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Cognition is Associated with Sleep Disordered Breathing in Older Women: Women's Health Initiative Sleep HyPoxia Effects on Resilience (WHISPER).

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Background. Sleep disturbances and disorders grow in prevalence as older adults continue to age, which largely go undetected and subsequently untreated. One such disturbance is sleep-disordered breathing (SDB) characterized by chronic intermittent hypoxia (IH). Epidemiological evidence suggests that SDB and IH are associated with negative health outcomes such as increased incidence and progression of cardiovascular disease (CVD), cancers, and cognitive decline including mild cognitive impairment (MCI), Alzheimer's disease (AD) and other forms of dementia. WHISPER (Women's Health Initiative Sleep HyPoxia Effects on Resilience) is an ancillary study of the Women's Health Initiative (WHI) Extension Study that is examining the role of SDB on 3-year trajectory of CVD and cancer events, and of cognitive function in older women. While the role of sleep quality on health has been examined in men and younger cohorts, the impact of disturbed sleep in older women has been historically understudied.

Methods. Currently, WHISPER is in the process of enrolling 5,000 postmenopausal women across the United States to complete a one-time sleep assessment using an at-home, low cost, wrist worn device: the Itamar WatchPAT. The WatchPAT utilizes finger pulse oximetry to continuously measure SDB for one night quantified by the Apnea Hypopnea Index (AHI) and the Oxygen Desaturation Index (ODI). AHI reflects the number of events involving a decrease of airflow through the nostrils and mouth by 80-100% for at least 10 seconds) per hour of sleep. AHI is measured using both a 3% and a 4% criterion indicating a decrease in pulse oxygen saturation by either 3% (AHI_3%) or 4% (AHI_4%). Higher AHI values are associated with increased severity of sleep apnea such that AHI>15 indicates moderate sleep apnea and AHI>30 indicates severe sleep apnea. ODI describes the number of times per hour of sleep that pulse oxygen saturation dips by at least 4%. The sleep assessment is followed by a baseline cognitive assessment administered over the telephone, which will be repeated 18 and 36 months later. The cognitive battery includes the modified Telephone Interview for Cognitive Status (TICSm) – a measure of global cognitive function that quantifies orientation, attention, verbal fluency, and immediate and short delay word recall.

To date, $N=2140$ participants have completed the in-home sleep assessment (mean age [SD] = 80.02 years [4.84]; range = 70-100 years). Of these participants, $N=477$ (22.3%) have met criteria for moderate sleep apnea and $N=146$ (6.8%) for severe sleep apnea. The majority of these participants were unaware of their clinically significant sleep disturbance. Additionally, $N=1389$ have completed the baseline cognitive assessment. In this 1389-person cohort, regression analyses were conducted to examine associations between sleep exposures (AHI_3%, AHI_4%, ODI) and baseline TICSm. The regression models were adjusted for age and education to examine the relative impact of these variables on the analyses.

Results. In models adjusted for age, TICSm scores were negatively correlated with AHI_3% ($r=-0.249$, $p<0.01$), AHI_4% ($r=-0.203$, $p<0.05$), and ODI ($r=-0.207$, $p<0.05$). This pattern of results persisted when the models were also adjusted for education. These results indicate that increasing severity of SDB as measured by AHI and ODI was associated with poorer performance on a test of global cognitive function in older women.

Implications. Our preliminary results demonstrate that a cost-efficient and user-friendly home-based sleep assessment tool can successfully be used by older women for sleep apnea screening to identify those at highest priority for intervention. Our findings also highlight an important relationship between SDB severity and global cognitive function, which elevates the importance for early intervention.