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Association between sleep duration and subjective memory complaints: A large-scale cross-sectional study based on NHANES

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ABSTRACT

Objective: When chatting, people often forget what they want to say, that is, they suffer from subjective memory complaints (SMCs). This research examines the Association between sleep duration and self-reported SMC in a sample representing the entire United States.

Methods: We examined data from 5567 individuals (aged 20–80) who participated in the National Health and Nutrition Examination Survey (2015–2018) to evaluate the association between sleep duration and SMC. Odds ratios (ORs) and a restricted cubic spline (RCS) curve were calculated with multiple logistic regression, and subgroup analysis was performed.

Results: Approximately 5.8 % (323) reported SMC, and most are older people (163). RCS analysis treating sleep duration as a continuous variable revealed a J-shaped curve association between sleep duration and SMC. Self-reported sleep duration was significantly linked to a 33 % elevated risk of SMC (OR, 1.33; 95 % confidence interval [CI], 1.23–1.43; $P < 0.001$). In the group analysis, individuals who slept more than 8 h per day had a greater association of experiencing SMC than those who slept for 6–8 h/day (OR, 1.75; 95 % CI, 1.36–2.23; $P < 0.001$). In the analysis of age groups, the stable association between sleep duration and SMC was observed only in the 60–80 age bracket (OR, 1.59; 95 % CI, 1.09–2.33; $P < 0.001$).

Conclusions: We found that people with self-report sleep duration exceeding 8 h are more likely to experience SMC, especially older adults. Improving sleep health may be an effective strategy for preventing SMC and cognitive impairment.

1. Introduction

The association between sleep duration and memory has attracted considerable interest in recent years. Sleep duration plays a vital role in shaping one's memory, and the association between sleep and objective memory performance is well established. However, the association between subjective memory complaints (SMCs) and sleep duration has not been extensively explored.

The association between sleep duration and memory decline in older adults has been examined. Keage et al. (Keage et al., 2012) found that individuals aged 65 or older with ≤ 6.5 h of nighttime sleep and excessive daytime drowsiness have a significantly higher risk of incurring cognitive impairments. Lin Xu et al. (Xu et al., 2014) established 7 h per day as the normative sleep duration for individuals aged 50 showing that shorter (≤5 h) and longer (≥9 h) sleep durations are linked to decreased memory function. Additionally, suggested sleep duration for individuals 65 or older is between 7 and 8 h every night (Hirshkowitz et al., 2015). Gildner et al. (Gildner et al., 2019) conducted a globally inclusive study on aging and adult health and noted that compared with moderate duration of sleep (6–9 h), short and long sleep durations were linked to decreased performance in tests measuring verbal fluency, digit span, and verbal memory (immediate and delayed recall). Li et al. (Li et al., 2022) and China Health and Retirement Longitudinal Study showed that cognitive scores consistently decrease with

Abbreviations: US, United States; NHANES, National Health and Nutrition Examination Survey; OR, odds ratio; CI, confidence interval; RCS, Restricted Cubic Spline Curve; SMC, subjective memory complaints; PIR, poverty-to-income ratio; BMI, body mass index; SD, standard deviation.

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increasing age in individuals with insufficient or excessive sleep durations. Additionally, different sleep durations have been linked to various health issues, such as diabetes, coronary events, and mortality (Ayas et al., 2003; Gallicchio and Kalesan, 2009; Kripke et al., 2002). However, these studies include only individuals aged 50 and above, neglecting other adult age groups. Our study examines adults aged 20–80 nationwide to explore the association between sleep duration and SMC, informing clinical practice broadly.

This research utilized NHANES sample data to conduct a cross-sectional analysis, sleep duration data, obtained through the SQL questionnaire, was treated as a continuous variable measured indirectly. Our study aims to investigate the association between sleep duration and SMC among adults aged 20–80 in the United States.

2. Material and methods

2.1. Study population

The present study employed information acquired from NHANES in two separate time frames under the Centers for Disease Control and Prevention administration: 2015–2016 and 2017–2018. The NHANES study is an ongoing, nationally representative research project that uses a complex four-stage sampling technique to gather the health-related data of the noninstitutionalized civilian residents of the United States. This comprehensive information is provided in other sources (Fang et al., 2021). A total of 11,288 participants aged 20–80 completed the interview. Exclusions comprised 126 pregnant women, 497 participants with a history of stroke, and 5098 individuals with incomplete covariate data, namely, age, gender, race or ethnicity, marital status, family income ratio, level of education, body mass index (BMI), smoking and drinking habits, coronary heart disease, hypertension, and diabetes. This cross-sectional study ultimately included 5567 participants from NHANES between 2015 and 2018 in its analytical cohort. The comprehensive inclusion and exclusion process is illustrated in Fig. 1. The research ethics review board of NCHS granted ethical approval for the data utilized in this research, and all individuals provided their consent in writing.

2.2. Determination of sleep variables

Sleep Disorders (SLQ): As part of the home interview segment within NHANES 2015–2018, interviewers conducted a questionnaire to explore sleep habits and sleep-related concerns. We incorporated four relevant sleep variables (sleep duration, snoring, sleep apnea, and daytime sleepiness) from the survey to evaluate sleep-related disorders. Continuous variable data on sleep duration were derived from responses to two questions: “What time do you usually go to sleep?” and “What time do you usually wake up?” Snoring frequency was assessed by asking participants or their relatives how often they snored in the past year. Sleep apnea data were collected by inquiring about snorting, gasping, or breath cessation during sleep. Daytime sleepiness was evaluated by asking participants how frequently they felt excessively sleepy during the day in the past month. These variables were treated as continuous and categorized into those with and without each condition, respectively.

2.3. Determination of SMC

Our assessment of SMC in participants was contingent on their responses to a specific question in the physical functioning questionnaire: “Are you limited in any way because of difficulty remembering or because you experience periods of confusion?” Participants responses (“yes” or “no”) established the categorization of SMC.

2.4. Covariates

Several potential covariates were evaluated using the existing literature (Li et al., 2023; Chen et al., 2016; Driscoll et al., 2016). The covariates included age, gender (male or female), race or ethnicity, marital status, family income ratio, level of education, BMI, smoking and drinking habits, and the existence of coronary heart disease, hypertension, or diabetes. Race or ethnicity included Mexican American, other Hispanic, non-Hispanic white, non-Hispanic black, and other race or multi-racial. Marital status included being married, unmarried, cohabiting, or other. According to a US government report (Agricultural ruralural Research Service, 2021), the poverty-to-income ratio (PIR) is calculated annually based on the poverty threshold established by the Department of Health and Human Services. It is computed by dividing household (or individual) income by specific poverty criteria for the survey year. A high PIR value indicates a high household income, and values over 1 represents incomes above the poverty line. We categorized PIR into three groups: low PIR (<1.3), moderate PIR (1.3–3.50), and

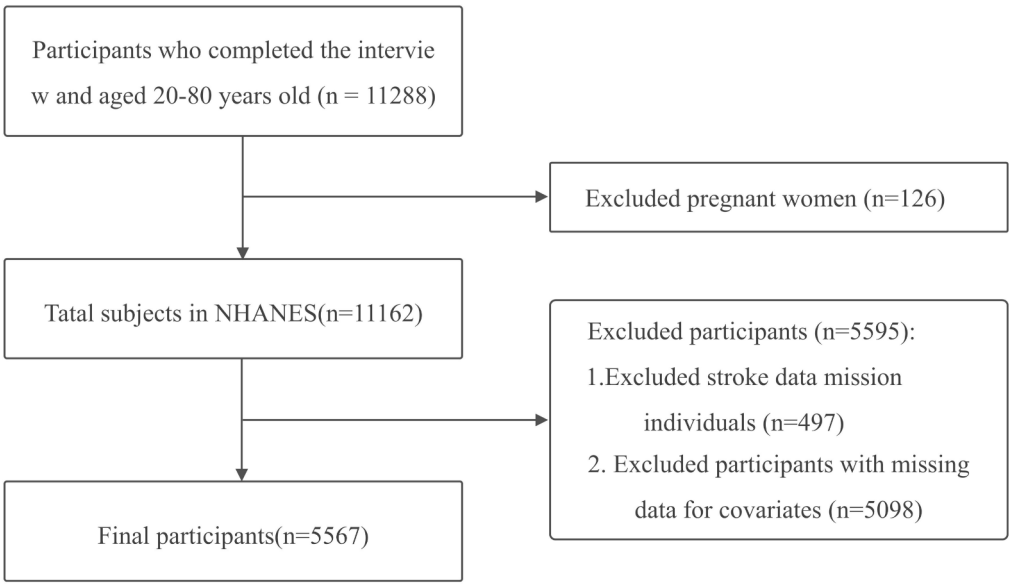

Fig. 1. Flow diagram of the screening and enrollment of study participants from NHANES 2015–2018 (n = 5567). Abbreviations: NHANES, National Health and Nutrition Examination Survey.

high PIR (≥3.50) (Rahman et al., 2022). Educational achievement was categorized into three brackets: under 9 years, between 9 and 12 years, and over 12 years. In line with prior definitions in the literature, the classification of smoking status was divided into three groups: individuals who had never smoked (those who had consumed less than 100 cigarettes), individuals who currently smoke, and individuals who used to smoke (people who quit smoking after having consumed more than 100 cigarettes) (Tang et al., 2023). Drinking status was classified as never drinkers (individuals who had consumed less than 12 drinks in their entire lives), current drinkers, and former drinkers (people who had consumed 12 or more drinks in a year but had not consumed any alcohol in the previous year, or those who had not consumed alcohol in the previous year but had consumed 12 or more drinks in their lifetimes) (Rattan et al., 2022). The determination of prior medical conditions such as coronary heart disease, hypertension, and diabetes, was based on responses to specific questions in the questionnaire, and whether a doctor had been informed of the condition in the past was inquired. BMI was calculated using a standardized method involving weight and height measurements. Participants with missing data for any covariate were excluded from the analysis.

2.5. Statistical analysis

This study entails a secondary analysis of publicly accessible datasets. Proportions (%) were used to present categorical variables, whereas mean (standard deviation) or median was used to characterize continuous variables. Group disparities were evaluated through one-way analysis of variance (for variables with normal distribution) or chi-square tests (for categorical variables). To assess the linearity and explore the association between sleep duration and SMC, we conducted a restricted cubic spline curve regression analysis. The inflection points were identified using the likelihood ratio test and bootstrap resampling technique. After these adjustments were implemented, participants with varying sleep durations were categorized into three groups according to assessed inflection points: less than 6 h, 6–8 h, and 8 h or longer. To investigate the association between sleep duration and SMC, we performed an analysis using multiple logistic regression. Additionally, we conducted stratified analysis on different sleep duration groups (<6, 6–8, ≥8) and age groups (<40, 40–60, ≥60). These analyses yielded odds ratios (OR) and their corresponding 95 % confidence intervals (95 % CIs). We conducted multiple model adjustments to ensure the robustness of our research results. Age and sex were considered in Model 1, and Model 2 included adjustments for race or ethnicity, marital status, family PIR, educational level, and BMI. The fully adjusted Model 3 included age, gender, race or ethnicity, marital status, family PIR, education, BMI, smoking and drinking habits, coronary heart disease, hypertension, and diabetes.

Statistical software packages R 4.3.2 (http //https://www.R-project.org, The R Foundation, Shanghai, China) were utilized for all analyses conducted on November 10, 2023. Free Statistics software version 1.9 was employed, and a P value of ≤ 0.05 was deemed statistically significant.

3. Results

3.1. Baseline characteristics

The baseline characteristics of the study subjects are summarized in Table 1 and categorized according to sleep duration groups: less than 6 h, 6–8 h, and 8 h or longer. Among the 5567 participants, only 323 reported experiencing SMCs; most were older adults (163; Table S1). The 6–8 h per day sleep duration category encompassed 42 % of the participants, whereas 8 % claimed to sleep less than 6 h, and 50 % reported sleeping over 8 h. The participants had an average age of 49.3 ± 17.2 years, and 2858 (51.3 %) were females. A considerable proportion of individuals reported experiencing snoring and daytime sleepiness.

Table 1
Characteristics of participants stratified by sleep duration from NHANES 2015–2018 (n = 5567).

Characteristic	Sleep duration, hours/day				
	Total	Q1 (<6)	Q2 (6–8)	Q3(>8)	*P* value
No	n = 5567	n = 438	n = 2344	n = 2785	
Age, Mean ± SD	49.3 ± 17.2	49.4 ± 15.6	49.0 ± 16.9	50.0 ± 19.2	0.266
Age group, n (%)					< 0.001
<40	1859 (33.4)	146 (33.3)	726 (31)	987 (35.4)	
40–59	1885 (33.9)	165 (37.7)	948 (40.4)	772 (27.7)	
≥60	1823 (32.7)	127 (29)	670 (28.6)	1026 (36.8)	
Sex, n (%)					< 0.001
Male	2709 (48.7)	243 (55.5)	1239 (52.9)	1227 (44.1)	
Female	2858 (51.3)	195 (44.5)	1105 (47.1)	1558 (55.9)	
Race/ethnicity, n (%)					< 0.001
Mexican American	839 (15.1)	839 (15.1)	55 (12.6)	332 (14.2)	
Other Hispanic	605 (10.9)	605 (10.9)	43 (9.8)	257 (11)	
Non-Hispanic White	2042 (36.7)	2042 (36.7)	113 (25.8)	813 (34.7)	
Non-Hispanic Black	1216 (21.8)	1216 (21.8)	162 (37)	547 (23.3)	
Other Race – Including Multi-Racial	865 (15.5)	865 (15.5)	65 (14.8)	395 (16.9)	
Marital status, n (%)					< 0.001
Married	2873 (51.6)	193 (44.1)	1302 (55.5)	1378 (49.5)	
Never married	1021 (18.3)	98 (22.4)	377 (16.1)	546 (19.6)	
Living with partner	547 (9.8)	43 (9.8)	215 (9.2)	289 (10.4)	
Other	1126 (20.2)	104 (23.7)	450 (19.2)	572 (20.5)	
PIR group, n (%)					< 0.001
<1.30	1502 (27.0)	143 (32.6)	527 (22.5)	832 (29.9)	
1.31–3.50	2271 (40.8)	190 (43.4)	937 (40)	1144 (41.1)	
≥3.50	1794 (32.2)	105 (24)	880 (37.5)	809 (29)	
Educational level (years), n (%)					< 0.001
<9	939 (16.9)	74 (16.9)	333 (14.2)	532 (19.1)	
9–12	1245 (22.4)	125 (28.5)	496 (21.2)	624 (22.4)	
≥12	3383 (60.8)	239 (54.6)	1515 (64.6)	1629 (58.5)	
Body mass index (kg/m2), Mean ± SD	29.7 ± 7.2	30.4 ± 8.0	30.0 ± 7.1	29.4 ± 7.1	< 0.001

(continued on next page)

Table 1 (*continued*)

Characteristic	Sleep duration, hours/day				
	Total	Q1 (<6)	Q2 (6–8)	Q3(>8)	*P* value
Smoking status, n (%)					< 0.001
Never	3286 (59.0)	234 (53.4)	1400 (59.7)	1652 (59.3)	
Former	1296 (23.3)	90 (20.5)	539 (23)	667 (23.9)	
Current	985 (17.7)	114 (26)	405 (17.3)	466 (16.7)	
Drinking status, n (%)					< 0.001
Never	782 (14.0)	51 (11.6)	319 (13.6)	412 (14.8)	
Former	478 (8.6)	39 (8.9)	175 (7.5)	264 (9.5)	
Current	4307 (77.4)	348 (79.5)	1850 (78.9)	2109 (75.7)	
Coronary heart disease, n (%)					0.996
No	5378 (96.6)	423 (96.6)	2265 (96.6)	2690 (96.6)	
Yes	189 (3.4)	15 (3.4)	79 (3.4)	95 (3.4)	
Hypertension, n (%)					0.23
No	3222 (57.9)	239 (54.6)	1379 (58.8)	1604 (57.6)	
Yes	2345 (42.1)	199 (45.4)	965 (41.2)	1181 (42.4)	
Diabetes, n (%)					0.862
No	4527 (81.3)	360 (82.2)	1901 (81.1)	2266 (81.4)	
Yes	1040 (18.7)	78 (17.8)	443 (18.9)	519 (18.6)	
Sleep duration, Mean ± SD	7.7 ± 1.5	4.7 ± 0.8	6.9 ± 0.5	8.8 ± 1.0	< 0.001
Snore, n (%)					< 0.001
No	1675 (30.1)	139 (31.7)	623 (26.6)	913 (32.8)	
Yes	3892 (69.9)	299 (68.3)	1721 (73.4)	1872 (67.2)	
Sleep apnea, n (%)					0.129
No	4224 (75.9)	315 (71.9)	1789 (76.3)	2120 (76.1)	
Yes	1343 (24.1)	123 (28.1)	555 (23.7)	665 (23.9)	
Daytime sleepiness, n (%)					0.005
No	949 (17.0)	57 (13)	377 (16.1)	515 (18.5)	
Yes	4618 (83.0)	381 (87)	1967 (83.9)	2270 (81.5)	
SMC, n (%)					< 0.001
No	5244 (94.2)	416 (95)	2244 (95.7)	2584 (92.8)	
Yes	323 (5.8)	22 (5)	100 (4.3)	201 (7.2)	

Abbreviations: NHANES, National Health and Nutrition Examination Survey; PIR, Poverty-to-Income Ratio; SMC, subjective memory complaint.

Moreover, individuals with more extended sleep periods were more inclined to be of advanced age, female, non-Hispanic white ethnicity, married, and non-smokers.

3.2. Association between sleep duration and SMC

Univariate analysis showed that SMCs are associated with various factors such as age, marital status, household income, education level, smoking habits, alcohol intake, coronary heart disease, hypertension, diabetes, sleep duration, sleep apnea, and daytime sleepiness (Table S2). We applied RCS analysis in which sleep duration was a continuous variable. A J-shaped curve association was found between sleep duration and SMC (Fig. 2). Threshold analysis found that participants sleeping at least 7 h per day had an OR of 1.37 (95 % CI,1.24–1.51; $P < 0.001$) for SMC (Table S3), implying 37 % increased risk per additional hour of sleep. Below 7 h, no association with SMC was observed.

Table 2 explains unaltered and modified ORs and their corresponding 95 % CIs, revealing insights into the association between sleep duration and SMC. In the unadjusted model, sleep duration positively associated with the risk of SMC (OR, 1.33; 95 % CI,1.23–1.43; $P < 0.001$). Multivariable regression models were used, which considered variables that can affect the results, such as age, gender, ethnicity, marital status, family income, education level, BMI, tobacco use, alcohol consumption, coronary heart disease, high blood pressure, and diabetes. The positive association remained statistically significant (OR, 1.23;95 % CI,1.14–1.32; $P < 0.001$). In the group analysis, individuals who reported sleeping more than 8 h per day showed a greater likelihood of experiencing SMCs than those who reported sleeping between 6 and 8 h per day (OR,1.75; 95 % CI,1.36–2.23; $P < 0.001$). After covariates were adjusted, the results remained robust (OR, 1.46; 95 % CI,1.13–1.89; $P = 0.004$).

3.3. Subgroup analyses

Additional subgroup analysis by age revealed a higher risk of SMC in individuals aged 60–80 who reported sleeping for over 8 h (OR, 1.75; 95 %CI, 1.21–2.53; $P = 0.003$) even after adjusting for multiple models (OR, 1.59; 95 %CI, 1.09–2.33; $P = 0.016$). However, no stable association was observed in the groups under 40 or between 40 and 60 (Table 3).

3.4. Associations among snore, sleep apnea, daytime sleepiness, and SMC

In the regression analysis of other sleep variables, positive associations were observed among sleep apnea, daytime sleepiness, and SMC (Table 4). After possible factors that can affect the results were considered (age, gender, race or ethnicity, marital status, family income ratio, education level, BMI, smoking and drinking habits, coronary heart disease, hypertension, and diabetes), the ORs were 2.02 (95 %CI, 1.57–2.60; $P < 0.001$) and 1.97 (95 %CI, 1.37–2.85; $P < 0.001$) after meticulous adjustment.

4. Discussion

Our primary finding reveals a J-shaped association between sleep duration and SMC in American adults aged 20–80, and the turning point was approximately 7 h per day. In the stratified analysis, sleep durations exceeding 8 h per day were significantly associated with SMC, even adjustments for various factors were made. Conversely, less than 6 h of sleep duration showed no association with SMC (Table 2). Individuals who reported sleep durations exceeding 8 h and SMC were predominantly older adults.

Ramos et al. (Ramos et al., 2013) underscored a connection between

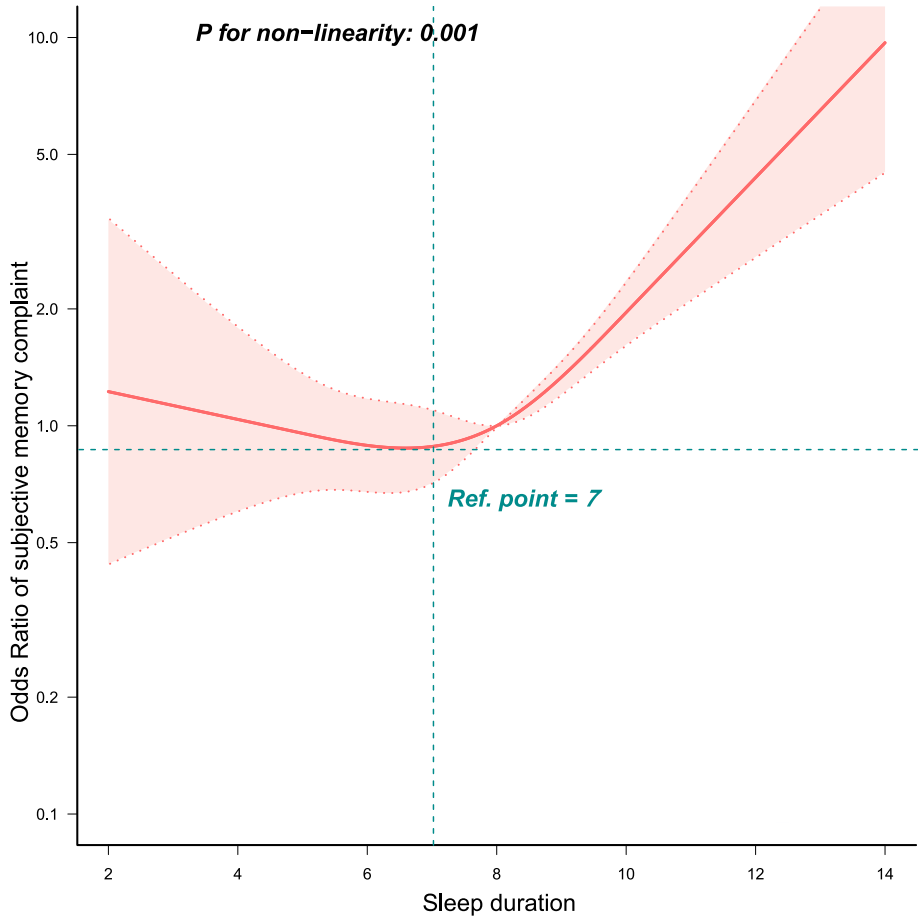

Fig. 2. Restricted cubic spline curve on the association between sleep duration of participants and subjective memory complaint, NHANES 2015–2018. Abbreviations: NHANES, National Health and Nutrition Examination Survey.

Table 2
Adjusted ORs for association between sleep duration and subjective memory complaint in individuals from NHANES 2015–2018.

		OR (95 %CI)							
Variables	**No.**	**Crude**	***P* value**	**Model 1**	***P* value**	**Model 2**	***P* value**	**Model 3**	***P* value**
Sleep duration (hours/day)	5567	1.33 (1.23 ~ 1.43)	<0.001	1.31 (1.21 ~ 1.41)	<0.001	1.22 (1.13 ~ 1.31)	<0.001	1.23 (1.14 ~ 1.32)	<0.001
Sleep duration groups (hours/d)									
Moderate (6–8)	2344	1(Ref)		1(Ref)		1(Ref)		1(Ref)	
Short (<6)	438	1.19 (0.74 ~ 1.9)	0.478	1.19 (0.74 ~ 1.91)	0.479	0.97 (0.59 ~ 1.57)	0.894	0.92 (0.57 ~ 1.51)	0.749
Long (≥8)	2785	1.75 (1.36 ~ 2.23)	<0.001	1.67 (1.3 ~ 2.14)	<0.001	1.45 (1.12 ~ 1.87)	0.004	1.46 (1.13 ~ 1.89)	0.004

Abbreviations: NHANES, National Health and Nutrition Examination Survey; OR, odds ratio; CI, confidence interval; Ref, reference.
Model 1 was adjusted for age and sex.
Model 2 was adjusted for Model 1 + race/ethnicity, marital status, family income to poverty (PIR) ratio, educational level, and body mass index (BMI).
Model 3 was adjusted for model 2 + smoking status, drinking status, coronary heart disease, hypertension, and diabetes.

sleep durations exceeding 9 h and cognitive impairment. This result corresponds with findings from a longitudinal cohort study by TSAPANOU et al. (Tsapanou et al., 2017), who have consistently associated extended sleep duration with decreased memory capacity but have not found significant association between shortened sleep duration and memory capacity. Other studies have documented associations between shortened and extended sleep durations and declining memory (Xu et al., 2014; Li et al., 2022; Low et al., 2019). In contrast to our study, the survey of Ohayon et al. (Ohayon and Vecchierini, 2005) found a association between less than 6 h of sleep and increased cognitive impairment in older adults. Possible explanations for these discrepancies include the subjective nature of sleep duration data obtained from participants, as evidenced by Lauderdale et al. (Lauderdale et al., 2008) who indicated that self-reported sleep durations exceed objectively measured durations by an average of 34 min for each additional hour of sleep. The reason for the discrepancy may be that few participants reported sleep durations of less than 6 h, that is, the sample size was insufficient to demonstrate a significant association with SMC.

Furthermore, uneven age distribution may have led to these differences. Nearly half of individuals aged 55 or older reported having difficulties in initiating or maintaining sleep (Cohen et al., 2022). Insomnia is prevalent in older adults, and changes in sleep pattern occur as age increases, resulting in reduced sleep time, increased time in shallow sleep stages, short and fragmented sleep, and increased susceptibility to disturbances (Skottheim et al., 2018). Approximately 12–20 % meet the criteria for clinical insomnia disorder (Roth et al., 2011). These

Table 3
Association between sleep duration and subjective memory complaint in various age groups in individuals from NHANES 2015–2018.

			OR (95 %CI)							
Age groups (years)	**sleep duration groups (hours/day)**	**No.**	**Crude**	***P* value**	**Model 1**	***P* value**	**Model 2**	***P* value**	**Model 3**	***P* value**
<40		**1859**								
	6–8	726	1(Ref)		1(Ref)		1(Ref)		1(Ref)	
	<6	146	0 (0 ~ Inf)	0.978	0 (0 ~ Inf)	0.978	0 (0 ~ Inf)	0.984	0 (0 ~ Inf)	0.984
	≥8	987	1.92 (1.07 ~ 3.46)	0.029	2.01 (1.11 ~ 3.63)	0.021	1.83 (0.99 ~ 3.35)	0.052	1.91 (1.03 ~ 3.55)	0.04
40–59		**1885**								
	6–8	948	1(Ref)		1(Ref)		1(Ref)		1(Ref)	
	<6	165	1.74 (0.89 ~ 3.38)	0.105	1.72 (0.88 ~ 3.35)	0.11	1.18 (0.59 ~ 2.36)	0.648	1.13 (0.56 ~ 2.3)	0.728
	≥8	772	1.53 (1 ~ 2.34)	0.049	1.54 (1 ~ 2.36)	0.048	1.18 (0.76 ~ 1.84)	0.468	1.15 (0.73 ~ 1.81)	0.537
≥60		**1823**								
	6–8	670	1(Ref)		1(Ref)		1(Ref)		1(Ref)	
	<6	127	1.25 (0.61 ~ 2.55)	0.547	1.24 (0.6 ~ 2.54)	0.558	1.17 (0.56 ~ 2.44)	0.666	1.21 (0.58 ~ 2.53)	0.615
	≥8	1026	1.75 (1.21 ~ 2.53)	0.003	1.67 (1.15 ~ 2.41)	0.007	1.57 (1.08 ~ 2.29)	0.019	1.59 (1.09 ~ 2.33)	0.016

Abbreviations: NHANES, National Health and Nutrition Examination Survey; OR, odds ratio; CI, confidence interval; Ref, reference.
Model 1 was adjusted for age and sex.
Model 2 was adjusted for Model 1 + race/ethnicity, marital status, ratio of family income to poverty (PIR), educational level, and body mass index (BMI).
Model 3 was adjusted for model 2 + smoking status, drinking status, coronary heart disease, hypertension, and diabetes.

Table 4
Association between snore, sleep apnea, daytime sleepiness, and subjective memory complaint in NHANES 2015–2018 individuals.

		OR (95 %CI)							
Variables	**No.**	**Crude**	***P* value**	**Model 1**	***P* value**	**Model 2**	***P* value**	**Model 3**	***P* value**
Snore									
No	1675	1(Ref)		1(Ref)		1(Ref)		1(Ref)	
Yes	3892	0.86 (0.68 ~ 1.09)	0.22	0.86 (0.67 ~ 1.09)	0.211	1.08 (0.84 ~ 1.40)	0.546	1.07 (0.83 ~ 1.39)	0.588
Sleep apnea									
No	4224	1(Ref)		1(Ref)		1(Ref)		1(Ref)	
Yes	1343	1.92 (1.51 ~ 2.42)	<0.001	1.89 (1.49 ~ 2.40)	<0.001	2.04 (1.59 ~ 2.62)	<0.001	2.02 (1.57 ~ 2.60)	<0.001
Daytime sleepiness									
No	949	1(Ref)		1(Ref)		1(Ref)		1(Ref)	
Yes	4618	1.63 (1.15 ~ 2.31)	0.006	1.71 (1.21 ~ 2.44)	0.003	1.99 (1.38 ~ 2.86)	<0.001	1.97 (1.37 ~ 2.85)	<0.001

Abbreviations: NHANES, National Health and Nutrition Examination Survey; OR, odds ratio; CI, confidence interval; Ref, reference.
Model 1 was adjusted for age and sex.
Model 2 was adjusted for Model 1 + race/ethnicity, marital status, family income to poverty (PIR) ratio, educational level, and body mass index (BMI).
Model 3 was adjusted for model 2 + smoking status, drinking status, coronary heart disease, hypertension, and diabetes.

symptoms can lead to difficulties in falling asleep, and thus the reported sleep time by many older adults is likely the time spent lying in bed and considerably longer than their actual sleep times. This finding can explain why self-reported sleep extension is concentrated in the older adult population. Further research incorporating directly measured sleep duration and efficiency variables will help clarify why older adults report long sleep durations.

Reid et al. (Reid and Maclullich, 2006) found that individuals with improved cognitive performance tend to report SMCs. Despite being predictive of future cognitive decline, these complaints do not necessarily indicate current cognitive dysfunction. Objective cognitive impairments in older adults may manifest later than SMCs (Kang et al., 2017). SMCs can be utilized in diagnosing Alzheimer's disease and mild cognitive impairment (Gifford et al., 2014; McMurray et al., 2024 Apr); and sleep disorders have been linked to cognitive decline. For instance, Lo et al. (Lo et al., 2016; Aakre et al., 2023) emphasized how excessive and insufficient sleep durations can affect the various aspects of memory and executive function. Alhola et al. (Alhola and Polo-Kantola, 2007) found that sleep deprivation can lead to cognitive decline and has adverse effects on the working memory function of the prefrontal cortex. Donlea et al. (Donlea, 2019), revealed the detrimental effects of sleep deprivation on memory acquisition and retention processes in vertebrates and invertebrates. However, these studies did not assess SMCs. Our research uncovered a strong link between extended sleep duration and SMC in older American adults aged 60–80, enhancing the literature on subjective memory assessment. We propose that prioritizing self-reported sleep duration aids in the diagnose is of mild cognitive impairment and Alzheimer's disease. For individuals with sleep disorders, especially older adults, listening to soothing music before bedtime may be an effective home intervention to improve sleep disturbances (Cordi et al., 2019) and prevent SMC.

Furthermore, we discovered a link between daytime sleepiness and a heightened risk of SMC. A recent cross-sectional study in Hong Kong supported this result, showing an intriguing inverted U-shaped

association between cognitive function and nap frequency. Notably, those who napped 1–2 times per week exhibited the highest cognitive function scores, highlighting the association between daily napping and increased risk of memory impairment (Auyeung et al., 2013). We explored sleep disorders, with particular emphasis on sleep apnea, which is a widely recognized condition that negatively affects overall health (Ho and Brass, 2011; Moyer et al., 2001). Harner et al. (Harner and Budescu, 2014) conducted an in-depth investigation into the association between poor sleep quality and sleep apnea, revealing additional evidence supporting the association between sleep apnea and the likelihood of experiencing memory problems. This result is consistent with our conclusion.

Our study has several limitations: First, being a cross-sectional study, it cannot establish causality between sleep duration and SMC. Further, longitudinal studies are necessary to elucidate causality. Second, sleep variables were derived from subjective reports, potentially introducing information bias because of participants' interpretation of the indicators. Future research should utilize objective measures (polysomnography) to mitigate this bias. Third, despite regression analysis and sensitivity testing, the potential influences of unmeasured or unidentified variables may have not been eliminated, resulting in residual confounding effects. Lastly, findings from the surveys of US adults may need to be universally generalizable to other demographic groups, warranting further investigation.

In summary, clinicians should prioritize addressing SMCs over objective ones to detect mild cognitive impairments, especially in older adults. Changing sleep habits and treating sleep disorders can be straightforward and practical approaches.

5. Conclusions

We found that individuals who self-reported sleeping for more than 8 h were more likely to experience subjective memory issues, especially in older adults. Sleep duration may be an effective indicator for evaluating early cognitive impairment, and improving sleep health may be an effective strategy for preventing SMC and cognitive impairment.

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CRediT authorship contribution statement

Xiaoguang Xie: Conceptualization, Methodology, Software. **Xiaojing Zheng:** Data curation. **Lan Mei:** Writing – original draft. **Yuanzhi Hu:** Methodology. **Jing Liu:** Software, Data curation. **Guohua Ma:** Methodology. **Yan Yang:** Writing – original draft. **Qiuyin Dai:** Writing – review & editing. **Menghui Ma:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

This study's publicly available datasets are available online. The repository/repositories' names and accession numbers are available online at https://www.cdc.gov/ nchs/nhanes.htm (accessed on November 10, 2023).

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2024.102790.

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