Reliability and Validity of the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Scale in Older Men

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Background. The Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS) are commonly used to quantify sleep and excessive daytime sleepiness in older adults. These measures, however, have not been comprehensively evaluated for their psychometrics in older men. We determined the internal consistency reliability and construct validity of the PSQI and ESS in a sample of older men.

Methods. Participants were 3,059 men (mean age = 76.4 years) in the Osteoporotic Fractures in Men Study (MrOS) who completed the two questionnaires, wrist actigraphy, and a range of additional psychosocial and health measures.

Results. Internal consistency was adequate for the PSQI (Cronbach's α =.69) and the ESS (α = .70) total scores. PSQI daytime dysfunction and sleep medications components were weakly associated with the total score, but their removal did not notably improve internal consistency. PSQI and ESS totals were associated with each other and with theoretically related variables (ie, actigraphic variables, depressive symptoms, mobility/instrumental activities of daily living, health-related quality of life) in expected directions. The PSQI differentiated participants reporting no sleep disorder from those reporting particular disorders more reliably than the ESS.

Conclusions. In general, we found evidence of the internal consistency reliability and construct validity of the PSQI and ESS in older men. Despite low correlation with the PSQI global score, the PSQI daytime dysfunction and sleep medications components do not appreciably reduce the PSQI total score's reliability or validity in older men.

Key Words: Validity—Reliability—Sleep—Men—Psychometrics.

SLEEP complaints and sleep-disordered breathing (SDB) are common in older adults. Over half of elders report some difficulty falling or staying asleep, early waking, requiring a nap, or nonrestorative sleep (1). Estimates of SDB prevalence range as high as 62% in community-dwelling elders (2). The elevated prevalence of sleep disturbance in older adults is particularly troubling in light of studies linking poor sleep to adverse outcomes in this population, including cognitive (3,4) and functional impairment (1).

Given the prevalence of sleep disturbance among elders and evidence for adverse consequences of poor sleep, reliable and valid measures are needed to maximize the rigor of late-life sleep assessment. Questionnaires commonly used to quantify sleep disturbance and its consequences include the Pittsburgh Sleep Quality Index (PSQI (5)) for sleep quality and the Epworth Sleepiness Scale (ESS (6)) for daytime sleepiness. The original PSQI validation was performed with mixed-age healthy controls, individuals with major depression, and sleep clinic patients (5). Additional research supports the reliability and validity of the PSQI in various populations, including patients with cancer and other medical conditions (7). The ESS was first shown to be reliable in medical students and patients with a range of sleep disorders (8); its validity was initially demonstrated in patients with sleep disorders and controls (6).

We know little, however, about the reliability and validity of the PSQI and ESS in the general population of older adults. We recently studied the internal consistency reliability and

construct validity of the PSQI and ESS in older women in the Study of Osteoporotic Fractures (SOF (9)). Total scores for both measures had good internal consistency, but multiple PSQI items and two subscales had low correlations with the total score (9). Advancement of knowledge regarding late-life sleep quality and daytime sleepiness also requires validation of these measures in older men.

We evaluated the internal consistency reliability and construct validity of the PSQI and the ESS in a cohort of older men. We hypothesized that greater disturbance on the questionnaires would be associated with (a) poorer objective sleep as measured by greater objectively measured sleep fragmentation and daytime napping; (b) more depressive symptoms, greater mobility/instrumental activity of daily living (IADL) difficulty, and lower health-related quality of life; and (c) the presence of self-reported sleep disorders.

METHODS

Participants

Participants were older men from the Osteoporotic Fractures in Men Study (MrOS), a cohort study of aging. The 5,994 men who participated in the initial MrOS study visit enrolled between 2000 and 2002 and were residents of Birmingham, AL; Minneapolis, MN; Palo Alto, CA; Pittsburgh/Monongahela Valley, PA; Portland, OR; and San Diego, CA. Additional detail about study design is described elsewhere (10,11). Participants had to be at least 65 years old, live near a study site, be able to provide informed consent, ambulate unassisted, and complete questionnaires. Men with bilateral hip replacement or an imminently terminal medical condition were excluded.

Data were collected during the MrOS Sleep Visit (2003–2005), from which men were excluded if they had an open tracheotomy or if over the prior 3 months, they used continuous positive airway pressure or bi-level positive airway pressure masks more than twice weekly, an oral appliance for snoring/SDB, or nocturnal oxygen therapy. Men could participate, however, if they discontinued use of devices during the Sleep Visit. Of the 5,994 men in the original cohort, 344 died, 36 terminated their participation, 150 were ineligible, and 1,997 were unwilling to participate. Of the remaining 3,467 men, 332 were not enrolled because recruitment goals had been met, leaving 3,135 men who participated in the Sleep Visit. Of these, 76 had someone else complete their questionnaires and were excluded. Our analysis sample contained 3,059 men, including 46 who reported using one of the above devices.

Measures

Pittsburgh Sleep Quality Index.—The PSQI, a self-report measure of sleep quality (5), queries about multiple sleep-related variables over the preceding month, using Likert and open-ended response formats. Respondents complete 19 items about themselves, of which 18 are used to calculate scores. Five additional items are completed by a bed partner or roommate but are not used to calculate scores. The PSQI yields seven component (ie, subscale) scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication, and daytime dysfunction. Component scores range from 0 to 3 and are summed to obtain a global score, which ranges from 0 to 21. Higher scores suggest greater sleep disturbance; a global score more than 5 suggests a significant disturbance (5).

Epworth Sleepiness Scale.—The ESS is an eight-item measure of daytime sleepiness. Respondents report their likelihood of falling asleep in particular situations using a 4-point Likert scale (6). Responses are summed, and higher scores indicate greater sleepiness; scores more than 10 suggest excessive daytime sleepiness (6).

Actigraphy.—Sleep Visit participants completed three or more 24-hour periods of wrist actigraphy (Octagonal Sleep Watch; Ambulatory Monitoring, Inc., Ardsley, NY). Data were edited and scored using Action W software (Ambulatory Monitoring, Inc.). To facilitate this, participants indicated in a sleep diary when they got into and out of bed or removed the actigraph. We studied one nighttime variable (wake after sleep onset or WASO; total time spent awake after initial sleep onset) and one daytime variable (napping; mean time spent inactive while out of bed). Averages were calculated across 24-hour periods.

Other measures.—Participants provided demographic information upon enrollment. At the Sleep Visit, participants indicated whether a health care provider had told them that they have sleep apnea, insomnia, restless legs, periodic leg movements, or narcolepsy. They also reported on history of medical conditions and difficulty with five mobility/IADL items (ie, walking, climbing 10 steps, preparing meals, doing heavy housework, shopping (12,13)) and reported alcohol and caffeine use. Participants also completed the SF-12, a measure of physical– and mental health–related quality of life (14) and the 15-item Geriatric Depression Scale (GDS (15)). Medication use was recorded in an electronic inventory based on the Iowa Drug Information Service Drug Vocabulary (College of Pharmacy, University of Iowa, Iowa City, IA (16)).

Statistical Analyses

We compared characteristics of our sample and men excluded from this study using *t* tests for continuous variables, Wilcoxon tests for skewed variables, and chi-square tests for categorical variables. We then compared PSQI and ESS scores by age, educational level, and race/ethnic group (white vs minority). To evaluate the questionnaires' internal

Table 1. Participant Characteristics ($M \pm SD$ or n (%))

Characteristics	Analysis Sample, $N = 3,059$
Age	76.4 ± 5.5
Race/ethnic group	
White	2,755 (90.1)
Minority	304 (9.9)
Education	
<High school	145 (4.7)
High school	482 (15.8)
Some college	689 (22.5)
College	567 (18.5)
Graduate education	1,176 (38.4)
Alcohol (had 12 drinks in past 12 months)	2,000 (65.7)
Caffeine intake (mg/day)	235.2 ± 244.2
Benzodiazepine use	133 (4.4)
Non-benzodiazepine sedative hypnotic use	62 (2.0)
Antidepressant use	234 (7.7)
Diabetes	405 (13.2)
Hypertension	1,520 (49.7)
Coronary artery disease	747 (24.4)
Congestive heart failure	185 (6.1)
COPD	154 (5.0)
Number of mobility/IADL difficulties	0.4 ± 0.8
Geriatric Depression Scale ≥ 6	194 (6.4)
SF-12 physical	48.7 ± 10.1
SF-12 mental	55.0 ± 7.5

Note: N ranges from 3,044 to 3,059. IADL = instrumental activities of daily living; COPD = chronic obstructive pulmonary disease.

consistency, we calculated raw Cronbach's αs for total and subscale scores and raw corrected item-total, item-component, and component-total Spearman's rho (r_s) correlations. We selected Cronbach's $\alpha \geq .70$ and corrected correlations (r_s) $\geq .30$ to indicate adequate internal consistency. Scores of participants reporting particular sleep disorders were compared with those of men reporting no such history using *t* tests or Wilcoxon tests for skewed variables. Analyses were conducted using SAS (SAS Institute, Cary, NC). We selected $\alpha < .05$ for statistical significance.

RESULTS

Demographics

We excluded 2,555 participants, who were alive and had not terminated participation at the time of the Sleep Visit, for reasons explained above. At baseline, these participants were older (mean age 73.9 vs 73.0 years), had less education (73.2% vs 79.5% had at least some college education), and were less likely to have had 12 alcoholic drinks in the past 12 months (61.6% vs 68.2%) than the 3,059 men in our analysis sample (all $p < .001$). Those excluded were more likely to take antidepressants (6.9% vs 5.4%) and have diabetes (11.2% vs 9.4%), hypertension (45.1% vs 40.9%), congestive heart failure (5.5% vs 3.7%), and chronic obstructive pulmonary disease (COPD; 11.3% vs 9.3%) and have lower SF-12 physical component summaries (mean 48.4 vs 49.9; all $p < .05$). There was a trend toward a higher prevalence of coronary artery disease (ie, myocardial

infarction or angina) in excluded participants compared with our analysis sample (21.8% vs 19.7%; $p = .05$).

At the Sleep Visit, participants' mean age ± standard deviation was 76.4 ± 5.5 years; 90.1% were white (Table 1). Other race/ethnic groups in our sample were black (3.6%), Asian (3.2%), Hispanic (1.9%), and "other" (1.2%). Most participants (79.5%) had at least some college education. Approximately 50% had hypertension, 24% coronary artery disease, 13% diabetes, 6% congestive heart failure, and 5% COPD. Participants had 0.4 ± 0.8 mobility/IADL impairments. Approximately 6% had elevated depressive symptoms (GDS ≥ 6). Mean SF-12 physical and mental component summaries were 48.7 ± 10.1 and 55.0 ± 7.5, respectively, indicating good physical– and mental health–related quality of life (14).

Descriptive Statistics for Questionnaires

Participants' mean PSQI global score was 5.6 ± 3.2 (Table 2), indicating that, on average, participants met a minimal threshold definition for poor sleep quality (ie, PSQI > 5); 44.2% had a global score more than 5. PSQI global scores differed by age group ($p = .04$) but the proportion of men with PSQI more than 5 did not. Higher educational attainment was associated with lower global PSQI scores and decreased likelihood of PSQI more than 5 (ps < .001). Men from race/ethnic minorities had higher global scores and a greater likelihood of PSQI more than 5 than white men (ps = .02).

On the ESS, participants' mean score was 6.1 ± 3.6; 12.7% had an ESS score more than 10 (Table 3). ESS scores did not differ by age or education. Men from minority groups had higher scores than white men ($p = .02$) but were not more likely to have ESS more than 10 ($p = .24$).

Internal Consistency

Internal consistency was adequate for both questionnaires' total scores. The PSQI global score had an $\alpha = .69$ (Table 4). Corrected component-total correlations ranged from .25 for the daytime dysfunction component and .28 for the sleep medications components to .57 for the sleep quality component. Removal of the daytime dysfunction and sleep medications components increased the PSQI global score's α to .72.

The ESS had an $\alpha = .70$. Item-total correlations ranged from .30 for the item assessing dozing while stopped in traffic to .51 for the item regarding dozing while sitting after lunch (Table 5).

Construct Validity

Worse sleep on the PSQI was associated with greater sleepiness on the ESS ($r = .13$; Table 6; all p values < .001). On both questionnaires, greater disturbance was modestly associated with longer actigraphic measurements of napping

Table 2. Descriptive Statistics ($M \pm SD$ or n (%)) for PSQI Scores Across Demographic Variables

	N	Global Score	p Value	Global Score > 5	p Value	Sleep Quality	Sleep Latency	Sleep Duration	Sleep Efficiency	Sleep Disturbances	Sleep Medications	Daytime Dysfunction
Total sample	3,039	5.6 ± 3.2		1,342 (44.2)		0.9 ± 0.7	0.8 ± 0.9	0.8 ± 0.7	0.6 ± 0.9	1.3 ± 0.5	0.5 ± 1.0	0.8 ± 0.7
Age (y)			.04		.31							
65–69	265	5.1 ± 2.8		103 (38.9)		0.9 ± 0.6	0.7 ± 0.8	0.8 ± 0.7	0.4 ± 0.8	1.3 ± 0.6	0.3 ± 0.8	0.7 ± 0.7
70–74	1,037	5.6 ± 3.3*		459 (44.3)		0.9 ± 0.7	0.8 ± 0.9	0.8 ± 0.7	0.6 ± 0.9	1.3 ± 0.5	0.5 ± 1.0	0.7 ± 0.7
75–79	880	5.6 ± 3.1*		391 (44.4)		0.9 ± 0.7	0.8 ± 0.8	0.8 ± 0.7	0.6 ± 0.8	1.3 ± 0.5	0.5 ± 1.0	0.8 ± 0.7
80+	857	5.7 ± 3.3*		389 (45.4)		0.9 ± 0.7	0.9 ± 0.9	0.7 ± 0.7	0.7 ± 0.9	1.3 ± 0.5	0.5 ± 1.0	0.8 ± 0.7
Education			<.001		<.001							
<High school	145	6.6 ± 3.6		81 (55.9)		1.0 ± 0.8	1.0 ± 1.0	0.9 ± 0.8	0.9 ± 1.0	1.5 ± 0.6	0.5 ± 1.1	0.8 ± 0.7
High school	481	5.9 ± 3.5*		230 (47.8)		0.9 ± 0.7	0.9 ± 0.9	0.9 ± 0.7	0.7 ± 1.0	1.4 ± 0.5	0.4 ± 1.0	0.8 ± 0.7
Some college	683	5.8 ± 3.3*		324 (47.4)		0.9 ± 0.7	0.8 ± 0.9	0.8 ± 0.7	0.6 ± 0.9	1.3 ± 0.6	0.5 ± 1.0	0.8 ± 0.7
College	561	5.5 ± 3.1*†		240 (42.8)		0.9 ± 0.7	0.8 ± 0.8	0.8 ± 0.7	0.6 ± 0.9	1.3 ± 0.5	0.4 ± 0.9	0.7 ± 0.7
Graduate education	1,169	5.2 ± 3.0*†‡		467 (40.0)		0.8 ± 0.7	0.7 ± 0.8	0.7 ± 0.6	0.5 ± 0.8	1.3 ± 0.5	0.5 ± 1.0	0.7 ± 0.7
Race/ethnicity			.02		.02							
White	2,735	5.6 ± 3.2		1,188 (43.4)		0.9 ± 0.7	0.8 ± 0.9	0.8 ± 0.7	0.6 ± 0.9	1.3 ± 0.5	0.5 ± 1.0	0.8 ± 0.7
Minority	304	6.0 ± 3.3		154 (50.7)		0.9 ± 0.7	0.9 ± 0.9	1.0 ± 0.8	0.8 ± 1.1	1.3 ± 0.6	0.3 ± 0.8	0.7 ± 0.7

Note: Higher global and component scores indicate greater disturbance; global scores >5 suggest clinically significant disturbance.
*p < .05 compared with the first category (age 65–69 or education less than high school).
†p < .05 compared with the second category (age 70–74 or education = high school).
‡p < .05 compared with the third category (age 75–79 or education = some college). PSQI = Pittsburgh Sleep Quality Index.

Table 3. Descriptive Statistics ($M \pm SD$ or n (%)) for ESS Scores Across Demographic Variables

	N	ESS Total Score	p Value	ESS > 10	p Value
Total sample	3,055	6.1 ± 3.6		388 (12.7)	
Age (y)					
65–69	265	6.3 ± 3.7	.48	35 (13.2)	.53
70–74	1,046	6.2 ± 3.7		139 (13.3)	
75–79	885	6.0 ± 3.6		100 (11.3)	
80+	859	6.2 ± 3.6		114 (13.3)	
Education					
<High school	145	6.1 ± 3.9	.25	18 (12.4)	.34
High school	482	6.4 ± 3.9		75 (15.6)	
Some college	688	6.0 ± 3.7		87 (12.7)	
College	567	6.2 ± 3.5		66 (11.6)	
Graduate education	1,173	6.1 ± 3.6		142 (12.1)	
Race/ethnic group					
White	2,752	6.1 ± 3.6	.02	343 (12.5)	.24
Minority	303	6.6 ± 3.9		45 (14.9)	

Note: Higher scores indicate greater sleepiness; scores >10 indicate excessive daytime sleepiness. ESS = Epworth Sleepiness Scale.

and greater WASO. The largest correlation was between WASO and the PSQI global score ($r = .18$).

Greater disturbance on the PSQI was moderately associated with a greater number of depressive symptoms on the GDS ($r = .34$), and lower mental health–related quality of life on the SF-12 ($r = -.30$). Greater sleepiness on the ESS was modestly associated with a greater number of depressive symptoms ($r = .17$) and lower SF-12 mental component scores ($r = -.12$).

Worse PSQI scores were modestly associated with greater impairment on the mobility/IADL questionnaire ($r = .23$) and moderately associated with lower SF-12 physical component summaries ($r = -.31$). Worse ESS scores were more weakly yet significantly associated with greater mobility/IADL impairment ($r = .11$) and lower SF-12 physical component scores ($r = -.17$). Removal of the daytime dysfunction and sleep medication components from the PSQI did not improve the correlations between the global score and theoretically relevant variables (data not shown).

Men reporting an insomnia history or periodic leg movements had worse PSQI scores than those reporting no sleep disorder history (Table 7; $p < .001$); they did not differ significantly on the ESS. Men reporting a history of restless

Table 4. PSQI Internal Consistency Data

PSQI Components (α = .69)	Correlation With Global Score*
Sleep quality	.57
Sleep latency	.45
Sleep duration	.36
Sleep efficiency	.46
Sleep disturbances	.36
Sleep medications	.28
Daytime dysfunction	.25

Note: N = 3,039. PSQI = Pittsburgh Sleep Quality Index.
*Spearman correlation with global score, corrected for overlap; all p values < .001.

Table 5. ESS Internal Consistency Data

ESS Items (α = .70)	Item-total correlation*
Sitting/reading	.45
Watching TV	.38
Public place	.45
Car passenger	.40
Afternoon	.34
Sit/talking	.35
After lunch	.51
In traffic	.30

Note: N = 3,055. ESS = Epworth Sleepiness Scale.

*Pearson correlation with total score, corrected for overlap; all *p* values < .001.

legs, sleep apnea, or narcolepsy had more sleep problems on both questionnaires than those reporting no sleep disorder history ($p < .05$ for all). With the daytime dysfunction and sleep medication components removed, all but one association—with narcolepsy history—remained significantly correlated with the PSQI (data not shown).

DISCUSSION

We studied the internal consistency and validity of the PSQI and ESS in 3,059 older men in the Osteoporotic Fractures in Men Study (MrOS). Results generally suggest that these measures are reliable and valid for use in this population.

The PSQI global score's internal consistency was on the border of the adequate range (α = .69). The sleep medication and daytime dysfunction components had low correlations with the global score; their removal increased internal consistency to α = .72. Although they differed from the high internal consistency (α = .83) in the original PSQI publication (5), our findings in older men are consistent with those in older women in SOF, which included an overall α = .72 and low correlations of the same two components with the global score (9). These two studies suggest that the PSQI is internally consistent in older adults, but slightly less so in older men than in older women, and that the medication and daytime dysfunction components might not co-vary with other PSQI components in older adults.

The ESS had adequate psychometrics in older men, with an α = .70, and corrected item-total correlations ≥.30.

Table 6. Pearson Correlations Between Sleep Measures and Relevant Variables

	PSQI Global Score	ESS Total Score
ESS total	.13	—
Daytime napping	.07	.10
Wake after sleep onset	.18	.07
15-item GDS	.34	.17
Mobility/IADL	.23	.11
SF-12 mental	−.30	−.12
SF-12 physical	−.31	−.17

Note: N ranges from 2,948 to 3,055. All *p* values < .001. ESS = Epworth Sleepiness Scale; GDS = Geriatric Depression Scale; IADL = instrumental activity of daily living; PSQI = Pittsburgh Sleep Quality Index.

A lower corrected item-total correlation for the ESS "traffic" item was consistent with findings in SOF (9). Results from these two studies suggest that the ESS is internally consistent when used in older adults.

Modest to moderate correlations with theoretically relevant variables suggest that the PSQI and ESS are valid for use in older men; these results are similar to those from older women in SOF (9). Specifically, we found that correlations between questionnaires and actigraphic WASO and napping were modest but statistically significant in older men. Another study in the MrOS cohort reported that greater WASO, measured by polysomnography (PSG), was independently associated with greater disturbance on the PSQI and the ESS, after adjustment for potential confounders (17). We found that removing the daytime dysfunction and sleep medication components did not improve the association between the PSQI global score and theoretically relevant variables.

Although we observed a moderate correlation between depressive symptoms and the PSQI, depressive symptoms were more modestly associated with the ESS in older men in the present study and in older women in SOF (9). Correlations between depressive symptoms and the PSQI and ESS are consistent with results from another MrOS study, which used a categorical GDS variable to investigate multi-variable-adjusted associations with the PSQI and ESS (18), rather than the continuous GDS score and bivariate correlations typically used for validation, reported here.

We found that the PSQI and, to a lesser degree, the ESS were more strongly associated with subjective psychosocial and functional measures (eg, GDS, SF-12 indices, mobility/IADLs) than with actigraphic variables. Similarly, Buysse and colleagues (19) categorized a mixed-age community sample on the basis of their PSQI and ESS scores and found that these groups differed on self-report psychosocial measures and sleep diaries but not on objective sleep measures. They suggested that the PSQI and ESS measure aspects of subjective sleep and wake that differ from the signals recorded by objective sleep measures (19). Although we detected correlations between these questionnaires and actigraphic measures, their modest magnitude supports this conclusion, particularly with regard to the PSQI.

Similar to findings in women (9), we found that men reporting a range of sleep disorders had worse scores on the PSQI than men reporting no sleep diagnoses. Removing the daytime dysfunction and sleep medication components did not improve the measure's ability to differentiate between men reporting different sleep disorders. ESS scores also differentiated men reporting several different sleep diagnoses, except insomnia or periodic leg movements, from those reporting no sleep disorders. Among the self-reported diagnoses assessed in SOF, however, ESS scores differed between older women with and without insomnia (9).

Our study has limitations. Our sample only included men, although comparisons with women suggest comparable psychometrics (9), and only 10% of participants were

Table 7. Scores on Questionnaires by Diagnostic Category

	PSQI Global Score			ESS Total Score		
	N	M ± SD	p Value*	N	M ± SD	p Value*
No diagnosis	2,639	5.4 ± 3.1		2,652	6.0 ± 3.6	
Insomnia	47	10.6 ± 3.9	<.001	47	5.7 ± 3.7	.54
Restless legs	65	8.1 ± 4.1	<.001	65	7.5 ± 4.7	.015
Periodic leg movements	54	7.6 ± 3.8	<.001	54	7.1 ± 4.3	.063
Sleep apnea	187	6.9 ± 3.6	<.001	189	7.3 ± 4.1	<.001
Narcolepsy	11	7.6 ± 3.5	.014	11	11.5 ± 6.1	.015

*Note: Compared with men reporting no diagnosis.

from race/ethnic minorities. Also, we omitted objective measures of SDB and nocturnal sleep duration because a prior MrOS paper reported unadjusted associations of PSG-measured SDB and actigraphic sleep duration with the questionnaires (17). Furthermore, in the present study, napping was measured by actigraphy. Although actigraphy might have utility in assessing daytime sleepiness when other methods are not feasible (20), actigraphy might incorrectly identify reduced activity as naps (21). This study also excluded men routinely using continuous positive airway pressure who would not discontinue use; it is unclear whether results will generalize to men with treated SDB. Finally, participants tended to be healthier than those who were excluded. Selection bias might have affected results.

Conclusions

Findings generally support the internal consistency reliability and construct validity of the PSQI and ESS in older men. Although two PSQI components had low correlations with the global score, their removal only slightly improved overall internal consistency and did not affect correlations with theoretically relevant variables, suggesting that these components can be retained when using the PSQI with older men.

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