

Volume 14, n 2, 2026

Clinical Psychology

Distinct Associations Between Psychopathological Distress and Sleep Quality in Good and Poor Sleepers

Ilaria Corbo ^{1*}, Giuseppe Forte ¹, Francesca Favieri ², Renata Tambelli ¹, Maria Casagrande ¹

Abstract

Background: Sleep quality commonly declines with advancing age and is closely linked to psychological distress through intricate and bidirectional mechanisms. Although this relationship is well established, less is known about whether psychopathological symptoms differentially affect specific dimensions of sleep among individuals with varying levels of sleep impairment. The present study aims to investigate the role of psychopathological distress on multiple components of sleep quality in good and poor sleepers.

Methods: Two hundred and seventy-three participants (aged 50-91) were divided into good sleepers (n = 145) and poor sleepers (n=128) using the Pittsburgh Sleep Quality Index (PSQI) cut-off. Psychological distress was evaluated using the Symptom Checklist-90 (SCL-90).

Results: ANOVAs revealed that poor sleepers reported significantly higher distress across all clinical subscales and global indices of SCL-90 ($p < .001$). Correlation analyses revealed different patterns between groups. Among good sleepers, psychological distress was mainly associated with sleep latency, suggesting a circumscribed impact on sleep onset. Conversely, among poor sleepers, psychological distress showed broader correlations with sleep disturbance, daytime dysfunction, and global PSQI scores. Hierarchical linear regressions confirmed that adding the Global Severity Index (GSI) to the model, after controlling for demographic covariates, significantly improved model fit in both groups. However, psychological distress accounted for a higher proportion of variance in Poor Sleepers ($R^2 = .14$, $\Delta R^2 = .10$, $p < .001$) than in good sleepers ($R^2 = .05$, $\Delta R^2 = .04$, $p = .012$).

Conclusions: These findings suggest that psychological distress may act as a pervasive perpetuating factor when sleep is already compromised. These findings highlight the importance of considering psychopathological burden when addressing sleep problems in later life and support the development of tailored interventions targeting both emotional distress and sleep dysfunction.

¹ Department of Dynamic and Clinical Psychology and Health Studies, "Sapienza" University of Rome, Rome, Italy

² Department of Psychology, University "G.D'Annunzio" of Chieti-Pescara, Chieti, Italy

E-mail corresponding author: ilaria.corbo@uniroma1.it



Keywords:

Aging, Clinical Psychology, Distress, Psychopathology, Sleep, Sleep Quality.

Received: 22 June 2026

Accepted: 11 August 2026

Published: 15 August 2026

Citation: Corbo, I., Forte, G., Favieri, F., Tambelli, R., & Casagrande, M. (2026). Distinct associations between psychopathological distress and sleep quality in good and poor sleepers. *Mediterranean Journal of Clinical Psychology*, 14(2).

<https://doi.org/10.13129/2282-1619/mjcp-5513>

1. Introduction

Sleep is a fundamental physiological process that supports physical and psychological health, as well as cognitive functioning. Despite its central role in overall well-being, sleep becomes increasingly vulnerable across the lifespan. Consequently, sleep disturbances are among the most frequent complaints in adulthood, with a significant increase in aging (Corbo et al., 2023). Accordingly, around 16% of adults and 25% of older adults are estimated to experience sleep disturbances (Cooke & Ancoli-Israel, 2011).

The aging process involves gradual and inevitable neurobiological, hormonal, and physiological changes, as well as relevant psychological and social transitions that can profoundly affect well-being. Critical life events such as retirement (Hagen et al., 2016; Myllyntausta et al., 2018; Vahtera et al., 2009), bereavement (Hall et al., 1997; Lancel et al., 2020; Monk et al., 2008), and the gradual diminution of social networks (Azizi-Zeinalhajlou et al., 2022; Cho et al., 2019; Ekström et al., 2024) represent substantial stressors that can increase psychological and behavioral vulnerability. All these experiences may exacerbate subjective distress, anxiety, depressive symptoms, and difficulties in adapting to age-related life changes, all of which have been associated with poorer sleep outcomes.

These changes alter sleep architecture and quality, reducing sleep duration and its restorative capacity, but also difficulty in falling asleep, decreased sleep efficiency, increased need for daytime napping, altered circadian rhythms, and substantial changes in REM/NREM structure (Bombois et al., 2010; Casagrande et al., 2022; Espiritu, 2008; Lavoie et al., 2018; Li et al., 2022; Mander et al., 2017). These changes are further exacerbated by an increased incidence of specific disorders, such as insomnia and obstructive sleep apnoea, further compromising sleep continuity and quality (Scullin & Bliwise, 2015).

A large body of evidence has documented the close relationship between psychopathological symptoms and sleep impairment. For example, anxiety disorders are characterized by a reciprocal interaction in which heightened physiological and cognitive arousal interferes with sleep, while inadequate sleep further intensifies anxiety symptoms and emotional dysregulation (Gulia & Kumar, 2018; Peng et al., 2024; Spira et al., 2009). A similar pattern has been observed in depression, where sleep alterations affect approximately 83% of patients and constitute one of the core clinical manifestations (Cooke & Ancoli-Israel, 2011; Nutt et al., 2008; Reynolds III & Kupfer, 1999), leading to an increased use of medications to treat the mood disorder and sleep disturbances (Nutt et al., 2008). Furthermore, chronic medical conditions frequently co-occurring with older age are associated with sleep difficulties compared with healthy populations, often due to persistent distressing physical symptoms that disrupt nocturnal sleep

(Gosling et al., 2012). Among these conditions, somatic disorders have nearly double the prevalence of sleep disturbances than the healthy population, often due to physical pain conditions that further exacerbate sleep disturbances (Ionescu et al., 2021). Consequently, non-restorative sleep can become a consequence and a maintaining factor that contributes to chronicize and amplify overall psychological distress.

In this context, the transition from acute sleep disruption to chronic sleep impairment can be understood through a multifactorial behavioral framework (Spielman et al., 1987). According to this model, age-related vulnerabilities and pre-existing psychopathological conditions act as predisposing factors, while acute life stressors or physical pain act as precipitating triggers. In some individuals, maladaptive coping mechanisms and dysfunctional beliefs about sleep can become perpetuating factors for sleep difficulties even after the original stressor has resolved (Spielman et al., 1987). Through this process, transient disturbances may evolve into persistent patterns of impaired sleep characterized by enduring cognitive and behavioral vulnerability (Han & Son, 2024).

Given the multifaceted nature of sleep quality, its assessment extends beyond a single global evaluation to encompass several dimensions, including subjective quality, latency, duration, and efficiency. Although the bidirectional association between psychological distress and overall sleep quality is well-documented, less is known about how specific psychopathological symptoms differentially affect these individual components, particularly among people experiencing different levels of sleep disturbance. To address this gap, the present study aims to investigate the relationship between psychopathological distress and multiple dimensions of sleep quality. Specifically, we hypothesize that psychopathological symptomatology exerts distinct effects on sleep outcomes in good sleepers and poor sleepers.

2. Methods

2.1 Participants

Two hundred and seventy-three participants (age range: 50-91 years, mean age 61.8 ± 8.26 years) voluntarily took part in the study, recruited through public notices. According to the Pittsburgh Sleep Quality Index (PSQI) cut-off, the total sample was divided into two groups: Good Sleepers and Poor Sleepers.

The Good Sleepers group included 145 participants (mean age: 60.9 ± 8.07), and the Poor Sleepers group comprised 128 participants (mean age: 62.9 ± 8.37). A history of psychiatric or neurological diagnosis (e.g., dementia, traumatic brain injury, stroke, epilepsy) and an age below 50 years were used as exclusion criteria.

2.2 Measures

2.2.1 Socio-Demographic and Anamnestic Information

Demographic data (age, gender, years of education), lifestyles (smoking, alcohol consumption, and coffee consumption), medical history, and psychiatric information were collected for each participant by a face-to-face interview.

2.2.2 Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989; Curcio et al., 2013)

The PSQI assessed participants' sleep quality over the past 30 days through 19 questions that collected quantitative and qualitative information on sleep habits.

Data were provided on seven components of sleep: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. A global sleep quality score was calculated for each participant. Higher global scores indicate worse sleep quality. According to the Italian validation, a cut-off of 5 was used to define good or poor sleep quality.

2.2.3 Symptom Checklist-90 (SCL-90; Derogatis et al., 1977; Cassano et al., 1999)

The SCL-90 is a self-report questionnaire that evaluates psychological distress experienced within the past week. Participants rate each item on a 5-point Likert scale ranging from 0 ("not at all") to 4 ("extremely"). The instrument yields nine primary symptom dimensions, which include Somatization (SOM), reflecting distress from perceived bodily dysfunction; Obsessive-Compulsive (O-C), focusing on persistent thoughts and impulses; Interpersonal Sensitivity (I-S), assessing feelings of inadequacy and social discomfort; Depression (DEP), measuring core symptoms of depressive disorders; Anxiety (ANX), evaluating clinical manifestations of anxiety and panic; Hostility (HOS), examining thoughts and actions related to anger and aggression; Phobic Anxiety (PHOB), measuring persistent, irrational fear responses; Paranoid Ideation (PAR), exploring suspiciousness and paranoid thinking; and Psychoticism (PSY), representing a continuum from mild alienation to overt psychosis symptoms. The instrument also provides three global indices of overall psychological distress: the Global Severity Index (GSI), which is the mean of all items indicating current distress severity; the Positive Symptom Total (PST), which counts the reported symptoms; and the Positive Symptom Distress Index (PSDI), which measures the average intensity of the reported symptoms.

2.3 Procedures

Informed consent was obtained from all subjects involved in the study. Then, the participants underwent the socio-demographic and anamnestic interview and completed the questionnaires (Pittsburgh Sleep Quality Index and Symptom Checklist-90).

The whole procedure lasted about 30 minutes. This study was conducted according to the Declaration of Helsinki and was approved by the Ethical Committee of the Department of Dynamic and Clinical Psychology and Health Studies, Sapienza University of Rome (Protocol number: 0183/2024, study code: 2024-02-OSSSZ-5970-CASAGRANDE).

2.4 Data Analysis

All statistical analyses were conducted using Jamovi (2.6.24), and a p -value $< .05$ was considered the significance threshold.

Initially, the total sample was categorized according to the Pittsburgh Sleep Quality Index (PSQI) cut-off score, with scores ranging from 0 to 5 indicating good sleep quality, and scores greater than 5 indicating poor sleep quality. Analyses of variance (ANOVAs) were conducted to determine differences between Good and Poor Sleepers in the sleep and psychopathological characteristics. Then Pearson's correlations were conducted to examine the association between sleep and psychopathology for each group. To control for Type I error rates due to multiple comparisons, p -values were adjusted using the Benjamini-Hochberg False Discovery Rate (FDR) procedure ($p_{adj} < .05$). Finally, to address the main aim of the study while accounting for potential confounding factors, hierarchical linear regression analyses were performed separately for Good and Poor Sleepers, using the PSQI Global Score as the dependent variable. In Model 1, demographic covariates (Age, Sex (0 = Female, 1 = Male)), and Employment status (0 = Employed, 1 = Retired) were entered. In Model 2, the Global Severity Index (GSI) of the SCL-90 was added as the primary independent variable reflecting overall psychopathological distress. To prevent severe multicollinearity among the highly collinear SCL-90 global indices (Positive Symptom Total and Positive Symptom Distress Index), only the GSI was retained in the final model. Regression diagnostics were conducted, including the evaluation of Variance Inflation Factors (VIF) and Tolerance values, to confirm the absence of multicollinearity ($VIF < 5.0$).

3. Results

3.1 Demographic aspects of participants and sleep characteristics of participants

Descriptive statistics of participants' demographic aspects are reported in Table 1. Regarding the sleep indices assessed via the PSQI and sleep characteristics, the analysis of variance examined the differences between the two groups across individual subscales. The Poor Sleepers group exhibited a statistically significant impairment in sleep quality compared to the Good Sleepers across all investigated dimensions ($F > 10.5$; $p < .01$; see Table 2).

Table 1*Demographic characteristics of participants*

	Good Sleepers (Mean $\pm$ SD)	Poor Sleepers (Mean $\pm$ SD)	F/ χ^2	p	η^2p
<i>Pittsburgh Sleep Quality Index</i>					
Age (Min-Max)	(50-88)	(50-91)	-	-	-
Mean	145	128	-	-	-
N°					
Age (Mean $\pm$ SD)	60.9 $\pm$ 8.07	62.9 $\pm$ 8.37	4.27	.040	.02
N° Female (%F)	93 (64.13%)	100 (78.13%)	15.2	<.001	-
N° Retired (%)	44 (30.34%)	59 (46.09%)	5.53	.019	-
Years of Education (Mean $\pm$ SD)	15.6 $\pm$ 3.93	15.0 $\pm$ 3.44	1.81	.18	.01

Table 2*Sleep Characteristics*

	Good Sleepers (Mean $\pm$ SD)	Poor Sleepers (Mean $\pm$ SD)	F	p	η^2p
<i>Pittsburgh Sleep Quality Index</i>					
PSQI - Subjective Sleep Quality	.66 $\pm$.57	1.51 $\pm$.74	113.0	<.001	.295
PSQI - Sleep Latency	.39 $\pm$.54	1.45 $\pm$.99	124.0	<.001	.315
PSQI - Sleep Duration	.66 $\pm$.59	1.21 $\pm$.79	42.8	<.001	.136
PSQI - Habitual Sleep Efficiency	.18 $\pm$.42	1.20 $\pm$ 1.11	105.0	<.001	.280
PSQI - Sleep Disturbance	1.03 $\pm$.37	1.66 $\pm$.58	116.0	<.001	.300
PSQI - Use of Sleep Medicine	.06 $\pm$.33	.77 $\pm$ 1.19	48.5	<.001	.152
PSQI - Daytime Dysfunction	.39 $\pm$.52	.95 $\pm$.78	50.1	<.001	.156
PSQI Global Score	3.37 $\pm$ 1.33	8.73 $\pm$ 2.70	450.0	<.001	.624
<i>Sleep Characteristics</i>					
Sleep Latency (Min)	10.26 $\pm$ 8.01	28.82 $\pm$ 31.26	47.6	<.001	.149
Awakening Latency (Min)	8.34 $\pm$ 11.93	15.69 $\pm$ 19.70	14.2	<.001	.050
Wake After Sleep Onset (Min)	15.65 $\pm$ 27.23	54.77 $\pm$ 62.02	47.4	<.001	.149
Time in Bed (Min)	463.18 $\pm$ 63.53	490.20 $\pm$ 73.71	10.5	.001	.038
Total Sleep Time (Min)	428.93 $\pm$ 64.51	391.75 $\pm$ 90.69	15.4	<.001	.054
Sleep Efficiency (%)	92.68 $\pm$ 6.45	79.92 $\pm$ 14.60	90.6	<.001	.251

PSQI: Pittsburgh Sleep Quality Index

3.2 Differences between groups in Psychopathology

Regarding the psychopathological profiles assessed with the SCL-90, differences between the two groups were tested for both individual clinical subscales and global indices. The findings revealed that *Poor Sleepers* presented significantly higher levels of distress and psychopathological symptoms across all considered parameters, highlighting differences in psychological well-being

between the two groups. Specifically, for the clinical subscales, significant group differences emerged for Somatization ($F=61.6$, $p<.001$, $\eta^2p=.185$), Depression ($F=57.2$, $p<.001$, $\eta^2p=.174$), Obsessive-Compulsive ($F=50.3$, $p<.001$, $\eta^2p=.156$), Anxiety ($F=48.1$, $p<.001$, $\eta^2p=.151$), Phobic Anxiety ($F=27.2$, $p<.001$, $\eta^2p=.091$), Paranoid Ideation ($F=24.6$, $p<.001$, $\eta^2p=.083$), Interpersonal Sensitivity ($F=19.9$, $p<.001$, $\eta^2p=.068$), Psychoticism ($F=17.2$, $p<.001$, $\eta^2p=.060$), and Hostility ($F=15.0$, $p<.001$, $\eta^2p=.052$). Finally, this pattern of significantly elevated psychological distress among Poor Sleepers was consistently confirmed by all global indices of the SCL-90, including the Global Severity Index ($F=64.3$, $p<.001$, $\eta^2p=.192$), the Positive Symptom Total ($F=61.3$, $p<.001$, $\eta^2p=.185$), and the Positive Symptom Distress Index ($F=42.5$, $p<.001$, $\eta^2p=.135$). See Table 3 and Figure 1.

Given the differences in sex, age, and occupational status between poor and good sleepers, ANCOVAs were conducted using these variables as covariates to compare SCL-90 psychopathological indices. No significant influences from age or occupational status emerged in the analyses, so the analyses were replicated by excluding these variables and were repeated using only sex as a covariate. The results of this second series of ANCOVAs revealed a significant, although small, effect of sex on the following scales: Somatization ($F = 53.80$, $p < .001$; Sex: $F= 22.4$, $p<.001$), Depression ($F = 51.31$, $p < .001$; Sex: $F= 6.23$, $p=.013$), Anxiety ($F = 43.01$, $p < .001$; Sex: $F= 5.12$, $p=.024$), Phobic Anxiety ($F = 23.24$, $p < .001$; Sex: $F= 6.26$, $p=.013$), Global Severity Index ($F = 58.23$, $p < .001$; Sex: $F= 5.54$, $p=.019$), Positive Symptom Total ($F = 55.32$, $p < .001$; Sex: $F = 5.83$, $p = .016$), and Positive Symptom Distress Index ($F = 37.94$, $p < .001$; Sex: $F = 4.30$, $p = .039$).

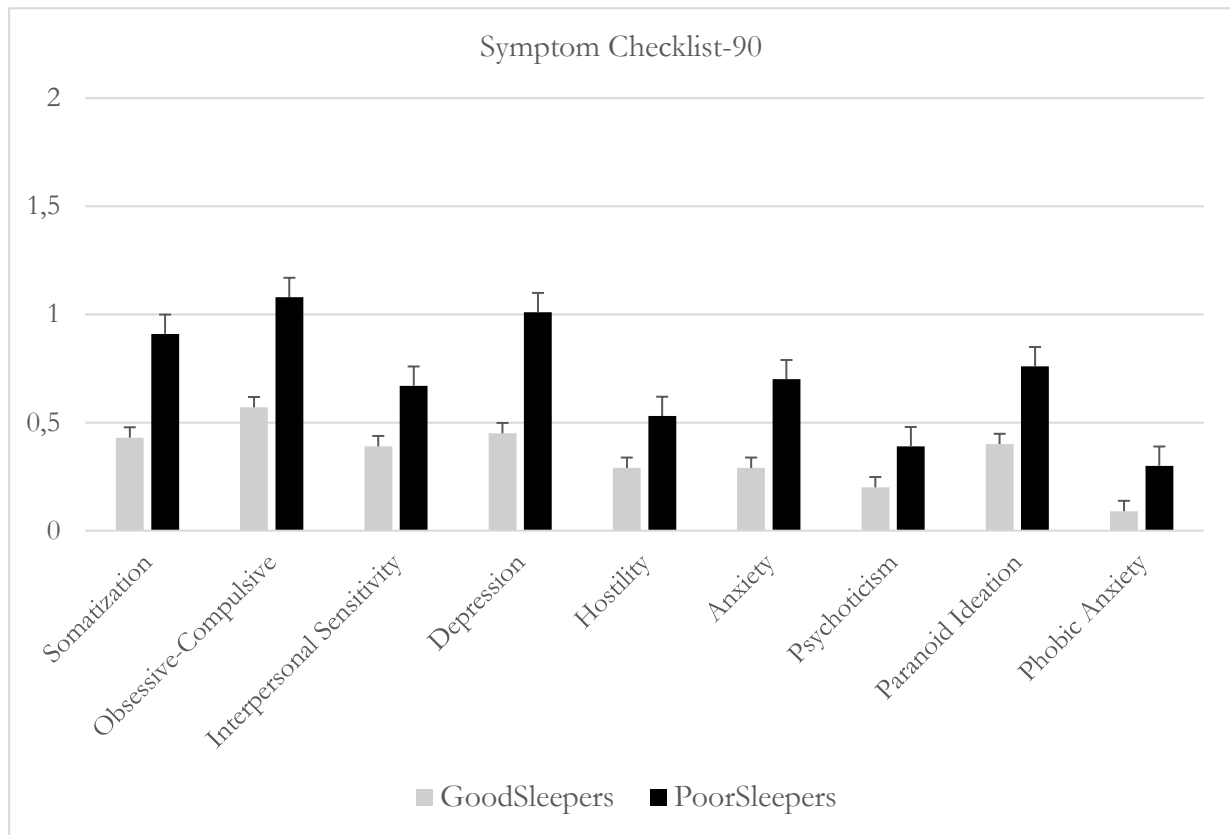
Table 3

Mean, standard deviation, and ANOVA results of Symptom Checklist-90

	Good Sleepers (Mean $\pm$ SD)	Poor Sleepers (Mean $\pm$ SD)	F	p	η^2p
<i>Somatization</i>	.43 $\pm$.36	.91 $\pm$.64	61.6	<.001	.185
<i>Obsessive-Compulsive</i>	.57 $\pm$.49	1.08 $\pm$.71	50.3	<.001	.156
<i>Interpersonal Sensitivity</i>	.39 $\pm$.43	.67 $\pm$.61	19.9	<.001	.068
<i>Depression</i>	.45 $\pm$.43	1.01 $\pm$.76	57.2	<.001	.174
<i>Hostility</i>	.29 $\pm$.42	.53 $\pm$.59	15.0	<.001	.052
<i>Anxiety</i>	.29 $\pm$.34	.70 $\pm$.61	48.1	<.001	.151
<i>Psychoticism</i>	.20 $\pm$.31	.39 $\pm$.46	17.2	<.001	.060
<i>Paranoid Ideation</i>	.40 $\pm$.45	.76 $\pm$.72	24.6	<.001	.083
<i>Phobic Anxiety</i>	.09 $\pm$.19	.30 $\pm$.46	27.2	<.001	.091
<i>Global Severity Index</i>	.38 $\pm$.31	.79 $\pm$.52	64.3	<.001	.192
<i>Positive Symptom Total</i>	23.58 $\pm$ 15.36	39.60 $\pm$ 18.43	61.3	<.001	.185
<i>Positive Symptom Distress Index</i>	1.33 $\pm$.36	1.66 $\pm$.47	42.5	<.001	.135

Figure 1

Differences in the Symptom Checklist – 90 in the two groups of poor and good sleepers



3.3 Pearson correlation

Pearson correlations showed two distinct patterns between the two groups. The subscales Subjective Sleep Quality, Sleep Duration, and Habitual Sleep Efficiency did not correlate with any SCL-90 index in either group. The Sleep Latency subscale in the Good Sleepers group correlated with the O-C, DEP, HOS, ANX, PSY, PAR, GSI, PST, and PSDI scales; no significant correlations emerged in the Poor Sleepers group. In the Sleep Disturbance scale, the Poor Sleepers group showed significant correlations with all SCL-90 indices, whereas the Good Sleepers group showed significant correlations only with the SOM scale. In the Daytime Dysfunction scale, Good Sleepers showed significant correlations for the SOM, O-C, GSI, and PST scales, while Poor Sleepers correlated with all SCL-90 subscales. Finally, the PSQI Global Score in Good Sleepers correlated only with SOM, O-C, DEP, and ANX, whereas in Poor Sleepers, it correlated with all psychopathological variables. See Tables 4 and 5.

Table 4*Pearson correlation between the Pittsburgh Sleep Quality Index and the Symptom Checklist-90 in Good Sleepers*

	Subjective Sleep Quality	Sleep Latency	Sleep Duration	Habitual Sleep Efficiency	Sleep Disturbance	Use of Sleep Medicine	Daytime Dysfunction	Global PSQI
SOM	.05	.13	-.02	.03	.27**	-.05	.27**	.24**
O-C	.04	.21**	.04	-.06	.03	-.08	.19*	.17*
IS	-.02	.16	.09	-.08	-.02	-.02	.12	.11
DEP	.02	.26**	.04	-.13	.11	.01	.15	.18*
HOS	.06	.26**	.01	-.03	.06	-.06	.09	.16
ANX	.05	.22**	.09	-.08	.07	-.09	.13	.18*
PSY	-.09	.23**	.06	.02	.08	.01	.12	.16
PAR	.11	.20*	.05	.12	.03	-.06	.07	.04
PHOB	.10	.03	-.14	.02	.07	.07	.03	.04
GSI	.04	.26**	.05	-.06	.11	-.05	.17*	.21**
PST	.04	.23**	.05	-.05	.11	-.02	.23**	.24**
PSDI	.06	.24**	.05	-.03	.13	-.08	-.03	.14

ANX: Anxiety; **DEP:** Depression; **GSI:** Global Severity Index; **HOS:** Hostility; **I-S:** Interpersonal Sensitivity; **O-C:** Obsessive-Compulsive; **PAR:** Paranoid Ideation; **PHOB:** Phobic Anxiety; **PSDI:** Positive Symptom Distress Index; **PSQI:** Pittsburgh Sleep Quality Index; **PST:** Positive Symptom Total; **PSY:** Psychoticism; **SOM:** Somatization.

Note: All p-values were adjusted for multiple comparisons using the Benjamini–Hochberg False Discovery Rate (FDR) procedure. *: $p_{adj} < .05$; **: $p_{adj} < .01$; ***: $p_{adj} < .001$.

Table 5*Pearson correlation between the Pittsburgh Sleep Quality Index and the Symptom Checklist-90 in Poor Sleepers*

	Subjective Sleep Quality	Sleep Latency	Sleep Duration	Habitual Sleep Efficiency	Sleep Disturbance	Use of Sleep Medicine	Daytime Dysfunction	Global PSQI
SOM	-.02	.13	.08	-.05	.36***	.17	.32***	.29***
O-C	.06	.10	.13	.06	.38***	.05	.34***	.31***
IS	.01	.11	.09	-.02	.25**	.05	.28**	.21*
DEP	.07	.08	.07	-.05	.27**	.18*	.34***	.28**
HOS	.09	.16	.16	-.04	.27**	.18*	.19*	.30***
ANX	.06	.11	.05	-.09	.35***	.26**	.33***	.31***
PSY	-.01	.16	-.01	-.05	.35***	.12	.27**	.23**
PAR	.01	.17	.03	-.03	.24**	.06	.22*	.20*
PHOB	-.05	.06	-.09	-.08	.24**	.29***	.27**	.21*
GSI	.05	.16	.10	-.03	.38***	.17*	.35***	.35***
PST	.05	.17	.13	.01	.40***	.10	.35***	.34***
PSDI	.16	.13	.12	.03	.29**	.23**	.19*	.35***

ANX: Anxiety; **DEP:** Depression; **GSI:** Global Severity Index; **HOS:** Hostility; **I-S:** Interpersonal Sensitivity; **O-C:** Obsessive-Compulsive; **PAR:** Paranoid Ideation; **PHOB:** Phobic Anxiety; **PSDI:** Positive Symptom Distress Index; **PSQI:** Pittsburgh Sleep Quality Index; **PST:** Positive Symptom Total; **PSY:** Psychoticism; **SOM:** Somatization.

Note: All p-values were adjusted for multiple comparisons using the Benjamini–Hochberg False Discovery Rate (FDR) procedure. *: $p_{adj} < .05$; **: $p_{adj} < .01$; ***: $p_{adj} < .001$.

3.4 Linear Regressions

Hierarchical linear regressions were conducted separately for Good Sleepers and Poor Sleepers, using the PSQI global score as the dependent variable. Demographic variables (Age, Sex, and Employment status) were entered in Model 1 as covariates, while the psychopathological distress index (Global Severity Index, GSI) was added in Model 2 as the independent variable. Diagnostic checks confirmed the absence of multicollinearity in both groups. For Good Sleepers, Variance Inflation Factor (VIF) values ranged from 1.01 to 2.12 (Tolerance between .47 and .99), with a GSI VIF of 1.01. For Poor Sleepers, VIF values ranged from 1.03 to 1.44 (Tolerance between .70 and .97), with a GSI VIF of 1.04. All values fell well below the conservative threshold of 5.

The results show that the inclusion of GSI significantly improved model fit in both samples, though accounting for a higher proportion of variance in Poor Sleepers ($R^2 = .14$, $\Delta R^2 = .10$, $p < .001$) than in Good Sleepers ($R^2 = .05$, $\Delta R^2 = .04$, $p = .012$). Higher GSI scores were significantly associated with poorer sleep quality in both Good Sleepers ($B = .13$, $SE = .05$, $p = .012$) and Poor Sleepers ($B = .24$, $SE = .06$, $p < .001$), whereas demographic covariates showed no significant association (see Table 6).

Table 6

Hierarchical linear regressions on the Global Pittsburgh Sleep Quality Index in good and poor sleepers

	Good Sleepers			Poor Sleepers		
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Model 1.						
<i>Age</i>	.01	.01	.89	-.01	.01	.20
<i>Sex (1 - 0)</i>	.04	.07	.62	.16	.17	.37
<i>Employment status (1 - 0)</i>	.04	.11	.72	-.10	.17	.53
<i>R</i>		.06			.20	
<i>R</i> ²		.01			.04	
<i>p</i>		.93			.17	
Model 2.						
<i>Age</i>	-.01	.01	.88	-.01	.01	.23
<i>Sex (1 - 0)</i>	.01	.07	.84	.05	.17	.78
<i>Employment status (1 - 0)</i>	.04	.10	.72	-.07	.16	.66
<i>Global Severity Index</i>	.13	.05	.012	.24	.06	<.001
<i>R</i>		.22			.38	
<i>R</i> ²		.05			.14	
<i>p</i>		.15			<.001	
Model 1 - Model 2						
ΔR^2		.043			.10	
<i>F</i>		6.44			14.6	
<i>p</i>		.012			<.001	

Note. Sex (0 = Female; 1 = Male), Employment status (0 = Employed; 1 = Retired).

4. Discussion

The present study examined the relationship between psychopathological distress and sleep quality in adults and older individuals with the specific aim of determining whether psychopathological symptomatology is differentially associated with sleep impairment in good and poor sleepers. The findings support this hypothesis and indicate that the association between psychological distress and sleep quality is not uniform across sleep quality profiles, in fact, psychopathological symptoms appear to play distinct roles in good and poor sleepers.

First, poor sleepers demonstrated significantly higher levels of psychopathological distress across all SCL-90 dimensions and global indices compared to good sleepers. This finding is consistent with the existing literature, which demonstrates that compromised sleep quality has a deleterious effect on overall psychological well-being (Hamilton et al., 2007; Steptoe et al., 2008).

These alterations are particularly relevant in later life, when age-related biological, psychological, and social changes jointly contribute to increased vulnerability in older individuals. Advancing age is characterized by greater psychological distress and declining psychological well-being (Lehti et al., 2021; Steptoe et al., 2015). Concurrently, increased sedentary behavior, lifestyle shifts, and rising physical health diseases may further undermine both sleep and mental health.

One possible mechanism underlying alterations in sleep patterns is chronic hyperarousal, which is a typical hallmark of older adults and is widely recognized as central to the development and maintenance of insomnia and poor sleep quality (Altena et al., 2017; Bonnet & Arand, 2010). This persistent physiological and cognitive activation may disrupt normal sleep, alter sleep architecture, and reduce sleep efficiency (Di Marco et al., 2025).

In parallel, sleep disturbances are increasingly recognized as transdiagnostic features of psychopathological disorders (e.g., Bagautdinova et al., 2023; Baglioni et al., 2016; Cox & Olatunji, 2020; Demichelis et al., 2023; Zhai et al., 2015).

Previous research has consistently documented a strong comorbidity between sleep disturbance and depressive disorders, suggesting that poor sleep may accompany and contribute to the onset of psychiatric conditions, but also increase the risk of cognitive impairment (Buysse, 2014; Palagini et al., 2013; Yu et al., 2010), an issue particularly relevant in older individuals. The elevated levels of distress observed among poor sleepers in the present study are therefore consistent with a broader framework in which sleep and psychological health mutually reinforce one another over time.

Sex also emerged as a significant, albeit modest, factor associated with psychopathological distress. Although the two groups differ in age, employment status, and sex, only the latter has

a significant the relationship with the psychopathological variables. This finding is consistent with evidence demonstrating sex-related differences in psychopathological vulnerability, particularly about internalizing dimensions such as distress, anxiety, depressive mood, and somatic complaints. In midlife and older adulthood, these differences may be further amplified by endocrine changes associated with menopause (Alblooshi et al., 2023; Becker et al., 2001; Bryant et al., 2012; Terauchi et al., 2013). Fluctuations in estrogen and progesterone levels during this phase has been strongly linked to structural sleep fragmentation, insomnia symptoms, and increased emotional vulnerability through their effects on neurotransmitter systems involved in mood regulation (Eichling & Sahni, 2005; Lang et al., 2025; Maki et al., 2024; Ohayon, 2006; Zhu et al., 2026). Nevertheless, the magnitude of this effect was smaller than that associated with sleep quality, suggesting that sex-related differences do not account for the observed relationship between sleep impairment and psychological distress.

However, the most significant findings emerged from the correlation analyses, which revealed radically different patterns between the two groups. Surprisingly, neither group exhibited significant correlations between psychopathological symptoms and subjective sleep quality, sleep duration, or habitual sleep efficiency. This finding suggests that quantitative measures of sleep, such as total sleep time or sleep efficiency, may be less sensitive to fluctuations in psychological distress. Conversely, the psychological symptomatology involves sleep continuity and daytime functioning.

However, a different pattern emerged among poor and good sleepers. In poor sleepers, psychopathological symptoms were associated with sleep disturbances, daytime dysfunction, and overall sleep quality, reflecting a broader and pervasive impact. These findings suggest that in poor sleepers, psychopathological symptoms overflow into daytime hours, maintaining a state of chronic hyperarousal that feeds into daily functional impairment and amplifies emotional distress. Such a profile is consistent with models of chronic insomnia proposing that persistent hyperarousal and maladaptive cognitive-emotional processes contribute to the generalization of sleep-related difficulties across multiple domains of functioning.

Hierarchical linear regression models further refined this interpretation while controlling for demographic confounders. While demographic covariates accounted for minimal variance in both groups, the addition of GSI significantly improved model fit for both groups. However, the proportion of explained variance was substantially higher among Poor Sleepers than among Good Sleepers. Furthermore, higher GSI scores emerged as a significant factor associated with poorer sleep quality in both groups, with a larger effect in Poor Sleepers than in Good Sleepers. These results indicate that global psychological distress is systematically linked to sleep

impairment, but its strength and clinical relevance are far more pronounced in individuals with established poor sleep quality.

Taken together, these findings support a multi-factorial and reciprocal model of the relationship between sleep and psychological health. Among poor sleepers, a behavioral framework is established where psychological symptoms appear to operate as a chronic perpetuating factor that maintains and amplifies sleep impairment, while poor sleep simultaneously contributes to emotional dysregulation and psychological vulnerability. Conversely, among good sleepers, the relationship appears more circumscribed and situational, affecting sleep-onset primarily without evolving into a broader pattern of dysfunction. The different patterns between good and poor sleepers may reflect different stages along a continuum ranging from transient sleep difficulties to chronic sleep impairment.

5. Strengths and Limitations

A primary strength of this study lies in revealing that the relationship between psychopathological distress and sleep impairment is not uniform, but exhibits distinct qualitative patterns based on the baseline severity of sleep disturbance. The present study directly compares good and poor sleepers, thereby demonstrating that psychological distress is not merely elevated in poor sleepers but also plays a more pervasive role across multiple sleep domains, including sleep disturbances and daytime dysfunction. By contrast, in good sleepers, its impact remains strictly limited to sleep-onset latency. Furthermore, the adoption of a component-level sleep assessment through the multidimensional PSQI enabled the identification of the specific qualitative and quantitative dimensions of sleep that are sensitive to psychological distress. This approach enables the development of a more refined clinical picture of sleep vulnerability in midlife and older adulthood, moving beyond a generic, global evaluation. Despite the results, the present study has some limitations that require caution when interpreting the data. First, the cross-sectional research design precludes establishing definitive causal relationships among the variables. Although the regression models examined psychopathological symptoms as related variables of sleep quality, it is impossible to exclude reverse causality. Second, both sleep and psychopathological symptoms were assessed exclusively using self-report instruments (the PSQI and SCL-90). While these questionnaires are standardized and widely validated, they rely on self-reported data that may be influenced by recall bias and subjective perceptions. Future studies should integrate objective measures of sleep, such as actigraphy or polysomnography, alongside longitudinal designs to clarify the temporal dynamics linking psychopathology and sleep impairment.

6. Conclusion

In conclusion, the present findings highlight the close interconnection between sleep quality and psychopathological distress in adults and older adults. More importantly, they suggest that the role of psychological distress varies with sleep status, exerting a broader and more clinically relevant influence when sleep quality is already compromised. Rather than affecting sleep uniformly, overall psychopathological distress relates to specific sleep parameters, such as sleep latency in good sleepers versus widespread sleep disturbances and daytime dysfunction in poor sleepers.

These distinct patterns carry fundamental clinical implications, emphasizing that therapeutic interventions should not rely solely on standard sleep hygiene, but should be tailored to the patient's baseline sleep profile. In poor sleepers, comprehensive protocols such as Cognitive Behavioral Therapy for Insomnia (CBT-I) should systematically incorporate strategies targeting transdiagnostic emotional distress and dysregulation. Furthermore, routine psychological screening in primary care settings is essential when older adults present with sleep complaints. Understanding these patterns is essential for creating more tailored, personalized, and effective diagnostic and therapeutic approaches that simultaneously address both sleep difficulties and psychological distress, particularly among individuals experiencing chronic sleep impairment. Finally, given that this study focused on older adults, any intervention should also aim to enhance those cognitive aspects, such as decision-making (i.e., Corbo et al., 2025), which are particularly susceptible to the aging process and may prevent individuals from adopting appropriate sleep management strategies.

Ethical approval

This study was conducted according to the Declaration of Helsinki and was approved by the Ethical Committee of the Department of Dynamic and Clinical Psychology and Health Studies, Sapienza University of Rome (Protocol number: 0183/2024, study code: 2024-02-OSSSZ-5970-CASAGRANDE).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Funding

The study was partially supported by Sapienza Large Research Projects Grant: RG125199C34F26C6 and the European Union – "NEXTGENERATIONEU" – PRIN 2022, CODICE PRIN 2022NH8W3C, CUP B53D23014710006, CUP MASTER B53D23014710006.

Data Availability Statement

Data will be available upon request.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any potential conflict of interest.

Authors' Contribution

IC: Conceptualization, Investigation, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. GF: Investigation, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. FF: Investigation, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. RT: Supervision, Writing - review & editing. MC: Conceptualization, Methodology, Formal analysis, Supervision, Writing - original draft, Writing - review & editing.

AI Disclosure Statement

The authors declare that no artificial intelligence (AI) tools, including generative AI systems, were used in the conception, design, analysis, interpretation of data, drafting, or writing of this manuscript. All intellectual content, scientific reasoning, and manuscript preparation were carried out solely by the authors.

References

1. Alblooshi, S., Taylor, M., & Gill, N. (2023). Does menopause elevate the risk for developing depression and anxiety? Results from a systematic review. *Australasian Psychiatry*, 31(2), 165–173. <https://doi.org/10.1177/10398562231165439>
2. Altena, E., Chen, I. Y., Daviaux, Y., Ivers, H., Philip, P., & Morin, C. M. (2017). How hyperarousal and sleep reactivity are represented in different adult age groups: Results from a large cohort study on insomnia. *Brain Sciences*, 7(4), 41. <https://doi.org/10.3390/brainsci7040041>
3. Azizi-Zeinalhajlou, A., Mirghafourvand, M., Nadrian, H., Samei Sis, S., & Matlabi, H. (2022). The contribution of social isolation and loneliness to sleep disturbances among older adults: A systematic review. *Sleep and Biological Rhythms*, 20(2), 153–163. <https://doi.org/10.1007/s41105-022-00380-x>
4. Bagautdinova, J., Mayeli, A., Wilson, J. D., Donati, F. L., Colacot, R. M., Meyer, N., Fusar-Poli, P., & Ferrarelli, F. (2023). Sleep abnormalities in different clinical stages of psychosis: a systematic review and meta-analysis. *JAMA Psychiatry*, 80(3), 202–210. <https://doi.org/10.1001/jamapsychiatry.2022.4599>
5. Baglioni, C., Nanovska, S., Regen, W., Spiegelhalter, K., Feige, B., Nissen, C., Reynolds III, C. F., & Riemann, D. (2016). Sleep and mental disorders: A meta-analysis of polysomnographic research. *Psychological Bulletin*, 142(9), 969. <https://doi.org/10.1037/bul0000053>
6. Becker, D., Lomranz, J., Pines, A., Shmotkin, D., Nitza, E., Bennamitay, G., & Mester, R. (2001). Psychological distress around menopause. *Psychosomatics*, 42(3), 252–257. <https://doi.org/10.1176/appi.psy.42.3.252>
7. Bombois, S., Derambure, P., Pasquier, F., & Monaca, C. (2010). Sleep disorders in aging and dementia. *The Journal of Nutrition, Health & Aging*, 14(3), 212–217. <https://doi.org/10.1007/s12603-010-0052-7>
8. Bonnet, M. H., & Arand, D. L. (2010). Hyperarousal and insomnia: state of the science. *Sleep Medicine Reviews*, 14(1), 9–15. <https://doi.org/10.1016/j.smrv.2009.05.002>
9. Bryant, C., Judd, F. K., & Hickey, M. (2012). Anxiety during the menopausal transition: a systematic review. *Journal of Affective Disorders*, 139(2), 141–148. <https://doi.org/10.1016/j.jad.2011.06.055>
10. Buysse, D. J. (2014). Sleep health: can we define it? Does it matter?. *Sleep*, 37(1), 9–17. <https://doi.org/10.5665/sleep.3298>
11. Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research*, 28(2), 193–213. 10.1016/0165-1781(89)90047-4
12. Casagrande, M., Forte, G., Favieri, F., & Corbo, I. (2022). Sleep quality and aging: a systematic review on healthy older people, mild cognitive impairment and Alzheimer's disease. *International Journal of Environmental Research and Public Health*, 19(14), 8457. <https://doi.org/10.3390/ijerph19148457>
13. Cassano, G. B., Conti, L., & Levine, J. (1999). SCL-90. *Repertorio delle scale di valutazione in psichiatria*, 325–332.
14. Cho, J. H. J., Olmstead, R., Choi, H., Carrillo, C., Seeman, T. E., & Irwin, M. R. (2019). Associations of objective versus subjective social isolation with sleep disturbance, depression, and fatigue in community-dwelling older adults. *Aging & Mental Health*, 23(9), 1130–1138. <https://doi.org/10.1080/13607863.2018.1481928>
15. Cooke, J. R., & Ancoli-Israel, S. (2011). Normal and abnormal sleep in the elderly. *Handbook of Clinical Neurology*, 98, 653–665. [10.1016/B978-0-444-52006-7.00041-1](https://doi.org/10.1016/B978-0-444-52006-7.00041-1)

16. Corbo, I., Favieri, F., Forte, G., & Casagrande, M. (2025). Decision-making under uncertainty in healthy and cognitively impaired aging: a systematic review and meta-analysis. *Archives of Gerontology and Geriatrics*, 129, 105643. <https://doi.org/10.1016/j.archger.2024.105643>
17. Corbo, I., Forte, G., Favieri, F., & Casagrande, M. (2023). Poor sleep quality in aging: the association with mental health. *International Journal of Environmental Research and Public Health*, 20(3), 1661. <https://doi.org/10.3390/ijerph20031661>
18. Cox, R. C., & Olatunji, B. O. (2020). Sleep in the anxiety-related disorders: A meta-analysis of subjective and objective research. *Sleep Medicine Reviews*, 51, 101282. <https://doi.org/10.1016/j.smrv.2020.101282>
19. Curcio, G., Tempesta, D., Scarlata, S., Marzano, C., Moroni, F., Rossini, P. M., Ferrara, M., & De Gennaro, L. (2013). Validity of the Italian version of the Pittsburgh sleep quality index (PSQI). *Neurological Sciences*, 34(4), 511–519. <https://doi.org/10.1007/s10072-012-1085-y>
20. Demichelis, O. P., Grainger, S. A., Burr, L., & Henry, J. D. (2023). Emotion regulation mediates the effects of sleep on stress and aggression. *Journal of sleep research*, 32(3), e13787. <https://doi.org/10.1111/jsr.13787>
21. Derogatis, L. R., & Cleary, P. A. (1977). Confirmation of the dimensional structure of the SCL-90: A study in construct validation. *Journal of Clinical Psychology*, 33(4), 981–989. [https://doi.org/10.1002/1097-4679\(197710\)33:4<981::AID-JCLP2270330412>3.0.CO;2-0](https://doi.org/10.1002/1097-4679(197710)33:4<981::AID-JCLP2270330412>3.0.CO;2-0)
22. Di Marco, T., Scammell, T. E., Sadeghi, K., Datta, A. N., Little, D., Tjptarto, N., ... & Dauvilliers, Y. (2025). Hyperarousal features in the sleep architecture of individuals with and without insomnia. *Journal of Sleep Research*, 34(1), e14256. <https://doi.org/10.1111/jsr.14256>
23. Eichling, P. S., & Sahni, J. (2005). Menopause related sleep disorders. *Journal of Clinical Sleep Medicine*, 1(03), 291–300. <https://doi.org/10.5664/jcsm.26347>
24. Ekström, H., Svensson, M., Elmståhl, S., & Wrånker, L. S. (2024). The association between loneliness, social isolation, and sleep disturbances in older adults: A follow-up study from the Swedish good aging in Skåne project. *SAGE Open Medicine*, 12, 20503121231222823. <https://doi.org/10.1177/2050312123122282>
25. Espiritu, J. R. D. (2008). Aging-related sleep changes. *Clinics in Geriatric Medicine*, 24(1), 1–14. <https://doi.org/10.1016/j.cger.2007.08.007>
26. Gosling, J. A., Batterham, P. J., & Christensen, H. (2012). Cognitive-behavioural factors that predict sleep disturbance 4 years later. *Journal of Psychosomatic Research*, 73(6), 424–429. <https://doi.org/10.1016/j.jpsychores.2012.08.011>
27. Gulia, K. K., & Kumar, V. M. (2018). Sleep disorders in the elderly: a growing challenge. *Psychogeriatrics*, 18(3), 155–165. <https://doi.org/10.1111/psyg.12319>
28. Hagen, E. W., Barnet, J. H., Hale, L., & Peppard, P. E. (2016). Changes in sleep duration and sleep timing associated with retirement transitions. *Sleep*, 39(3), 665–673. <https://doi.org/10.5665/sleep.5548>
29. Hall, M., Buysse, D. J., Dew, M. A., Prigerson, H. G., Kupfer, D. J., & Reynolds III, C. F. (1997). Intrusive thoughts and avoidance behaviors are associated with sleep disturbances in bereavement-related depression. *Depression and Anxiety*, 6(3), 106–112. [https://doi.org/10.1002/\(SICI\)1520-6394\(1997\)6:3<106::AID-DA3>3.0.CO;2-B](https://doi.org/10.1002/(SICI)1520-6394(1997)6:3<106::AID-DA3>3.0.CO;2-B)
30. Hamilton, N. A., Nelson, C. A., Stevens, N., & Kitzman, H. (2007). Sleep and psychological well-being. *Social Indicators Research*, 82(1), 147–163. <https://doi.org/10.1007/s11205-006-9030-1>

31. Han, E. K., & Son, H. K. (2024). The factors affecting sleep quality in community-dwelling older adults, based on Spielman's 3P model of insomnia. *Iranian Journal of Public Health*, 53(12), 2739.
32. <https://doi.org/10.3390/ijerph20031661>
33. Ionescu, C. G., Popa-Velea, O., Mihăilescu, A. I., Talaşman, A. A., & Bădărău, I. A. (2021, August). Somatic symptoms and sleep disorders: a literature review of their relationship, comorbidities and treatment. *Healthcare*, 9(9), 1128. <https://doi.org/10.3390/healthcare9091128>
34. Lancel, M., Stroebe, M., & Eisma, M. C. (2020). Sleep disturbances in bereavement: A systematic review. *Sleep Medicine Reviews*, 53, 101331. <https://doi.org/10.1016/j.smrv.2020.101331>
35. Lang, X. L., Huang, C. C., Cui, H. Y., Zhong, H. X., Shen, M. Y., & Zhao, F. (2025). From physiology to psychology: an integrative review of menopausal syndrome. *World Journal of Psychiatry*, 15(11), 108713. <https://doi.org/10.5498/wjp.v15.i11.108713>
36. Lavoie, C. J., Zeidler, M. R., & Martin, J. L. (2018). Sleep and aging. *Sleep Science and Practice*, 2(1), 3. <https://doi.org/10.1186/s41606-018-0021-3>
37. Lehti, T. E., Öhman, H., Knuutila, M., Kautiainen, H., Karppinen, H., Tilvis, R., Strandberg, T. E., & Pitkala, K. H. (2021). Symptom burden is associated with psychological wellbeing and mortality in older adults. *The Journal of Nutrition, Health & Aging*, 25(3), 330–334. <https://doi.org/10.1007/s12603-020-1490-5>
38. Li, J., Vitiello, M. V., & Gooneratne, N. S. (2022). Sleep in normal aging. *Sleep Medicine Clinics*, 17(2), 161–171. <https://doi.org/10.1016/j.jsmc.2017.09.001> 1556-407X/18/
39. Maki, P. M., Panay, N., & Simon, J. A. (2024). Sleep disturbance associated with the menopause. *Menopause*, 31(8), 724–733. <https://doi.org/10.1097/GME.0000000000002386>
40. Mander, B. A., Winer, J. R., & Walker, M. P. (2017). Sleep and human aging. *Neuron*, 94(1), 19-36. <https://doi.org/10.1016/j.neuron.2017.02.004>
41. Monk, T. H., Begley, A. E., Billy, B. D., Fletcher, M. E., Germain, A., Mazumdar, S., Douglas, E. M., Shear, K., Thompson, W. K., & Zarotney, J. R. (2008). Sleep and circadian rhythms in spousally bereaved seniors. *Chronobiology International*, 25(1), 83–98. <https://doi.org/10.1080/07420520801909320>
42. Myllyntausta, S., Salo, P., Kronholm, E., Pentti, J., Kivimäki, M., Vahtera, J., & Stenholm, S. (2018). Changes in sleep difficulties during the transition to statutory retirement. *Sleep*, 41(1), zsx182. <https://doi.org/10.1093/sleep/zsx182>
43. Nutt, D., Wilson, S., & Paterson, L. (2008). Sleep disorders as core symptoms of depression. *Dialogues in Clinical Neuroscience*, 10(3), 329–336. <https://doi.org/10.31887/DCNS.2008.10.3/dnutt>
44. Ohayon, M. M. (2006). Severe hot flashes are associated with chronic insomnia. *Archives of Internal Medicine*, 166(12), 1262–1268. <https://doi.org/10.1001/archinte.166.12.1262>
45. Palagini, L., Maria Bruno, R., Gemignani, A., Baglioni, C., Ghiadoni, L., & Riemann, D. (2013). Sleep loss and hypertension: a systematic review. *Current Pharmaceutical Design*, 19(13), 2409–2419. <https://doi.org/10.2174/1381612811319130009>
46. Peng, A., Ji, S., Lai, W., Hu, D., Wang, M., Zhao, X., & Chen, L. (2024). The bidirectional relationship between sleep disturbance and anxiety: sleep disturbance is a stronger predictor of anxiety. *Sleep Medicine*, 121, 63–68. <https://doi.org/10.1016/j.sleep.2024.06.022>
47. Reynolds III, C. F., & Kupfer, D. J. (1999). Depression and aging: a look to the future. *Psychiatric Services*, 50(9), 1167–1172. <https://doi.org/10.1176/ps.50.9.116>

48. Scullin, M. K., & Bliwise, D. L. (2015). Sleep, cognition, and normal aging: integrating a half century of multidisciplinary research. *Perspectives on Psychological Science*, 10(1), 97–137.
<https://doi.org/10.1177/1745691614556680>
49. Spielman, A. J., Saskin, P., & Thorpy, M. J. (1987). Treatment of chronic insomnia by restriction of time in bed. *Sleep*, 10(1), 45–56. <https://doi.org/10.1093/sleep/10.1.45>
50. Spira, A. P., Stone, K., Beaudreau, S. A., Ancoli-Israel, S., & Yaffe, K. (2009). Anxiety symptoms and objectively measured sleep quality in older women. *The American Journal of Geriatric Psychiatry*, 17(2), 136–143.
<https://doi.org/10.1097/JGP.0b013e3181871345>
51. Steptoe, A., Deaton, A., & Stone, A. A. (2015). Subjective wellbeing, health, and ageing. *The Lancet*, 385(9968), 640–648. [https://doi.org/10.1016/S0140-6736\(13\)61489-0](https://doi.org/10.1016/S0140-6736(13)61489-0)
52. Steptoe, A., O'Donnell, K., Marmot, M., & Wardle, J. (2008). Positive affect, psychological well-being, and good sleep. *Journal of Psychosomatic Research*, 64(4), 409–415. <https://doi.org/10.1016/j.jpsychores.2007.11.008>
53. Terauchi, M., Hiramitsu, S., Akiyoshi, M., Owa, Y., Kato, K., Obayashi, S., Matsushima, E., & Kubota, T. (2013). Associations among depression, anxiety and somatic symptoms in peri-and postmenopausal women. *Journal of Obstetrics and Gynaecology Research*, 39(5), 1007–1013.
<https://doi.org/10.1111/j.1447-0756.2012.02064.x>
54. Vahtera, J., Westerlund, H., Hall, M., Sjösten, N., Kivimäki, M., Salo, P., Ferrie, J. E., Jokela, M., Pentti, J., Singh-Manoux, A., Goldberg, M., & Zins, M. (2009). Effect of retirement on sleep disturbances: the GAZEL prospective cohort study. *Sleep*, 32(11), 1459–1466. <https://doi.org/10.1093/sleep/32.11.1459>
55. Yu, J., Mahendran, R., Rawtaer, I., Kua, E. H., & Feng, L. (2017). Poor sleep quality is observed in mild cognitive impairment and is largely unrelated to depression and anxiety. *Aging & Mental Health*, 21(8), 823–828. <https://doi.org/10.1080/13607863.2016.1161007>
56. Zhai, L., Zhang, H., & Zhang, D. (2015). Sleep duration and depression among adults: A meta-analysis of prospective studies. *Depression and Anxiety*, 32(9), 664–670. <https://doi.org/10.1002/da.22386>
57. Zhu, J., Huang, Y., Yuan, J., Du, L., Huang, L., Li, X., & Qi, W. (2026). Recent advances in the relationship between mental symptoms in postmenopausal women and estrogen fluctuations. *Journal of Psychosomatic Obstetrics & Gynecology*, 47(1), 2666107. <https://doi.org/10.1080/0167482X.2026.2666107>

