



## CLINICAL REVIEW

# The Pittsburgh sleep quality index as a screening tool for sleep dysfunction in clinical and non-clinical samples: A systematic review and meta-analysis



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## SUMMARY

This review appraises the process of development and the measurement properties of the Pittsburgh sleep quality index (PSQI), gauging its potential as a screening tool for sleep dysfunction in non-clinical and clinical samples; it also compares non-clinical and clinical populations in terms of PSQI scores. MEDLINE, Embase, PsycINFO, and HAPI databases were searched. Critical appraisal of studies of measurement properties was performed using COSMIN. Of 37 reviewed studies, 22 examined construct validity, 19 – known-group validity, 15 – internal consistency, and three – test-retest reliability. Study quality ranged from poor to excellent, with the majority designated fair. Internal consistency, based on Cronbach's alpha, was good. Discrepancies were observed in factor analytic studies. In non-clinical and clinical samples with known differences in sleep quality, the PSQI global scores and all subscale scores, with the exception of sleep disturbance, differed significantly. The best evidence synthesis for the PSQI showed strong reliability and validity, and moderate structural validity in a variety of samples, suggesting the tool fulfills its intended utility. A taxonomic analysis can contribute to better understanding of sleep dysfunction as either a dichotomous or continuous construct.

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## Introduction

Disturbed sleep is among the most frequent health complaints clinicians encounter [1,2]. It is common in the general population – more than one half of adults in the Western world experience intermittent sleep disturbances and between 15 and 20% of adults report chronic sleep problems [2]. Sleep dysfunction can lead to

serious impairment in daytime performance [3,4], increase the risk of involvement in motor-vehicle and occupational accidents [5,6], exacerbate medical, neurologic, and/or psychiatric conditions [7,8], and result in diminished quality of life [9]. In the past, sleep complaints were treated with hypnotic medications without further diagnostic evaluation [10]. The last three decades of research have culminated in the understanding of sleep dysfunction as a complex entity [11,12], wherein a range of primary sleep disorder symptoms overlap with neurophysiological, psychological, and behavioral factors, requiring targeted diagnostic and treatment intervention (Fig. 1).

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<b>Glossary of terms</b>	
Construct validity:	the degree to which the measure scores reflect the hypotheses; includes 1) convergent, 2) divergent, and 3) known-group
Convergent validity:	the degree of relatedness between two constructs hypothesized to be related
Divergent validity:	the degree of relatedness between two constructs hypothesized to be different
Known-group validity:	ability of the measure to discriminate between a group of individuals known to have a particular trait and those who do not have that trait (same as discriminative validity)
Sensibility:	enlightened common sense [82]; consists of domains 1) purpose, population, and setting, 2) content validity, 3) face validity, and 4) feasibility
Content validity:	the fitness of the domains covered in the measure; reflects the appropriateness of the method by which items were selected and reduced for inclusion in the measure during its development
Face validity:	the appearance that the measure, by its wording of items, response options, and score meanings, is suitable to measure the desired construct
Feasibility:	practicality of administering the measure; for self-administered questions, the measure's self-explanatory nature for valid responses and limited non-responses, completion time, and scoring formula
Reliability:	the extent to which the measure is reliable, that is, free of errors in score not due to true state of construct measured in the patient; consists of 1) internal consistency, 2) test-retest, 3) inter-rater, and 4) intra-rater
Internal consistency:	the degree to which the components making up the measure are related
Test-retest reliability:	consistency of scores for the same patient over time
Inter-rater reliability:	degree of agreement between the score given by one rater and that by another at one time with respect to the same respondent; addresses the interpretability of the measure; falls under the broader test-retest reliability category
Intra-rater reliability:	degree of agreement between scores given by the same respondent or rater at one time and those given at another time; falls under the broader test-retest reliability category
<b>Abbreviations</b>	
CFA	confirmatory factor analysis
COSMIN	consensus-based standards for the selection of health status measurement instruments
DD	daytime dysfunction
DSM-IV	diagnostic and statistical manual of mental disorders, 4th edition
EFA	exploratory factor analysis
ESS	Epworth sleepiness scale
HSE	habitual sleep efficiency
ICC	intraclass correlation coefficient
ICSD-2	international classification of sleep disorders, 2nd edition
MSLT	multiple sleep latency test
PCC	Pearson product-moment correlation coefficient
PSG	polysomnography
PSQI	Pittsburgh sleep quality index
SD	sleep duration
SDI	sleep disturbance
SL	sleep latency
SM	sleep medications
SQ	sleep quality
TBI	traumatic brain injury
WMD	weighted mean difference

### Measurement need

The multifactorial construct of sleep dysfunction causes diagnostic confusion in determining which persons need to be extensively investigated for the etiology of their complaints to be established. Issues of self-insight and awareness are also important to note – some persons may not be fully aware of their sleep impairment and will thus not emphasize such issues in the physician's office, or do not appreciate the extent or impact of their sleep problems [13]. As such, the main challenge today for primary care and specialist clinicians is to identify the patients who may have undetected sleep dysfunction and to direct further diagnostic investigation. A tool for this purpose would be discriminative, according to criteria defined by Kirshner and Guyatt [14] and thus, should be evaluated by its 1) intra-rater reliability; 2) internal consistency and reliability; and 3) construct validity.

There are numerous instruments, both subjective and objective, that can be used to measure sleep functioning [15]. In objective measures, the expectation is limited involvement of personal

judgment, that is, results are to be influenced neither by the person doing the measuring nor the person being measured. In subjective measurements, both roles can impact the outcome to some extent. Given that even objective measures have a subjective component, often requiring an expert to read and interpret the measures, many feel that a patient's opinion and appraisal of his or her own status is of great value [16]. This view is evident in the recent initiative of the US federal government, which seeks a balance between outcomes that are of interest to investigators (i.e., results of laboratory testing, etc.), and those of primary interest to the patient (i.e., satisfaction, self-perceived quality, etc.) in using patient reports of health status [17].

### Measurement concept of 'sleep quality'

Self-perceived sleep quality represents something of a challenge to measure because there is no generally accepted reference or gold standard [18]. One approach would be to use a carefully constructed questionnaire incorporating the recommendations of the American Psychological Association pertaining to clinical sleep dysfunction

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