



Profiles of sedentary behaviors in the oldest old: findings from the National Health and Aging Trends Study

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Abstract

Background Sedentary behavior is a significant health risk. Emerging research suggests that mentally active sedentary behaviors (e.g., computer use and reading) are associated with better health than mentally passive sedentary behaviors (e.g., watching TV). However, these relationships are not well established in the literature, and little is known about the oldest old (age ≥ 80).

Aims The aims of this study were to (1) identify distinct subgroups of oldest old adults based on six domains of sedentary behavior (watching TV, using a computer/tablet, talking to friends or family members, doing hobby or other activities, transportation, and resting/napping); and (2) compare health-related outcomes across identified subgroups, using the National Health and Aging Trends Study (NHATS) dataset.

Methods Latent profile analysis was used to identify distinct profiles of sedentary behavior. Design-based linear and logistic regressions were used to examine associations between different profiles and health outcomes, accounting for socio-demographic characteristics.

Results A total of 852 participants were included. We identified four profiles and named them based on total sedentary time (ST) and passive/active pattern: “Medium-passive”, “High-passive”, “Low”, “High-mentally active”. Compared to the “High-passive” group, “Low” group and “High-mentally active” group were associated with fewer difficulties with activities of daily living, fewer problems limiting activities and higher cognitive function.

Conclusion This study, with a national representative sample of the oldest old population, suggests that both total ST and sedentary behavior pattern matter when evaluating health outcomes of being sedentary. Interventions should encourage oldest old adults to reduce ST and especially target mentally passive ST.

Keywords Sedentary behavior · Older adults · Oldest old · Latent profile analysis

Higher sedentary time is associated with poor health outcomes, including cardiovascular disease, cancer, all-cause mortality, cognitive decline, frailty, and poorer physical function [1–4]. Sedentary behavior is defined as any behavior in a sitting or lying position with an energy expenditure ≤ 1.5 metabolic equivalents [5]. Adults aged 80 and older, referred to as the oldest old, tend to spend large

amounts of time in sedentary behaviors [6]. Recent studies have explored the health effects of different types of sedentary behavior in older adults (≥ 60 years) [7, 8], however, these relationships are not well established and little is known about the patterns of sedentary behavior among oldest old adults.

Some sedentary behaviors involve cognitive engagement and can be classified as mentally active, while other sedentary behaviors are mentally passive [9, 10]. Mentally passive sedentary behaviors include watching television (TV), sitting around, and listening or talking while sitting [11]. Mentally active sedentary behaviors include using a computer and hobbies such as reading, playing games, or doing crafts [11]. Evidence suggests that mentally passive sedentary behaviors are associated with more depressive symptoms in adults and worse cognitive function and higher psychological distress

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in older adults, while mentally active sedentary behaviors may reduce depression and improve cognitive performance [11–13]. Higher TV viewing time has been associated with worse cardiometabolic outcomes in older adults [7, 11, 14, 15]. In these studies, mentally active sedentary behavior was either not associated with cardiometabolic outcomes or was associated with better outcomes (lower BMI) [7, 11, 14, 15] although the association with weight may change when mentally active sedentary behavior exceeds 3 h per day [11]. In addition, less time spent watching TV and more time in mentally active sedentary behaviors may contribute to successful aging (fewer health deficits) [16]. Only one known study has examined specific domains of sedentary behavior in an oldest old population, this study focused solely on the outcome of psychological distress [17].

Understanding how different types of sedentary behavior cluster and how different profiles are related to socio-demographic characteristics and health outcomes beyond psychological distress in oldest old adults could have important implications for designing interventions to reduce specific types of sedentary behavior associated with harmful health effects. The aims of this study were to (1) use latent profile analysis to identify distinct groups of older adults (≥ 80 years) with similar sedentary behavior based on time spent in six domains of sedentary behavior (watching TV, using a computer/tablet, talking to friends or family members, doing hobbies or other activities, transportation, and resting/napping); and (2) compare socio-demographic characteristics and health-related outcomes across identified groups, using the nationally representative National Health and Aging Trends Study (NHATS) dataset.

Methods

Data sources and study population

The NHATS dataset is a national longitudinal cohort study with annual survey waves of Medicare beneficiaries aged 65 and older living in the community, residential care, and nursing homes [18]. Data have been collected since 2011 from a sample of respondents (Round 1), and in 2015, the sample was replenished (Round 5). In both Rounds 1 and 5, participants were selected using a stratified three-stage sample design with oversampling of older persons (aged 90 and older) and Black non-Hispanic individuals [18]. In each round, an analytic weight was calculated by the NHATS leadership which accounted for differential probabilities of selection and adjusted for potential bias related to unit non-response. The weighted response rate at each round ranged from 71.5 to 96% [18].

The current study analyzed data from Round 6 of the NHATS which was collected in 2016. In Round 6, 7276

interviews were completed. A random subset comprising one-third of participants were asked questions about sedentary behavior ($n = 2141$). Participants who were at least 80 years old in Round 6 and had complete data on six domains of sedentary behavior were eligible for inclusion. A total of 1289 were excluded from the 2141 respondents: 1158 were younger than 80 years old and 131 did not have complete information about sedentary behaviors, leaving a study sample of 852 participants.

Measures

Sedentary behaviors were assessed using questionnaire items modeled after existing instruments [19], Dori E. [20]. These items measured time spent on six types of sedentary behavior, including (1) sitting or lying down to watch TV, (2) sitting and using a computer or tablet, (3) sitting and talking to friends or family members, (4) sitting to do hobbies or other activities such as reading, playing cards, puzzles, or crafts, (5) driving or riding somewhere as a passenger, and (6) laying down to rest or take a nap. Participants were asked “how many of the last 7 days”, “how many hours on a typical day” and “how many minutes on a typical day (if less than 1 h)” they spent in each sedentary behavior. For each sedentary behavior, sedentary time was computed as number of days/week multiplied by number of h/day. Total sedentary time was calculated as the sum of time spent on all six types of sedentary behavior per week. Some of the six sedentary behaviors have been characterized in the literature as mentally passive (watching TV, talking, resting/napping) or mentally active (computer use, hobbies), while other sedentary behaviors are not as well defined [11].

We analyzed five socio-demographic characteristics including: (1) age (measured in 5-year bands), (2) sex, (3) race/ethnicity, (4) educational level, and (5) marital status. We analyzed seven health-related outcomes. Self-rated health was rated as excellent, very good, good, fair, or poor. Body mass index (BMI) (calculated based on self-reported height and weight) was used both as a continuous measure and to categorize participants as underweight, normal, overweight, or obese. Number of chronic conditions was based on self-reports of the following chronic conditions: heart attack, heart disease, blood pressure, arthritis, osteoporosis, diabetes, lung, stroke, dementia and cancer. Number of difficulties in activities of daily living (ADL) was based on validated items assessing difficulty with the following activities: eating, showering or bathing, using the toilet, getting dressed, getting out of bed, and getting around inside the home [21]. Number of problems limiting activities was based on self-reports of the following problems: pain, breathing, upper body strength, lower body strength, low energy, and balance coordination problems. A depression

and anxiety score was obtained by summing responses for the two items in Patient Health Questionnaire-2 and two items in the Generalized Anxiety Disorder-2 scale [22, 23]. The total depression and anxiety score ranged from 4 to 16, with a higher score indicating poorer mental health. Cognitive function was assessed using immediate word recall score, which ranged from 0 to 10 with a higher score indicating better cognitive function [24].

Statistical analysis

The final sample included 852 participants (≥ 80 years) who had complete data on all six types of sedentary behaviors. To identify profiles/groups of people with similar patterns of sedentary behavior, we conducted an exploratory (with no covariates) Latent Profile Analysis (LPA) using Mplus version 8.0. To select an optimal number of profiles/groups, the model fit was assessed using the Bayesian Information Criterion (BIC), Vuong–Lo–Mendell–Rubin Likelihood Ratio Test (VLMR), Lo–Mendell–Rubin adjusted likelihood ratio test (LRT), and entropy measures. The best fit was determined by a low BIC to indicate a good fit and high entropy to indicate a good separation of the latent profiles/groups; significant VLMR and LRT tests were also assessed to compare adjacent lower and higher order class solutions (e.g., 3-class solution versus 2-class solution) to determine the optimal number of groups [25–27]. The resulting groups were then profiled and defined based on their overall level of sedentary time and the types of sedentary behavior where they spent the most time.

Once the profiles were defined, we used Stata/SE 17.0 software to compare the sedentary time, socio-demographic, and health-related outcomes across the identified subgroups of sedentary behavior. The complex sample design (stratification and primary sampling units) and sampling weights in Round 6 were accounted for in the analyses. Taylor series linearization methods were used for variance estimation. A subpopulation of participants who were aged ≥ 80 and who had completed all six sedentary behavior items was created ($n = 852$), while accounting for the full sample design. Descriptive statistics (percentages for categorical variables, means and standard errors for continuous variables) were calculated to summarize the sedentary time, socio-demographic, and health-related outcomes. Bivariate analyses were used to compare the socio-demographic and health-related outcomes of different groups; bivariate differences were assessed with Rao–Scott Chi-square tests for categorical variables and design-based F-tests for continuous variables. To control for socio-demographic characteristics (age, sex, race/ethnicity, educational level, marital status), we conducted design-based linear regression analyses to determine whether BMI, the number of chronic conditions, number

of difficulties in ADL, number of problems limiting activities, anxiety and depression, and word recall were different among groups. The adjusted coefficients and 95% confidence intervals (95% CI) were provided. We also conducted design-based logistic regression analyses to determine whether the self-rated health (excellent or not) was different among groups, controlling for socio-demographic characteristics. The adjusted odds ratios (aOR) and 95% CI were calculated.

Results

Characteristics of study population

Fifty percent of the participants were 80–84 years old. Most were female (59.68%), Non-Hispanic White (83.76%), single/divorced/widowed (58.17%), overweight/obese (57.31%), reported excellent/very good/good health (72.34%), and did not obtain college degree (78.38%). They reported an average of 2.77 chronic conditions, 0.96 difficulties with ADL, and 1.48 problems limiting activities. Their average depression and anxiety score was 6.04 (score range 4–16) and average word recall was 4.01 (score range 0–10) (see Table 1).

Identified groups

Overall, individuals reported a total of 46.86 ± 1.07 h/week sedentary time (TV = 16.91 ± 0.57 ; talking = 8.66 ± 0.33 ; computer = 3.68 ± 0.32 ; hobbies = 8.65 ± 0.38 ; transportation = 4.17 ± 0.19 ; resting = 4.77 ± 0.33). The results of the LPA indicated that a four-class solution provided both optimal fit and an interpretable number of distinct groups/profiles based on the six different types of sedentary behavior (see Supplemental Table 1 for detail). Figures 1 and 2 show group profiles based on the composite sedentary behavior score and the six different types of sedentary behavior. In terms of total sedentary time, Group 2 and Group 4 were high (74–84 h/week), Group 1 was medium (62.5 h/week), and Group 3 was low (34 h/week). In terms of sedentary behavior pattern (mentally active/passive), Group 1 was high in passive sedentary behavior (TV), Group 2 was high in passive sedentary behavior (TV, talking, resting), Group 3 was low in all sedentary behavior, and Group 4 was high in mentally active sedentary time (computer, hobbies). Based on the total sedentary time and sedentary behavior pattern, Group 1 was named “*medium-passive*”, Group 2 was named “*high-passive*”, Group 3 was named “*low*”, and Group 4 was named “*high-mentally active*”.

Table 1 Socio-demographic and health-related outcomes across distinct subgroups (design adjusted mean or proportion)

Characteristics	Total	Group 1 (Medium-passive)	Group 2 (High-passive)	Group 3 (Low)	Group 4 (High-active)	Statistics
Sample size, no	852	201	69	541	41	
Socio-demographic characteristics						
Age, %						
80–84	50.05	40.51	49.43	52.11	66.42	$P < 0.05$
85–89	33.13	42.49	22.42	31.49	27.71	
90 and older	16.83	17.00	28.15	16.41	5.87	
Sex, %						
Male	40.32	39.50	43.80	40.34	38.82	$P = 0.97$
Female	59.68	60.50	56.20	59.66	61.18	
Race and ethnicity, %						
Non-Hispanic White	83.76	78.32	86.71	85.15	86.38	$P = 0.08$
African American	7.50	7.48	10.19	7.44	4.60	
Hispanic	5.72	11.34	1.82	4.66	0.00	
Other	3.02	2.86	1.27	2.75	9.02	
Education status, %						
Less than college degree	78.38	87.97	83.86	75.96	59.43	$P < 0.001$
College degree	21.62	12.03	16.14	24.04	40.57	
Marital status, %						
Not married	58.17	59.09	61.53	57.95	52.42	$P = 0.85$
Married	41.83	40.91	38.47	47.58	47.58	
Health-related outcomes						
Self-rated health, %						
Excellent	8.99	6.02	2.67	9.67	21.63	$P < 0.05$
Very good	29.93	26.74	31.65	30.61	32.92	
Good	33.42	35.88	34.08	32.86	28.87	
Fair	21.74	20.15	24.44	22.48	16.58	
Poor	5.92	11.21	7.17	4.37	0.00	
BMI, %						
Underweight	3.06	4.35	0.00	2.87	4.05	$P = 0.31$
Normal	39.62	30.88	42.78	43.22	31.36	
Overweight	37.26	43.29	32.68	35.48	38.81	
Obese	20.05	21.47	24.54	18.43	25.78	
No. of chronic conditions, mean (SE)	2.77 (0.06)	2.98 (0.11)	2.81 (0.28)	2.71 (0.07)	2.59 (0.25)	$P < 0.05$; 1 > 3
No. of difficulty with ADL, mean (SE)	0.96 (0.07)	1.24 (0.13)	1.49 (0.22)	0.85 (0.08)	0.47 (0.18)	$P < 0.01$; 1 and 2 > 3 and 4
No. of problems limiting activities, mean (SE)	1.48 (0.09)	1.82 (0.15)	1.89 (0.22)	1.35 (0.11)	1.03 (0.30)	$P < 0.01$; 1 and 2 > 3 and 4
Depression and anxiety, mean (SE)	6.04 (0.12)	6.35 (0.18)	6.43 (0.50)	5.97 (0.13)	5.22 (0.38)	$P < 0.05$; 1 and 2 > 4
Word recall, mean (SE)	4.14 (0.07)	3.86 (0.13)	3.58 (0.24)	4.19 (0.09)	5.31 (0.26)	$P < 0.01$; 4 > 3 > 1 and 2

National estimates based on complex survey design

ADL activities of daily living, SE standard error

P value compares older adults in different subgroups

Differences in socio-demographic and health-related outcomes across subgroups

Table 1 compares socio-demographic and health-related outcomes across the four subgroups. Compared to Group

3 “low” and 4 “high-mentally active”, individuals in Group 1 “medium-passive” and 2 “high-passive” were older, had lower education levels, were more likely to report poor health, report more difficulties with ADL, report more problems limiting activities, and had lower cognitive function

Fig. 1 Total sedentary time across different subgroups (design adjusted mean and 95% CI)

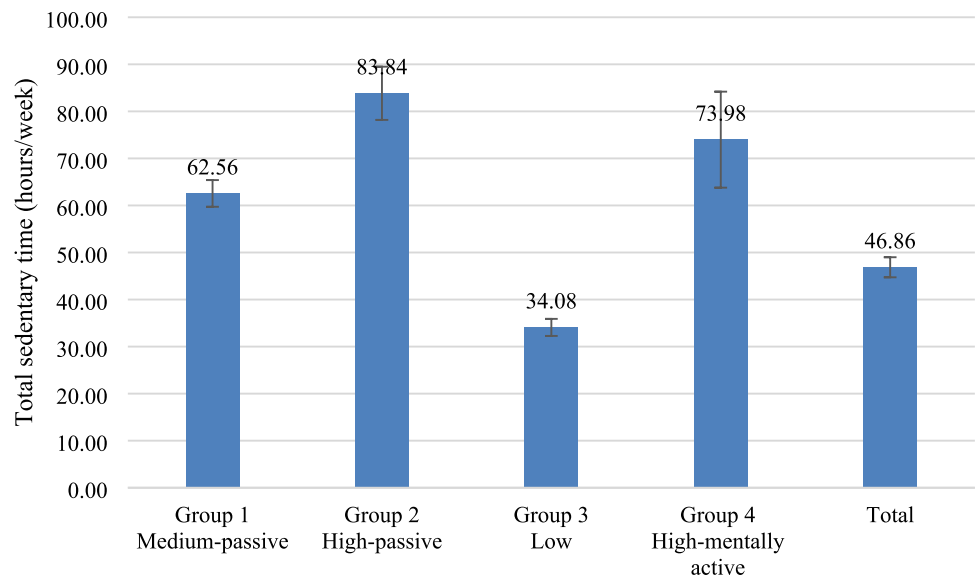
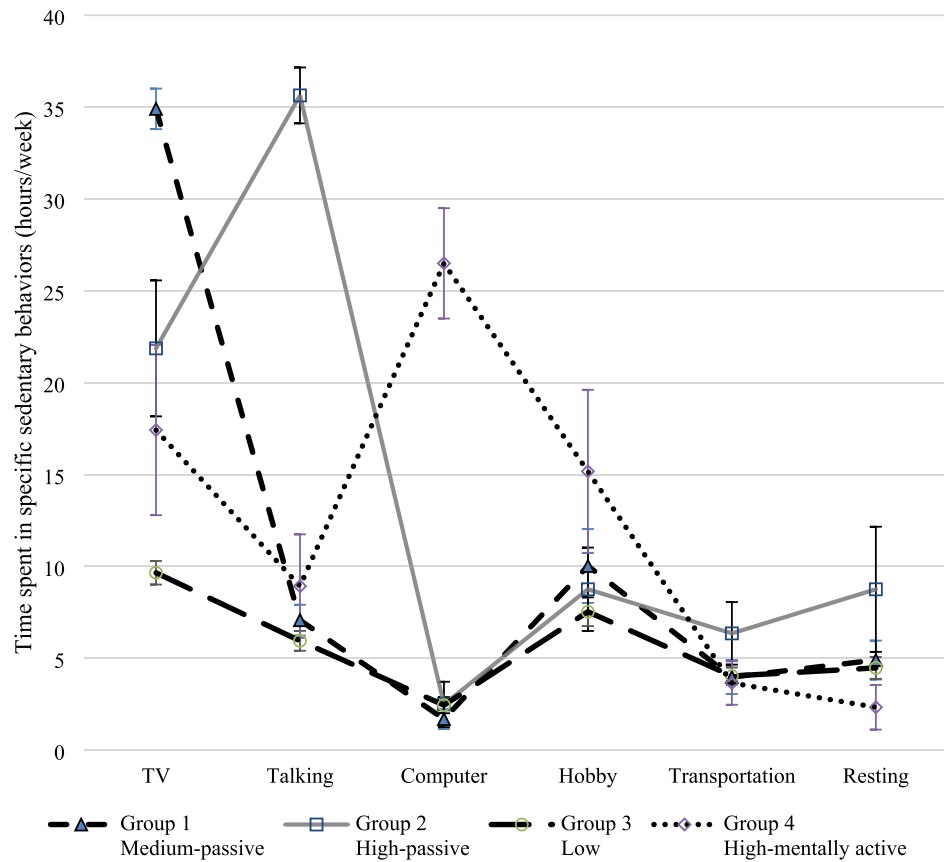


Fig. 2 Six sedentary behaviors across different subgroups (design adjusted mean and 95% CI)



(recalled fewer words). In addition, individuals in Group 1 “medium-passive” reported more chronic conditions compared to Group 3 “low”; Individuals in Group 1 “medium-passive” and 2 “high-passive” had higher depression and anxiety scores compared to Group 4 “high-mentally active”.

Table 2 and Supplemental Table 2 show the relationships between identified subgroups and health-related outcomes, controlling for socio-demographic characteristics. Linear regression models showed that membership in Group 3 “low” and 4 “high-mentally active” were associated with fewer

Table 2 Weighted estimates of adjusted coefficients in linear regression models of health-related outcomes

Independent variables	BMI b (SE)	No. of chronic conditions b (SE)	No. of difficulty in ADL b (SE)	No. of problems limiting activities b (SE)	Depression and anxiety b (SE)	Word recall b (SE)
Subgroups						
Group 1 (medium-passive)	− 0.40 (0.85)	0.09 (0.31)	− 0.28 (0.24)	− 0.13 (0.28)	− 0.41 (0.49)	0.38 (0.29)
Group 2 (high-passive)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)
Group 3 (low)	− 1.06 (0.74)	− 0.08 (0.28)	− 0.55 (0.22)*	− 0.55 (0.22)*	− 0.49 (0.45)	0.45 (0.22)*
Group 4 (high-mentally active)	− 0.22 (1.13)	− 0.13 (0.33)	− 0.84 (0.32)*	− 0.80 (0.38)*	− 1.04 (0.51)*	1.21 (0.33)**
Age						
80–84	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)
85–89	− 1.40 (0.40)**	0.07 (0.13)	0.25 (0.11)*	− 0.01 (0.14)	− 0.05 (0.23)	− 0.37 (0.14)**
90 and older	− 2.40 (0.54)***	0.21 (0.16)	0.48 (0.14)**	0.25 (0.17)	0.13 (0.23)	− 0.81 (0.20)***
Sex						
Male	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)
Female	− 0.98 (0.50)	0.31 (0.14)*	− 0.12 (0.12)	0.01 (0.18)	0.41 (0.26)	0.64 (0.13)***
Race and ethnicity						
Non-Hispanic White	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)
African American	0.99 (0.70)	0.21 (0.14)	0.39 (0.16)*	0.02 (0.17)	0.17 (0.29)	− 0.41 (0.17)*
Hispanic	1.51 (1.20)	0.23 (0.24)	0.20 (0.19)	0.23 (0.36)	1.36 (0.53)*	− 1.28 (0.28)***
Other	− 0.19 (1.64)	− 0.08 (0.29)	0.41 (0.47)	0.07 (0.47)	0.68 (0.72)	− 0.02 (0.43)
Education status						
Less than college	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)
College degree	− 0.91 (0.35)*	− 0.37 (0.16)*	− 0.07 (0.15)	− 0.01 (0.21)	− 0.87 (0.21)***	1.00 (0.19)***
Marital status						
Not married	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)	0.00 (reference)
Married	− 0.62 (0.46)	0.06 (0.13)	− 0.10 (0.11)	− 0.06 (0.17)	0.18 (0.26)	0.07 (0.15)

Models are adjusted for complex survey design

ADL activities of daily living, SE standard error

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$

difficulties with ADL, fewer problems limiting activities, and better cognitive function/higher word recall, compared to Group 2 “high-passive”. In addition, membership in Group 4 “high-mentally active” was associated with lower depression and anxiety scores compared to Group 2 “high-passive”. Identified subgroups were not associated with BMI or number of chronic conditions. Logistic regression model showed that individuals in Group 3 “low” and 4 “high-mentally active” were more likely to report excellent health, compared to Group 2 “high-passive”.

Discussion

We identified four subgroups of oldest old adults based on their different levels and types of sedentary behavior (mentally active vs. passive). We demonstrated that both total sedentary time and the type of sedentary behavior matter when evaluating health outcomes of sedentary behavior in the oldest older adults. For example, individuals with high total sedentary time but a mentally active pattern may

have fewer difficulties with ADLs, fewer problems limiting activities, lower anxiety and depression and higher cognitive function, compared to individuals with high total sedentary time but a passive pattern. Based on our review of published literature, this is the first analysis to examine associations between different sedentary profiles (total sedentary time and passive/mentally active pattern) and health-related outcomes in a nationally representative sample of the oldest old population.

We found that individuals with low total sedentary time reported better physical and cognitive outcomes. This confirms findings from previous studies, and it is well established that low sedentary time is protective [28, 29]. Total sedentary time in the oldest old was lower in this study compared to other studies with objective measures. A recent meta-analysis found that oldest old adults are sedentary for an average of 10.6 h/day when sedentary behavior is measured with objective devices [6]. This is not surprising considering underestimation of self-reported sedentary time is common [30], and sedentary behaviors may go beyond the six sedentary behaviors measured in this study, such as time on telephone or public transport.

In addition to total sedentary time, our study also supported the relationships between sedentary pattern (passive versus mentally active) and three health outcomes, cognitive performance, mental health, and physical performance. These relationships are not well established in the literature; this study confirms the relationship using a nationally representative dataset and extends findings from general older adults to the oldest old. Given the cross-sectional nature of analysis, we could not clarify the direction of these relationships. Better cognitive or physical function and mental health could increase the ability or willingness to engage in mentally active sedentary behaviors [16, 31]. Conversely, mentally active sedentary pattern could contribute to better cognitive, mental, and physical health outcomes, as discussed below.

First, we found that a mentally active sedentary pattern was associated with better cognitive performance, which is consistent with a prior study in general older adults [13]. The cognitive stimulation required by mentally active sedentary activities may reduce cognitive decline, potentially by building cognitive reserve [7, 13]. Second, we observed that a mentally active sedentary pattern was associated with lower anxiety and depression compared to a passive pattern. This result is in line with prior studies in adults and older adults which found that passive sedentary behavior is associated with depression and lower mental health-related quality of life [7, 9, 9, 10, 10]. Common passive sedentary behaviors such as TV watching may be more socially isolating and contribute to negative ruminations more than mentally active sedentary behaviors [9, 10].

In addition, we found that a passive sedentary pattern was associated with more difficulty with ADLs and problems limiting activities. Prior research regarding the relationship between passive sedentary time and physical function has been inconsistent. Some reported that higher passive sedentary behaviors were associated with worse physical performance (e.g., grip strength, walking, agility) and frailty in older adults, while mentally active sedentary behaviors were associated with better physical function [7, 32] or had no relationship with physical function [33], D. E. [34]. Higher passive sedentary behaviors in adults 60 and older contribute to accelerated accumulation of functional and mental health deficits, an indicator of less successful aging [16]. In contrast, one study found that measures of physical performance were not associated with different types of sedentary behaviors in adults 65 and older [35] and another study found that not watching TV was associated with disability [36]. It is not well understood why different types of sedentary behavior may differentially affect physical health and function because all sedentary behaviors involve muscular inactivity. One explanation is that TV viewing may be more harmful to physical health than other sedentary behaviors because it is associated with unhealthy eating habits [7].

In our study, those with higher educational level tended to spend more time in mentally active sedentary behavior. This is in line with previous research indicating that TV viewing time is greater in adults with lower education, while higher education is associated with increased computer use (a mentally active sedentary behavior) [37].

We are not aware of other studies reporting sedentary times within different domains for oldest old adults, but studies of adults aged 60 and older have reported similar amounts of time spent watching TV, using a computer, reading/doing hobbies, and in transportation as we found here in adults aged 80 and older. [7, 11, 13, 14, 38]. TV watching time is typically the most prevalent sedentary behavior in older adults and this is consistent with our findings in the oldest old [7, 11, 13, 38, 39]. In our analysis, time spent talking was higher than previous studies that reported time socializing in adults aged 60 and older (1.24 vs. 0.5–0.8 h/day) [7, 14].

The above findings highlight the importance of assessing various domains of sedentary behavior in addition to overall sedentary time in research and practice. Future research may consider measuring total sedentary time with objective measures and sedentary context with self-reported measures. Future research is needed to establish differential health effects of various sedentary activities in oldest old adults and establish directions of causality.

In terms of practical implementation, more harmful types of sedentary behavior such as TV watching could be specifically targeted through interventions, e.g., using TV control devices to restrict access to TV [40]. TV watching

presents an important opportunity for reducing sedentary time as it is often the most common sedentary behavior and has been consistently associated with worse health outcomes. Interventions also could be tailored for individuals according to their baseline patterns of sedentary behavior, such as the types of subgroups identified in this analysis. Future policies could encourage oldest old adults to reduce sedentary time and especially target mentally passive sedentary time.

This study had some strengths and limitations. The use of a nationally representative dataset was a major strength as the results are generalizable to the oldest old adults in the United States. As mentioned above, the cross-sectional analysis prevents us from drawing conclusions about the direction of the relationships between domains of sedentary behavior and the health-related outcomes. In addition, the self-report measures of sedentary behavior are not as accurate as objectively measured sedentary behavior, although necessary for assessing specific domains of sedentary behavior. Cognitive function may have also influenced the accuracy of self-reported sedentary behavior.

Conclusion

Despite the limitations, this study is the first to identify subgroups of the oldest old adults based on distinct sedentary behavior profiles using a nationally representative sample. Individuals with higher sedentary time and a passive sedentary behavior pattern tend to report worse health, more difficulty with ADLs, more problems limiting activities, higher anxiety, and depression and fewer word recall. Our study suggests that interventions may focus on overall sedentary time reduction, as well as target more harmful sedentary behaviors (e.g., TV viewing) to promote healthier aging.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s40520-022-02157-1>.

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Author contributions WZ, KW and JL contributed to the study conception and design. WZ and PL contributed to the data analysis. WZ, KW, PL and JL contributed to the preparation and revision of the manuscript. All the authors approved the final version of the manuscript.

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Data availability The NHATS data analyzed in the current study are publicly available for research purposes at www.nhats.org.

Declarations

Conflict of interest The authors declare no conflict of interest.

Ethical approval NHATS was approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board. Informed consent was obtained from the NHATS participants. This current study was exempt from an institutional ethical review because it involved a publicly available, de-identified dataset.

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