transformed responses into z-scores with higher scores indicating better sleep health.[19] Another study calculated a Sleep Composite Index that they used to create a median threshold to dichotomize the index for other analyses.[20]

The majority of studies were conducted in the United States (n = 34) followed by the United Kingdom (n = 3), then Japan, Australia, and the Netherlands (n = 2 each), then China, Turkey, and Italy (n = 1 each; Table 1). One study consisted of data from both the Netherlands and the United States.[21] Thirty-six articles were secondary analyses, and 22 analyzed data from the same dataset (SWAN,[22,23] MIDUS,[24,25] MIDUS 2,[19,25-27] MIDUS 3,[25,26] MIDUS Refresher,[19,27] MROS,[21,28-30] SOF,[21,31,32] and UKBB).[33-35] Five and six domains were the most common number of domains included in the MDSH composite score (n = 20 each) followed by 7 domains (n = 4), and two articles included 4 domains (Table 1). Articles mainly included either only self-report measures (n = 21) or a mix of self-report and objective (actigraphy) measures (n = 21) in their MDSH composite score (Table 1). Three articles included only objective measures in their MDSH composite score. One study did not specify the measurements used to assess the domains in their MDSH composite score.[33]

Twelve unique MDSH domains were identified (Table 1): Regularity, Satisfaction/Quality, Alertness/Sleepiness, Timing, Efficiency, Duration, Chronotype, Continuity, Latency, Napping, Rhythmicity, and Sleep Disorders. The domain most commonly included was Duration (n = 45), followed by Alertness/Sleepiness (n = 42), Satisfaction/Quality (n = 39), and Timing (n = 37). Studies that used the

Table 1
Multidimensional Sleep Health (MDSH) studies by country and domain

	N
Country study was conducted	
United States	34[a]
United Kingdom	3
Japan	2
Australia	2[b]
China	1
The Netherlands	2[a]
Turkey	1
Italy	1
Secondary analyses	38
Analyzed data from the same dataset	22
Number of domains included in MDSH composite score	
7	4
6	20[c]
5	20
4	2[c]
Types of measures included	
Self-report only	21[c]
Objective only	3[c]
Mix	21
Not provided[d]	1
MDSH domains	
Duration	45
Alertness/Sleepiness	42
Satisfaction/Quality	39
Timing	37
Regularity	31
Efficiency	31
Sleep disorders	10
Latency	5
Continuity	8
Chronotype	3
Napping	2
Rhythmicity	3

Countries of studies conducted, number of domains included in the Multidimensional Sleep Health (MDSH) score, type of measures included in the MDSH score, and the domains included in the MDSH scores are provided.

[a] Data include one article where research was conducted in both the United States and the Netherlands.

[b] Data included one article that came from UK Biobank and authors in Australia.

[c] Yoo et al, 2024 contains two MDSH composite scores: both are reported.

[d] Original article did not specify the type of measure used to assess the domains.

same combination of domains were grouped in Table 2. The domains were assessed in a variety of ways (Table 3; Supplementary File 4; Supplementary File 5), with most individual domains (n = 5) being assessed using both self-report and objective measures and assessed using only self-report measures (e.g., Satisfaction/Quality) (n = 5), few domains were assessed using solely objective measures (e.g., Rhythmicity; n = 2).

In characterizing the populations represented in the included articles (Table 4), six focused on females/women, three focused specifically on males/men, 10 focused on older adults, and two focused on African Americans. Seventeen articles investigated sleep in individuals with a stated comorbid condition (e.g., diabetes, childhood trauma, and migraines; Table 4; Supplementary File 4). However, there was an insufficient number of articles with a particular population characteristic to group sleep health domains. Finally, no patterns were detected regarding the inclusion of particular domains with specific research goals, health outcomes, or disciplinary perspectives.

Discussion

This scoping review describes the domains included in MDSH composite scores and how the domains are defined. Twelve unique MDSH domains were identified with variable assessment criteria. Articles tended to either use only self-report measures or a mix of self-report measures in their MDSH composite scores. To advance the study of sleep health, consensus is needed on the definition of sleep health domains or, at a minimum, clear reporting on the definitions used. Further research is needed to determine which MDSH domains are most associated with health outcomes and, thus, most appropriate to include in an MDSH composite score.

It is perhaps not a surprise that the most common domains were those within the Ru-SATED framework. The six most included domains were Regularity (n = 31), Satisfaction/Quality (n = 39), Alertness/Sleepiness (n = 42), Timing (n = 37), Efficiency (n = 31), and Duration (n = 45). The SATED framework was proposed by Buysse,[4] and he provided evidence linking each sleep health domain to negative health consequences when not achieved. Buysse[4] did discuss that Regularity was another dimension of sleep, and Ravyts et al[10] added Regularity as a sleep health domain, thus extending the framework to Ru-SATED in their study to evaluate the psychometric properties of the Ru-SATED scale.[10] Of the 46 individual sleep health composites created, 20 followed the Ru-SATED framework, 5 followed the SATED framework, and 16 cited the SATED/Ru-SATED framework but did not strictly follow it due to various reasons (four cited lack of data,[24,26,36,37] three used actigraphy so unable to assess satisfaction,[18,38,39] five were semantic differences,[29,31,32,40,41] and four followed the framework but added an additional domain).[30,42-44] Five papers used alternative frameworks: Huang et al[33] and Sampasa-Kanyinga et al[34] utilized the same MDSH framework that included daytime sleepiness, snoring, insomnia, sleep duration, and chronotype, Schiel et al[35] used the same framework but assessed sleep medication use instead of snoring, Yu et al[20] based on practicality for real-world settings (e.g., limited time requirements and simplicity), and Madrid-Valero et al[45] assessed overall sleep quality during the coronavirus outbreak with night awakenings, time awake, latency, quality, and duration. Thus, while the SATED/Ru-SATED framework is a well-known and utilized sleep health framework, the presence of domains outside the SATED/Ru-SATED framework indicates a lack of consensus on what sleep health *is* and *how to measure* sleep health.

One major point of discrepancy in the domains utilized for the MDSH composites is the inclusion or exclusion of sleep disorders. The concept of sleep health was meant to move beyond the presence or absence of a sleep disorder to describe aspects of sleep per its positive attributes.[4] Therefore, it is surprising that Sleep Disorders was included as a domain in MDSH composite scores 10 times in six different studies.[20,31,33-36] Of the 10 times the Sleep Disorder domain was included, four instances included assessment of insomnia,[31,33-35] two included assessment of sleep apnea,[33,34] and one included assessment of sleep medications,[35] REM Sleep Behavior Disorder,[20] or symptoms of sleep disorders,[36] and one did not provide details about the sleep disorder assessment.[20] In four of these studies,[20,33-35] Sleep Disorder was included as a domain in the MDSH composite score two times, making the presence of sleep disorders an even weightier component of the composite score. The articles that included sleep disorders in their MDSH composite scores included sleep disorders that were associated with the health conditions, outcomes, or populations they were studying[20,31,34-36] or were based on previously established methods.[33] For most articles, a domain was given the name of a sleep disorder (e.g., insomnia) though the description was a set of conditions that did not meet or require a diagnosis.[20,31,34-36] Schiel et al[35] stated the insomnia symptoms domain was meant to be reflective of Continuity and, to a limited extent, Satisfaction/Quality domains in the SATED/Ru-SATED framework. Therefore, it is possible the intention in these cases was to stay within the bounds of sleep health (i.e., not focused on sleep disorders), though the shared language with a sleep disorder caused confusion. Regardless of the reason, sleep health was intended to be a distinct construct from sleep disorders. Therefore, the inclusion of Sleep Disorders domain in the MDSH composite scores is a divergence from the intended purpose of the original sleep health framework[4]; and thus, should be excluded in

Table 2
Domain combinations

First author and publication year	Framework used	Domains included
Bowman 2020; Bowman 2021; Brindle 2018; Brindle 2019; Bruno 2024; Chung 2021; Clementi 2023; Dong 2019; Dong 2023; Harvey 2021; Ipar 2025; Kline 2021; Lee 2021; Polanka 2023; Savin 2024; Tighe 2021; Tracy 2025; Woo 2024; Yoo 2023; Zarchev 2025	Ru-SATED	Satisfaction/Quality Timing Alertness/Sleepiness Duration Efficiency Regularity
Cavailles 2023; Furihata 2024; Griggs 2022, Griggs 2024; Wallace 2025	SATED	Satisfaction/Quality Timing Alertness/Sleepiness Duration Efficiency
Turner 2024, Wallace 2018; Whibley 2021	Ru-SATED (missing Efficiency; added Rhythmicity and Continuity)	Satisfaction/Quality Timing Alertness/Sleepiness Duration Continuity Regularity Rhythmicity
Hawkins 2023	Ru-SATED (missing Efficiency; added Continuity)	Satisfaction/Quality Timing Alertness/Sleepiness Continuity (2) Duration Regularity
Thomas 2024	Ru-SATED (missing Satisfaction)	Timing Alertness/Sleepiness Duration Efficiency Regularity
Yoo 2023	Ru-SATED (missing Satisfaction and Alertness)	Timing Duration Efficiency Regularity
Calfee 2025; Lee 2024	Ru-SATED (missing Timing)	Satisfaction/Quality Alertness/Sleepiness Duration Efficiency Regularity
DeSantis	Ru-SATED (missing Alertness)	Satisfaction/Quality Timing Duration Efficiency Regularity
Hawkins 2023	Ru-SATED (missing Satisfaction and Alertness; added Napping)	Timing Napping Duration Efficiency Regularity
Makarem 2022	Ru-SATED (missing Satisfaction, Timing, and Efficiency; added Latency and Sleep Disorders)	Latency Alertness/Sleepiness Duration Sleep Disorders Regularity
Chen 2024; Ensrud 2020; Furihata 2017	SATED (missing Efficiency; added Latency)	Satisfaction/Quality Latency Timing Alertness/Sleepiness Duration
Furihata 2020	SATED (missing Efficiency; added Sleep Disorders)	Satisfaction/Quality Timing Alertness/Sleepiness Duration Sleep Disorders
Lee 2020	SATED (missing Timing; added Continuity and Napping)	Satisfaction/Quality Alertness/Sleepiness Continuity Napping Duration
Madrid-Valero 2021	Other	Satisfaction/Quality Latency Continuity (2) Duration
Yu 2024	Other	Satisfaction/Quality Alertness/Sleepiness Sleep Disorders (2)

(*continued on next page*)

Table 2 (*continued*)

First author and publication year	Framework used	Domains included
Huang 2021; Sampasa-Kanyinga 2022; Schiel 2022	Other	Alertness/Sleepiness Duration Sleep Disorders (2) Chronotype

Studies are organized by the combinations of domains and how they differ from the SATED/Ru-SATED framework.

Table 3
Type of measure by Multidimensional Sleep Health (MDSH) domain

MDSH domain	Type of measures		
	Self-report (n)	Objective[a] (n)	Not reported[b] (n)
Duration	20	24	1
Alertness/Sleepiness	41	0	1
Satisfaction/Quality	39	0	0
Timing	14	23	0
Regularity	11	20	0
Efficiency	11	20	0
Sleep disorders	8	0	2
Latency	5	0	0
Continuity	4	4	0
Chronotype	2	0	1
Napping	0	2	0
Rhythmicity	0	3	0

[a] All articles that measured MDSH domain(s) objectively used actigraphy.
[b] Articles did not specify the type of measure used to assess the domains.

Table 4
Study population characteristics

	N
Sex/gender	
Female/women	6
Male/men	3
Age	
Older adults	10
Middle adults	1
Young adults	2
Adolescents/youth	5
Children	1
Adults	11
Race or ethnicity	
African American	2
American Indian/Alaska Native	1
Japanese	1
Hispanic/Latino	1
Medical or health condition	
Headache/migraine	3
OSA	2
Diabetes	5
Mental illness	1
Cardiovascular disease/heart failure	2
Neurologic condition	3
Other	
Nurses	1
Veterans	1
Retired	1
Childhood trauma	1

Study population characteristics are from title of article.
OSA, obstructive sleep apnea.

future MDSH composite scores. Because sleep disorders impact health, they should be assessed, but separately from MDSH.

Beyond the selection and naming of the domains themselves, great variability also existed within each domain regarding the sleep feature used for assessment, cutoffs for "good" sleep health, type of assessment (e.g., self-report or objective), timeframe of assessment, and directionality of the composite score. At the intersection of the issues of domain naming and assessment methodology are the semantic differences in how domains are defined. For example, while many investigators might agree that napping is an important metric to measure related to sleep health, Hawkins et al[43] used napping to assess Alertness, while others[29,38] included Napping as a distinct domain. Reviewers deferred to the terminology and assessment methods used by the authors when categorizing domains (e.g., napping remained an assessment for Alertness for Hawkins et al[43]), but this adds to the complexity and confusion surrounding sleep health and comparability across studies. Additionally, Lee et al[26] assessed Satisfaction/Quality using insomnia symptoms, while these have also been categorized as insomnia for either a separate sleep health domain[33] or as distinct from a sleep health characteristic.[17,21] Furthermore, the variable cutoffs for "good" sleep health also create inconsistencies across studies. Returning to the example of napping, actigraphy was used as an objective measure of napping in two studies. However, Lee et al[29] defined good sleep health as napping less than two times a week for older males, while Hawkins et al[38] defined good sleep health as the average nap duration lasting less than 100 minutes a day for pregnant people. Similarly, the cutoffs for good sleep efficiency ranged from 80% to 90.8% in the studies using that metric. While variations in cutoffs may be warranted for unique populations, a consensus on how to measure sleep health domains and what is deemed as a "healthy" behavior, with exceptions or justifications for specific populations (e.g., pregnant people), would increase the generalizability of MDSH composite scores.

Variations in whether self-report or objective measures are used and the timeframe for sleep assessments are common in sleep research but create another barrier for comparability across MDSH composite scores. For self-report measures, some articles used a single-item question, while others used a validated sleep questionnaire. It is reasonable that there are differences in methods used to assess the domains [e.g., the Duration domain was assessed almost equally using self-report (n = 20 instances) or objective measures (n = 24 instances), whereas the Satisfaction/Quality domain was assessed only using self-report]. However, it would be ideal to have consensus on the assessment (or range of assessments) for the respective domains as the variance in self-report assessments and associated scales creates another issue of comparability between studies (e.g., Satisfaction/Quality assessments had both 5-point Likert scales and scales from 0-100). The issue of variable timeframe for sleep assessments exists between studies and within studies. Many studies utilizing both self-report and objective measures had a mismatch between domains assessed via questionnaires (e.g., Pittsburg Sleep Quality Index reflects sleep over the past month) and actigraphy (e.g., commonly worn for a week). While investigating the impact on data that this difference could have is outside the scope of this review, it is important to acknowledge that this difference could impact the external validity of the MDSH composite scores (when timeframes differ between studies) and create inconsistencies within a given composite score (assessing some domains acutely and others more chronically when timeframes differ within a study). More research needs to be done to conclude the most appropriate timeframe for assessing sleep health. Lastly, the direction of the MDSH composite score scales differed among studies (i.e., a higher number indicated better sleep health in some studies but indicated worse sleep health in other studies). Consensus on

acceptable assessment methods for each domain, an appropriate timeframe, and the direction of the scale is needed to aid in interpretation and comparison between studies.

A consensus on clear reporting of MDSH composite scores regarding how the domains are measured, the interpretation of results, the verbiage used, and reporting standards would increase transparency and limit variability. There were many instances where authors did not specify certain characteristics of variables used, creating increased difficulty of comparison between studies. For example, a number of studies did not clarify how certain variables were scored or interpreted.[20,26,28,31,33,34,46] To improve consistency in reporting and comparability across studies, we propose the inclusion of the following criteria for MDSH scoring: (1) domain name consistent with previous literature (e.g., Wallace et al[17]) with the addition of unique domains identified in this review (e.g., Chronotype and Rhythmicity), (2) operational definition of the domain consistent with previous literature (e.g., Wallace et al[17]), (3) assessment used to measure the domain with possible responses and clarity on timeframe, (4) scoring criteria for each domain (i.e., cutoff for "good" sleep) and description of how the composite score was calculated, and (5) details about the study sample and rationale for any specifications based on targeted sample or outcomes. We recommend the addition of Chronotype and Rhythmicity due to the frequency of use (n = 3 for both) in prior studies (Table 1) and because they are unique domains (as opposed to Latency and Continuity that overlap with Satisfaction/Quality and Efficiency). In the context of MDSH, we propose Chronotype be defined as "an individual's rest-activity preference" and typically assessed via self-report (e.g., Morning-Eveningness Questionnaire)[47,48] and Rhythmicity as "the strength of the sleep-wake pattern" and typically assessed via actigraphy.[30,42] To aid in data sharing and aggregation, we defer to the recommendations set by Wallace et al.[17] Additionally, we suggest the scores be reported in a positive direction for every domain that meets "good" sleep health criteria to better reflect the beneficial nature of sleep health behaviors and that all domains are assessed using the same timeframe.

A limitation of this scoping review is articles were included only if they defined the domains to be included in the MDSH composite a priori; thus, we excluded articles that used modeling techniques to determine which sleep health domains should be included in a model or were predictive of a condition. For example, Buxton et al[49] included demographic variables, sleep apnea symptoms variables, and sleep health variables in regression models to predict cardiometabolic risk for workers in extended care and information technology industries. Additionally, Hoepel et al[50] utilized latent class analysis to find that those of a poor sleep cluster (i.e., short duration, high daytime sleepiness, and low sleep quality) had higher levels of depressive symptoms than those of an average sleep health cluster (i.e., high sleep quality with moderate duration). It may be that different domains should be included in a MDSH composite score depending on the health condition being targeted. While we only included those that used sums of sleep health indicators as was set out by the initial framework[4] and per the scoping review protocol,[15] future studies would benefit from alternative methodologies, such as cluster analyses, to better inform which specific components of sleep health are associated with a particular health condition or behavior. The decision to include studies that have 4 or more domains stemmed from the SATED/Ru-SATED framework of 5-6 domains, from which we lowered eligibility criteria to 4 domains in an effort to be more inclusive while still maintaining the multidimensionality nature of the sleep health construct. This approach, however, excluded studies with fewer than 4 domains included in their MDSH composite scores (n = 7). Future research on composite scores for specific populations or directed at specific outcomes (e.g., brain health, cardiovascular disease) is needed to better understand which and how many domains are needed in order to assess sleep health in certain instances.

In conclusion, while the domains most often included in the MDSH composite scores followed the SATED/Ru-SATED framework, there was variability in the domains included as well as variability in how the domains were assessed. A consensus is needed within the sleep health research and clinical community on what domains should be included in a MDSH composite score and the most appropriate assessment(s) to use to measure the respective domains.

Author contributions

Catherine Siengsukon: Conceptualization, Methodology, Investigation, Writing – original draft. **Jade Robichaud**: Investigation, Writing – review and editing. **Lauren Hand**: Writing – review and editing. **Ashley Barry**: Investigation, Writing – review and editing. **Prasanna Vaduvathiriyan**: Methodology, Software, Investigation, Data curation, Writing – review and editing. **Karen Bock**: Conceptualization, Methodology, Investigation, Writing – review and editing.

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Use of generative AI and AI-assisted technologies

Generative AI was not utilized for this work.

Data sharing

Requests for data will be considered by the PI.

Declaration of conflicts of interest

CS is the owner and CEO of Sleep Health Education, LLC. KB developed educational materials for Pure Medical, Inc, a lymphedema compression garment company. All other authors have none to declare.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.sleh.2026.03.004.

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