Article

Gerontology & Geriatric Medicine
Volume 6: 1–10

DOI: 10.1177/2333721420970730
journals.sagepub.com/home/ggm
SAGE

Daytime sleepiness and napping in nursing-home eligible community dwelling older adults: A mixed methods study

Miranda V. McPhillips, PhD[1], Junxin Li, PhD[2], Nancy A. Hodgson, PhD[1], Pamela Z. Cacchione, PhD[1], Victoria V. Dickson, PhD[3], Nalaka S. Gooneratne, MD[1], and Barbara Riegel, PhD[1]

Abstract

Objectives: To describe perceptions and beliefs about daytime sleepiness and napping along with subjective and objective daytime sleep characteristics in nursing-home eligible community dwelling older adults.

Methods: A mixed methods study; we conducted semi-structured interviews and measured sleep variables via Actigraphy, sleep diary, and Epworth Sleepiness Scale (ESS). Napping was defined as >10 minutes; anything less was considered dozing.

Results: Final sample ($n = 40$) was primarily female (85%), Black (100%), with a mean age of 72 ± 9.5 years. Few (25%) reported daytime sleepiness (ESS >10). However, average duration of napping per day was 33.1 ± 11.5 minutes with a nap frequency of 2.5 ± 1.5 naps.

Conclusion: Our sample napped frequently throughout the day, yet the majority reported no daytime sleepiness. These older adults did not always recognize napping or how much they napped.

Keywords

sleep, daytime sleepiness, nap, aged, frail elderly

Manuscript received: February 27, 2020; **final revision received:** October 9, 2020; **accepted:** October 13, 2020.

Introduction

Sleep disturbances and their consequences are common in older adults and are often associated with daytime problems, such as excessive daytime sleepiness. Excessive daytime sleepiness is defined as difficulty maintaining a desired level of wakefulness (Young, 2004) or the feeling of being drowsy with a tendency to actually fall asleep or nap (Laffont et al., 2002). Estimates of excessive daytime sleepiness in community dwelling older adults range from 10% to 30% (Onen et al., 2013; Pak et al., 2017) and reach 70% in nursing home residents (Martin et al., 2006; Rao et al., 2005). Daytime sleepiness has been linked with a range of unfavorable health consequences, including cognitive decline or dementia (Foley et al., 2001; Jaussent et al., 2012; Merlino et al., 2010), brain atrophy (Carvalho et al., 2017), obesity, poor self-rated health, impaired daily functioning, poor quality of life (Gooneratne et al., 2003), disability (Nakakubo et al., 2016) and depression (Lima et al., 2015).

Daytime napping is also common in older adults, presumably to address daytime sleepiness. Estimates of napping range from 22% to 60% in older adults (Li et al., 2017; Owusu et al., 2019). The benefits of napping remain controversial in the literature; some research suggests that consolidated napping may compensate for short nighttime sleep duration and reduce daytime sleepiness (Fang et al., 2013; Lovato & Lack, 2010) while other studies suggest napping may negatively impact nighttime sleep (Martin et al., 2006; Monk et al., 2011). Two studies reported that short (<30 minutes), frequent (4 or more times a week) napping was associated with an 84% increase in Alzheimer's disease risk (Asada,

[1]University of Pennsylvania, Philadelphia, PA, USA
[2]Johns Hopkins University, Baltimore, MD, USA
[3]New York University, New York, NY, USA

Corresponding Author:
Miranda V. McPhillips, School of Nursing, University of Pennsylvania, 418 Curie Blvd, 307b, Philadelphia, PA 19104, USA.
Email: mvarr@nursing.upenn.edu

et al., 2000) and that longer, more frequent naps were associated with poorer cognitive function (Cross et al., 2015). In contrast, Li and colleagues reported significant cross-sectional and longitudinal associations between afternoon napping of moderate duration (30–90 minutes) and improved cognition in Chinese older adults (Li et al., 2017).

The consequences of poor sleep are associated with an increased risk of institutionalization (Spira et al., 2012). As older adults, health care providers, and policymakers have a shared goal of supporting older adults living independently at a residence of their choice (i.e., aging in place) (AARP, 2010; Bronstein et al., 2009; Farber et al., 2011), it is critical to understand factors that might contribute to institutionalization (Ye & Richards, 2018). No study to date has examined daytime sleep characteristics in nursing-home eligible older adults who remain living in the community. The aim of this study was to describe perceptions and beliefs about daytime sleepiness and napping and examine subjective and objective daytime sleep characteristics in this population.

Methods

We conducted a concurrent nested mixed method study (QUAL+quan) (Creswell & Plano-Clark, 2006) to learn about older adults' perceptions and beliefs about daytime sleepiness and napping. We sought to describe subjective and objective daytime sleep characteristics and older adults' recognition and interpretation of daytime sleepiness and napping. Semi-structured interviews were conducted to obtain qualitative data. Standardized sleep survey and objective sleep data augmented the qualitative data. Qualitative and quantitative data were integrated during analysis to identify how older adults recognized and interpreted their daytime sleep issues.

Setting and Sample

After receiving Institutional Review Board approval, 40 participants were recruited from one urban Program of All-Inclusive Care for the Elderly (PACE) in northeastern United States. Participants in PACE have similar functional limitations (average three limitations) and comorbidities (average eight chronic conditions) as those living in nursing homes (National PACE Association, 2020), but have chosen to join a PACE program to remain living in the community.

Inclusion criteria were: aged $\geq$55 years, resided (independently or cohabitated) in the community, were cognitively intact or had mild cognitive impairment (measured with Montreal Cognitive Assessment (MoCA); and were able to speak and write in English. Using normative data from a sample with comparable demographics (Rossetti et al., 2017), we used a MoCA cut-point of 20 to indicate the participant was cognitively able to participate in the study. We enrolled both good and poor sleepers in terms of subjective ratings of typical sleep quality. We asked one question during screening, "Do you feel you sleep well or poorly?". Those who were unable to call themselves either a good or poor sleeper were labeled as "variable" sleepers.

Procedures

The Director of Nursing Research at PACE generated a list of all members with a Mini-Mental Status Exam score $>$26, as preliminary evidence of intact cognition (Folstein et al., 1975). Employees at the center initiated contact with members on the list and asked permission for a researcher to contact them. Members were screened for eligibility with MoCA. All eligible participants provided written informed consent. Demographic and clinical data were obtained from electronic health records to minimize participant burden. The first research visit consisted of a qualitative interview, survey administration, and instructions for wearing the Actiwatch. Participants were provided a sleep diary to complete for the next week and received two check-in phone calls. At the second research visit, 7 to 10 days later, participants returned the Actiwatch and sleep diary and were compensated with a $25 gift card.

Qualitative Data Collection

Daytime activities and napping were explored qualitatively in a single one-on-one, face-to-face, audiotaped interview lasting approximately 30 to 60 minutes. The interview was conducted in a private setting using a semi-structured interview guide with theoretically derived questions and probes based on existing literature and the research team's clinical experiences working with older adults with sleep disturbances. Open-ended questions were used to provide moderate structure while allowing the participants to freely communicate their own perceptions (Sandelowski, 2000). Open-ended questions began broadly and were followed by additional questions and probes that elicit in-depth descriptions (i.e., Tell me about a typical day). Questions that targeted beliefs about napping (i.e., Tell me about how napping affects you) and feeling sleepy during the day (i.e., Describe how you feel during the day after a night's sleep) were used to ensure a rich description of the phenomenon.

Quantitative Data Collection and Measures

Demographic and clinical information: Age, gender, race, medications and chronic conditions were collected from participants' electronic health records. The Epworth Sleepiness Scale (ESS) was used to measure daytime sleepiness (Johns, 1991). Respondents rate the likelihood of falling asleep in eight soporific situations using a 4-point Likert scale; scores range from never dozing (0) to high chance of dozing (3). Scores are summed,

with higher scores indicating more daytime sleepiness, or categorized as not sleepy (<11) or sleepy (≥11). Test-retest reliability (correlation coefficient = 0.82) and internal consistency (correlation coefficient = 0.88) have been established in addition to its single factor structure (Johns, 2000). The ESS has a sensitivity of 93.5% and a specificity of 100% for distinguishing pathological from normal sleepiness (Maislin et al., 1995) and was internally consistent in our sample ($\alpha = 0.84$).

Wrist actigraphy (Mullaney et al., 1980) was the objective measure of napping used in conjunction with a sleep diary. Participants wore the Actiwatch-2 device (Koninklijke Philips, N.V.), a piezoelectric accelerometer, on their non-dominant wrist for 1 week. Movement data were sampled at a rate of 32 Hz and activity counts were recorded in 60-second epochs. Sleep diary in conjunction with actigraphy provides the most reliable representation of sleep habits; both actigraphy and sleep diary have been validated for seven-day use in older adults (Ancoli-Israel et al., 2003; Morgenthaler et al., 2007).

Qualitative Data Analysis

Thematic content analysis was used to analyze the qualitative data. Interviews were transcribed verbatim, accuracy was confirmed, and coded using ATLAS.ti version 7.5.16. Preliminary analysis included a line-by-line review that yielded clusters of data which were then labeled into brief headings. Additional codes derived from this data were linked to interview questions to yield coding categories. We analyzed the codes within-cases, then across cases, and subsequently cross-classified to yield a descriptive analysis. Lastly, emerging themes both within and across coding categories were identified; and review of fit with data verified. In this manner, we generated a rich description of perceptions regarding daytime sleepiness and napping developed directly from the participants.

Quantitative Analysis

Stata version 14.1 was used for quantitative analyses. Descriptive statistics were used to characterize the sample, with measures of central tendency and variation for continuous measures, and frequencies and percentages for dichotomous and categorical variables. Correlational analyses, to describe relationships among demographic, self-report and objective sleep measures, were done using non-parametric Spearman rho tests to protect against skewed data. An *a priori* significance level was set at $p < 0.05$.

Actigraphy data for each 60 second epoch were automatically scored using a validated algorithm on the low threshold setting in the Philips Actiware 6.0.8 software. The low threshold setting is more likely to score movement epochs as wake, which has been found to be most accurate and consistent with PSG in studies of older adults, who have less activity (Blackwell et al., 2008; Sivertsen et al., 2006; Taibi et al., 2013). We used sleep diary, ambient light and activity levels to hand score rest intervals and correct the automated algorithm when warranted. Sleep could be overestimated during the daytime due to the actigraph's low specificity of detecting sleep (scoring inactivity while being awake as sleep) (Goldstone et al., 2018). Therefore, we defined a nap to be more than ten consecutive minutes of actigraphically scored sleep in duration and occurring outside the nighttime sleep period; anything less than that was considered inactivity or brief dozing off. Actigraphy data were averaged over a one-week period.

Data Integration

Integration was achieved by first comparing actigraphy and ESS scores to each other and then with qualitative data. We further examined congruence between the data sets by determining whether the objective (actigraphy) data supported the subjective (interviews and ESS) data. For example, if a participant discussed routinely napping, we confirmed napping using Actigraphy. Objective data was used to augment the subjective data by enhancing the picture of how participants perceived, recognized, and interpreted daytime sleep characteristics.

We took several steps to ensure methodological rigor in the qualitative and mixed methods portions of the study. We used member checking; findings were validated by participants to enhance credibility. We established: (1) confirmability via audit trails and regular meetings with the team to discuss and determine validity of inferences; and (2) reliability of coding by having a colleague well trained in qualitative data analysis independently code two interviews chosen at random. Discrepancies were discussed and >95% agreement was achieved. Triangulation during the data integration phase increased the credibility and dependability of the findings (Creswell & Plano-Clark, 2006).

Results

Screening and Baseline Characteristics

We screened 76 potential participants and enrolled 40 (see Figure 1). The final sample was primarily female (85%) and Black (100%), with ages ranging from 59 to 92 years (mean 72 ± 9.5). See Table 1. On the screening question, participants self-identified as good (40%), poor (50%), or variable (10%) sleepers.

Qualitative Findings

Beliefs about sleep and daytime sleepiness. Almost all (90%) participants felt strongly that nighttime sleep was critically important because of its impact on daytime functioning and mood. One woman in her late 80s described, "I feel that sleep has always been a friend to me. . .it takes me places. I dream. . . I feel good after I

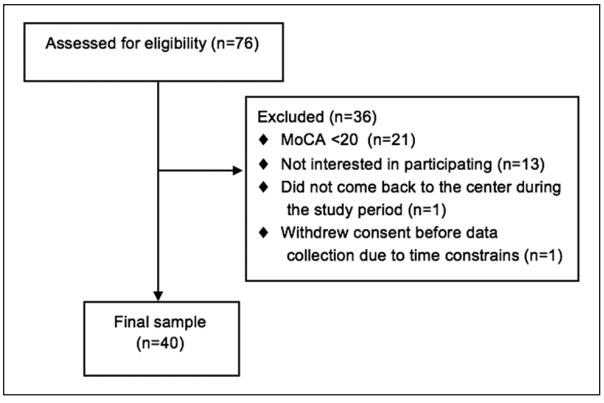

Figure 1. Screening and enrollment.

Table 1. Characteristics of the Sample of 40 Older Adults.

Demographic variables	Overall sample
Age (Years)	72.38 ± 9.54
Gender	
Female	34 (85%)
Male	6 (15%)
Race	
Black	40 (100%)
Living arrangement	
Alone	30 (75%)
Roommate(s)	10 (25%)
Clinical variables	
Montreal cognitive assessment	24.05 ± 2.44
Total number of medications	10.58 ± 3.63
Number of medical comorbidities	8.75 ± 3.03
Diagnosed mental health disorder	17 (42.5%)

sleep. . . it seems to revive me, renew me. . .renew for the next day." Most (67%) participants also believed that daytime activities affected nighttime sleep: "Usually, I am so worn out within the course of the day until it makes me sleep even better. I prefer to be worn out."

Daytime sleepiness was often described as a consequence of poor night's sleep, medications, or lack of activity. Participants said: "It's very important for me to sleep well. . .I know if I don't get my sleep, I'm gonna be very angry. I'll be upset. I'll be nasty to people for no apparent reason because I'm tired and I'm grouchy", "So sometime I fall asleep with the iPad in my hand, and I wake up, it'll be on the floor. . .that's only after I take my medicine. . .I take medicine for my heart, and I think it kind of like relaxes me a lot, and I fall asleep", "I think I could be more active. . .to sleep better."

Beliefs about napping. Beliefs about napping varied; some purposefully took naps, some napped out of boredom and others did not nap due to the negative effects on nighttime sleep. Some participants believed a nap was beneficial to their mood and overall well-being. One woman in her 80s who self-identified as a poor sleeper reported napping daily, "I love to take a nap. . . everybody takes a nap in the afternoon. . .about an hour. . .it makes you feel good." Other older adults tended to nap when they were bored. For example, one poor sleeper said, ". . .if I'm at home, doin' nothin', I got a tendency to doze off" and one good sleeper said, ". . .if I'm home, and I'm bored, or something like that, I may nap during the day. . ." For some participants, naps were planned, and for others they were not: "Sometimes I'll lay back on my bed and most of the times the naps are nothing planned, and I'll fall asleep when I lay back, and then I'll wake up and look at the time, and I'll start looking to see what's on, and so on. . ."

Others believed napping would negatively affect their nighttime sleep. One woman in her 60s who self-identified as a good sleeper said, "If I get tired or something' I'll do something. . .if I take a nap I know I'm gonna be up all night", while another poor sleeper in her 60s said, "Because I sleep during the day, that may affect me sleeping at night. I don't know." Finally, some participants believed napping had no effect on their nighttime sleep: "I might nap during the day and then at night hey, I go to sleep just like always did."

Quantitative Findings

Results of the nighttime sleep characteristics are presented in detail elsewhere (McPhillips et al., 2019), but most participants did not get the recommended (420–480 minutes or 7–8 hours) sleep at night during the study: 75% had short sleep and 12.5% had long sleep.

The average duration of total resting during the day was 162.8 ± 83.2 minutes with a mean rest frequency per day of 33.9 ± 15.0 episodes. That is, on average participants were resting quietly (could be quiet wakefulness or dozing off) almost 34 times each day for a total of 2.5 hours. The average duration of napping (defined as rest period >10 minutes during the nonsleep interval) per day was 33.15 ± 11.5 minutes with a nap frequency per day of 2.5 ± 1.5 naps. Napping accounted for roughly 20% of total resting during the day. See Table 2.

The sleep screening question was not correlated with the ESS. Living alone was significantly correlated with Epworth Sleepiness Scale scores (r = –0.32; p = 0.04) such that those who lived alone had increased sleepiness. Objective daytime sleep was not correlated with ESS or any clinical or demographic variables.

Integration

Participants were categorized as good (n = 19), poor (n = 17), or variable (n = 4) sleepers based off investigator determined ratings of sleep based off interview data. We examined concordance and discordance for daytime sleepiness and nap data. See Table 3.

ESS scores were primarily concordant among the good sleeping group (79%). In the discordant group (21%), good sleepers who had daytime sleepiness on ESS talked about having the option to nap. For example,

Table 2. Daytime Sleep Characteristics of Older Adults ($n = 40$).

Variable	Overall sample	Good sleeping group ($n = 16$)	Poor sleeping group ($n = 20$)	Interpretation
Actigraphy data (mins)				
24 hour TST	556.39 ± 114.23	562.58 ± 138.70	556.85 ± 103.78	TST + daytime inactivity
Total daytime inactivity	162.80 ± 83.22	173.67 ± 97.20	150.83 ± 79.40	Total inactivity outside nighttime sleep period
Frequency/day	33.95 ± 15.05	35.04 ± 17.27	31.80 ± 14.58	
Napping	33.15 ± 11.51	34.08 ± 12.10	31.98 ± 12.25	Nap ≥ 10 mins
Frequency/day	2.50 ± 1.47	2.55 ± 1.34	2.47 ± 1.68	
Inactivity or brief dozing	129.66 ± 83.02	139.59 ± 95.17	118.85 ± 81.39	Nap < 10 mins
Frequency/day	31.44 ± 14.11	32.50 ± 16.27	29.33 ± 13.54	
Epworth sleepiness scale total score	7.65 ± 5.36	6.8 ± 4.25	8.8 ± 6.21	Not sleepy (<11)
Not sleepy	30 (75%)	13 (81.25%)	13 (65%)	Sleepy (≥11)
Sleepy	10 (25%)	3 (18.75%)	7 (35%)	

mins = minutes; TST = total sleep time.

Table 3. Concordance and Discordance between Qualitative and Quantitative Data in Older Adults, with Illustrative Quotes ($n = 36$).

Sleep group	Construct	Overall	Concordant group	Discordant group
Good	Napping/resting			
	N (%)	19 (100%)	13 (68.4%)	6 (31.6%)
	Mean ± SD	175.81 ± 92.84	202.22 ± 94.76	109.934 ± 43.16
	Qualitative exemplar		". . .I'm home, and I'm bored. . . I may nap during the day."	"I never take a nap. . . if I get. . .tired or something I'll do something."
	Daytime sleepiness (ESS)			
	N (%)	19 (100%)	16 (87.5%)	3 (12.5%)
	Mean ± SD	6.68 ± 4.07	5.82 ± 3.26	13.00 ± 2.65
	Qualitative exemplar		"I'm not tired at all."	"I feel rested."
Poor	Napping/resting			
	N (%)	17 (100%)	11 (64.7%)	6 (35.3%)
	Mean ± SD	144.4 ± 79.90	139.58 ± 67.39	153.24 ± 105.84
	Qualitative exemplar		"During the course of the day. . . because I have not slept concretely. . . I tend to doze off."	"No. I can't take no nap. I gotta go to sleep next night.
	Daytime sleepiness (ESS)			
	N (%)	17 (100%)	7 (41.2%)	10 (59.8%)
	Mean ± SD	9.29 ± 6.52	15.86 ± 4.18	4.70 ± 2.63
	Qualitative exemplar		"My body be tired."	"It's a very seldom during the day that I feel sleepy. It's. . .very rare that I would take a nap."

Note. Concordance for daytime function refers to good sleepers who have no reported daytime sleepiness and poor sleepers with daytime sleepiness. Concordance for naps refers to those that said they napped on interview and had evidence of napping on actigraphy.

"I'm a little exhausted. . .I lay down for a couple hours. . .wake back up." Scores on ESS were primarily discordant among the poor sleeping group (59.8%), such that although they reported being poor sleepers, they did not report daytime sleepiness on ESS. Of those in the discordant group of poor sleepers, half mentioned being sleepy during the interview with an inability to sleep and had maladaptive beliefs toward sleep: "The only worries or concerns that I have about my sleep is that I get enough sleep. . .and when it's time for me to go to sleep that I can go to sleep." The others did not mention being sleepy during the day and had a sense of adaptation, "I don't have any worries about it (sleep). It's just one of those things that happen to some people."

Of the 35 participants who discussed naps during the interview, 26 napped daily or occasionally and nine (2 good; 5 poor; 2 variable sleepers) specified they do not nap. After an in-depth review of interviews of those who did not discuss napping, we concluded that despite objective evidence of napping, these participants did not

perceive napping during the day. They discussed being very active during the day and having busy schedules, with no discussion of taking time to rest.

About two-thirds of the sample recognized they napped at least occasionally during the day; one-third did not. Participants generally did not recognize the full extent to which they napped or dozed each day. One woman in her 80s, classified as a poor sleeper but without subjective reports of daytime sleepiness, had a mean nap duration of 83 minutes and a mean total sleep time of 523 minutes said, "Don't understand it. . .by me not sleeping well at night, you would think I would wanna nap during the day, but not me. I'm still just as wide awake." There was no difference between the mean number of napping minutes per day for those who said they napped or did not nap.

Discussion

The purpose of this study was to describe perceptions and beliefs about daytime sleepiness and napping and examine subjective and objective daytime sleep characteristics in nursing-home eligible community dwelling older adults. We found that participants took naps for various reasons while others resisted taking naps, even when they felt sleepy. In addition, few participants reported daytime sleepiness, despite enrolling participants with self-identified good and poor sleep. Our actigraphy data showed that our sample napped frequently throughout the day; these nap episodes were fragmented. These older adults did not always recognize that they napped or how much they napped.

Only a quarter of our sample reported daytime sleepiness, despite having objective nocturnal sleep disruptions (McPhillips et al., 2019) and frequent napping during the day. This is consistent with other studies of community dwelling older adults, which report EDS prevalence of 15% to 30% (Carvalho et al., 2017; Gooneratne et al., 2003; Jaussent et al., 2012; Lima et al., 2015). Given that our sample is more matched in terms of functional limitations and comorbidities to those in nursing homes, we anticipated the prevalence of EDS to be higher (upwards of 70% in nursing homes) (Martin et al., 2006). There are a few possible explanations for the low reports of daytime sleepiness.

First, older adults may not report sleepiness because they may have an inability to sense sleepiness. Research on interoception, the perception of stimuli that originate within the body (Craig, 2004) or the internal sense of the condition of the body (Harshaw, 2015) suggests that interoception declines with age. For example, studies have shown that the ability to feel resting heart beat (Khalsa et al., 2009), accurately identify prevailing heart rhythms in atrial fibrillation (Garimella et al., 2015), feel pain (Gibson & Farrell, 2004), and sense dyspnea (Bednarek, et al., 2008) all decline with age. There is also evidence to suggest the pathophysiology of heart failure may neutralize perceptions of (Arzt et al., 2006; Masterson Creber et al., 2016; Rao et al., 2006), even when there is evidence of objective sleepiness (Masterson Creber et al., 2016). Therefore, these older adults with multiple chronic conditions may not be able to sense that they feel sleepy due to declines in interoception or the complex pathophysiology of their medical conditions.

In additional to pathophysiological processes that accompany chronic medical conditions, almost half of the participants had a diagnosed mental health disorder (mostly anxiety and depression) and all were taking multiple medications. We know that there is an association between daytime sleepiness, and anxiety and depression and that they often co-exist (Foley et al., 2007; Gould et al., 2018). We also know that certain classes of medications can contribute to daytime sleepiness (Brewster et al., 2018), while others may promote alertness (Trotti et al., 2017). Therefore, the presence of both physical and mental health disorders as well as taking medications might have also affected perceptions of daytime sleepiness.

Another possible explanation for low reports of daytime sleepiness could be that the ESS may not adequately capture sleepiness in this population. One criticism of the instrument is that it includes two questions related to driving and being a passenger in a vehicle. The total ESS score is an aggregate sum, so if an older adult does not drive and therefore skips these questions, their scores will inherently be lower (higher scores indicate more sleepiness). In our study, we asked the participants each question to prevent omitted responses and prompted our participants to answer the driving question as if they were a passenger in a vehicle; we know they spend time as passengers because they are transported to PACE in vans. That said, half of our poor sleepers who were not considered sleepy based on score on the ESS did mention being sleepy or tired during the qualitative interview. Perhaps in our case, it is not omitted questions driving the low sleepiness rates, but the cut point for discriminating sleepy versus not sleepy may not be accurate for this population (Onen et al., 2013). Other investigators have lowered the cut point for various disease states, such as heart failure (Masterson Creber et al., 2016; Riegel et al., 2011).

Older adults may also not perceive or report daytime sleepiness due to age-related changes in perception; they may have become accustomed to daytime sleepiness and not perceive it as problematic (Unruh et al., 2008; Vitiello et al., 2004; Zilli et al., 2009). This finding is consistent with other research in healthy older adults that found older adults tend to adapt their perception of what is "acceptable" sleep and do not necessarily complain even in the face of compromised sleep quality (Buysse et al., 1992; Vitiello et al., 2004). Additionally, older adults may not worry about daytime sleepiness because they have fewer daytime demands and performance requirements which may be met with less sleep (Unruh et al., 2008) or they have the option to nap.

Our participants may have been dozing on and off for short periods of time frequently throughout the day. On average, they took 2 to 3 naps (>10 mins per nap) for a total of 33 minutes a day, which accounted for only 20% of total resting time during the day. Prior studies reported that older adults napped more frequently than younger groups (Furihata et al., 2016). We found discrepancy between actigraphically defined nap and self-reported naps. These results are similar to those of a study of older adults referred to a sleep center; almost 40% failed to perceive that they were napping when undergoing a multiple sleep latency test, an objective measure of daytime sleepiness (Nguyen-Michel et al., 2015). These authors reported that those with low sleepiness scores were less likely to perceive napping. Other studies support our findings that older adults nap more as they age, yet underreport naps (Dautovich et al., 2008; Foley et al., 2007; Jean-Louis et al., 2000). The underreported daytime naps may indicate that older adults tend to take naps unintentionally or doze off briefly without noticing themselves, which was found in our sample. Experts from the America National Sleep Foundation reached a consensus that more than four naps per day was an indicator of poor sleep health in older adults (Ohayon et al., 2017). Also, frequent dozing off and multiple naps within a day has been reported as a detriment to older adults' health in general (Neikrug & Ancoli-Israel, 2010; Takahashi, 2003).

Consistent with the literature, our sample took daytime naps due to inadequate nighttime sleep, daytime sleepiness, tiredness, and being bored (Li et al., 2018). We also found that the personal belief or experience on how naps affect health impact older adults' napping behaviors. For example, participants choose to nap regularly because they believed naps could positively impact their physical and emotional well-being. While others intentionally avoided daytime naps even they felt sleepy because they believed napping would disturb their nighttime sleep. Little research has been done to examine the effect of daytime naps on nighttime sleep and other health consequences in people with inadequate nighttime sleep. We are uncertain of the health consequences of avoiding napping in these older adults.

Our sample may not perceive sleepiness or napping and may not bring these issues up at a healthcare visit. Thus, providers must initiate conversation about daytime sleepiness and napping in this group. Given the time constraints associated with health care visits and the complexity of the population (multiple chronic conditions and co-existing mental health problems), providers should use brief screening questionnaires that could quickly provide insight into sleep problems. Proactively assessing daytime sleep and napping is critical, as it can provide insight into treatment options that have the potential to mitigate unwanted health consequences.

Further research is greatly needed in this at-risk population. Replication studies with a larger sample size would provide more insight into relationships between daytime sleep and other factors such as specific comorbid conditions. Longitudinal studies would clarify associations between daytime sleepiness and multiple chronic conditions and the direction of causality. Additional research can also focus on specific sleep disorders and sleep measures that are more suitable for use in at-risk older adults. Intervention studies that focus on increasing stimulating activities during the day for older adults to decrease dozing, quiet resting, and napping during the daytime are warranted. Lastly, research is needed to determine health benefits and consequences of both planned and unplanned napping in this population.

Our results are only generalizable in other PACE settings with comparable demographics, primarily female and Black. Given that we recruited our sample from one PACE center, which provided older adults with various physical and social activities throughout the day, the characteristics of daytime napping observed in our sample may be different from that found in nursing home eligible older adults without access to daytime services. Furthermore, we only asked one question during screening to determine self-perceptions of sleep and did not screen for specific sleep disorders. Additionally, the most widely used sleep research instruments were developed in younger adults and we found discordance between subjective interviews and sleep surveys. Actigraphy was our objective measure of sleep, but actually measures movement. Given that activity is relatively low in this population, we may have overestimated the nap variables. To address this issue, we used 10 minutes of inactivity as a cutoff for naps and defined any daytime sleep less than 10 minutes as inactivity or briefly dozing.

In conclusion, these older adults were napping daily; yet rarely reported daytime sleepiness and did not always recognize the extent of their napping. There was lack of congruence between subjective and objective measures of daytime sleep; thus using multiple methods of assessing sleepiness and napping is important. Increasing stimulating activities for older adults may help to reduce dozing, quiet resting, and napping during the daytime. Lastly, more research is needed to determine health benefits and consequences of both planned and unplanned napping in this population.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This worked was supported by the National Institute of Nursing Research, Mentored Career Development Award (K23NR018487), Ruth L. Kirschstein National Research Service Award (NRSA) in *Individualized Care for At Risk Older Adults* (T32NR009356), Ruth L. Kirschstein NRSA in

Training in Sleep and Sleep Disorders (T32HL07953) and Frank Morgan Jones, Tyson, and Sigma Theta Tau Funding.

ORCID iDs

Miranda V. McPhillips https://orcid.org/0000-0002-0741-1545
Nancy A. Hodgson https://orcid.org/0000-0001-8862-9986

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