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Correlates of US Adult Physical Activity and Sedentary Behavior Patterns

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Abstract

Objectives—Physical activity and sedentary behavior patterns may be differentially associated with socio-demographic and health measures. We explored correlates of day-to-day patterns over a week in accelerometer measured physical activity and sedentary behavior to inform intervention development.

Design—Cross-sectional study

Methods—National Health and Nutrition Examination Survey (NHANES) adult participants (≥20 years) in 2003–2006 wore an accelerometer for 1 week. Accelerometer data from 7236 participants were used to derive latent classes describing day-to-day patterns over a week of physical activity and sedentary behavior. Correlates of each pattern were identified using multinomial logistic regression from 21 potential variables grouped into four domains: socio-demographic, acculturation, cardiovascular, and health history.

Results—Older age, female sex, higher body mass index, and history of chronic disease were consistently associated with lower odds of being in a more active compared to the least active class. In contrast, being employed, speaking Spanish at home, and having better self-rated health were associated with higher odds of being in a more active compared to the least active class.

Conclusions—Correlates of physical activity and sedentary behavior patterns were identified from all domains (socio-demographic, acculturation, cardiovascular, and health history). Most correlates that were positively associated with physical activity were negatively associated with sedentary behavior. Better understanding of the correlates of physical activity and sedentary behavior patterns can inform interventions to promote physical activity and reduce sedentary behavior.

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Keywords

accelerometry; motor activity; latent class analysis; surveillance; weekend warrior

Introduction

Physical activity is an essential component of ideal cardiovascular health and for the prevention of chronic disease.[1] Moreover, sedentary behavior (waking time spent sitting or reclining) is an independent risk factor for cardiovascular disease and diabetes.[2] Understanding the importance of physical activity and sedentary behavior for health has increased with the development of more sophisticated measurement tools. Measures of physical activity and sedentary behavior have progressed from simple dichotomy (active vs. inactive) to self-reported frequency and duration, and more recently to accelerometer-based measures.[3,4] Typically, accelerometer output is summarized as total time in sedentary behavior, light, moderate, and vigorous physical activity over the course of the monitoring period (usually assessed per week).[4] However, in addition to the cumulative amount, the manner in which physical activity and sedentary behavior are accumulated may be important.[5,6] For example, the health benefits of physical activity may differ for engaging in some physical activity every day compared to longer bouts of physical activity only on weekends.[7] Also, prolonged sitting is likely to be more detrimental to health than interrupted bouts of sedentary behavior.[8] To explore the relative health impacts of different frequencies and durations of physical activity and sedentary behavior we need to characterize patterns of physical activity and sedentary behavior.[9,10]

Patterns of physical activity and sedentary behavior can be explored using latent class analysis, which identifies subgroups within a population on the basis of some characteristic or set of characteristics.[11] Latent class analysis has been applied to self-reported physical activity or sedentary behavior.[12–14] Applying this approach to accelerometer data gathered over multiple days from the same individuals enables the use of more information from the accelerometer to distinguish detailed patterns of physical activity and sedentary behavior.[5,11]

Day-to-day patterns over a week of physical activity and sedentary behavior were derived for a nationally representative sample of American adults using latent class analysis of accelerometer data.[11] Patterns of average intensity of physical activity and moderate-to-vigorous physical activity (MVPA) were characterized by low levels of physical activity on all days of the week, higher levels of physical activity on most days of the week with a decrease on weekend days, or limited physical activity during the work week with longer bouts of physical activity on the weekend (Supplemental Figure 1). The latter pattern has been called the “weekend warrior” pattern.[7,15] Sedentary behavior patterns were differentiated by the average daily amount of sedentary behavior, with daily averages remaining stable across all days of the week. This study identified a high prevalence of unhealthy patterns: 66% to 80% of adults were grouped into the two least active MVPA patterns, and 31% were grouped in the two most sedentary patterns (Supplemental Figure 1).[11]

Identifying the characteristics of individuals who engaged in different day-to-day patterns of behavior over the course of a week is important to understand who is at risk for adverse health effects associated with physical inactivity and for targeting of interventions.[9,10] For example, interventions could be tailored to days of the week when people are most likely to be sedentary or to groups at highest risk for prolonged sitting to increase intervention effectiveness.[13] Our objective was to explore correlates of previously developed latent classes[11] describing patterns of physical activity and sedentary behavior among a nationally representative sample of American adults.

Methods

The study population was adults aged ≥20 years in the National Health and Nutrition Examination Survey (NHANES) 2003–2006 (N=10,020), the most recent NHANES with accelerometer assessed physical activity. Participants wore an ActiGraph AM7164 accelerometer on their right hip during waking hours for one week outside of any water-based activities. We excluded adults who did not have accelerometer data (N=1,396), whose accelerometer was not in calibration on return or was found to be faulty (N=554), or who did not wear the accelerometer for ≥8 hours per day on ≥3 days (N=834). We excluded participants <20 years because they were not asked about prior diagnoses of chronic diseases. The total sample size for this analysis was 7,236 adults. Participants provided informed consent before completing any questionnaires or measurements. The consenting documents are available for the 2003–2004 (http://www.cdc.gov/nchs/nhanes/nhanes2003-2004/brochures03_04.htm) and 2005–2006 (http://www.cdc.gov/nchs/nhanes/nhanes2005-2006/brochures05_06.htm) cohorts. The protocol for our project was reviewed for compliance with ethical guidelines by the University of North Carolina Institutional Review Board and deemed exempt. Funding agencies did not have any role in data collection, analysis, or interpretation, or in final approval of this text.

Physical activity and sedentary behavior patterns were identified from accelerometer data using latent class analysis, as described previously[11] and developed from work by Metzger et al.[5] Briefly, accelerometer data was processed to exclude non-wear time, defined as ≥90 consecutive minutes of zero counts/min allowing up to 2 minutes of nonzero counts if no counts were detected during the 30 minutes up and downstream from that interval.[16] Four measures of physical activity and sedentary behavior were developed. First, average intensity was the average counts/min per day with a higher average reflecting a greater overall volume of physical activity. Second, MVPA was defined using cutpoints originally applied to NHANES (≥2020 counts/min).[17] Third, a lower intensity threshold (≥760 counts/min) was used to define MVPA based on studies that incorporated more lifestyle activities.[18] Finally, sedentary behavior was defined as <100 counts/min.[19] Measures of MVPA and sedentary behavior were divided by the participant's daily time wearing the accelerometer to yield measures of the percent of time wearing the accelerometer in MVPA and in sedentary behavior. Percentage measures were used to best control for between participant differences in time wearing the accelerometer.

Latent class analysis was performed using MPlus software to identify patterns of activity across each day of the week (Monday—Sunday). Models with three to seven classes were explored for each variable (average intensity per day, percent MVPA per day, and percent sedentary behavior per day). The final number of classes was determined by statistical testing, class size, and substantive knowledge.[11,20] Six classes emerged for average intensity and percent MVPA using the lower threshold (≥760 counts/min), while five classes were identified for each of percent MVPA (≥2020 counts/min) and sedentary behavior (Supplemental Figure 1). For each accelerometer-based measure, participants were assigned to the latent class for which they had the highest posterior class membership probability.[11] Latent class analysis of vigorous physical activity (>5999 counts/min) was attempted but daily percentages of time in vigorous physical activity were too low to yield useful classes.

Potential correlates were selected using substantive knowledge from NHANES variables.[10,20,21] Twenty-one potential correlates were grouped into four domains: socio-demographic, acculturation, cardiovascular, and health history variables.

Socio-demographic and acculturation characteristics were self-reported. Socio-demographic correlates were age, sex, race/ethnicity, education, marital and employment status. Categories were created for age (20–39, 40–59, ≥60 years), race/ethnicity (Hispanic, non-Hispanic black, non-Hispanic white, other), and education (< high school, high school graduate/GED, > high school). Marital and employment status were dichotomized (married vs. not, employed vs. not). Acculturation correlates were language of NHANES interview (English, Spanish), language spoken at home (English, other), and time in the United States (born in US, <5 years, 5– <15 years, ≥15 years).

Cardiovascular correlates were body mass index (BMI), hypertension, smoking status, and total energy intake. BMI (kg/m^2) was calculated from measured height and weight and categorized (<18.5, 18.5– <20, 25– <30, 30– <35, ≥35 kg/m^2). Hypertension was based on self-reported prior diagnosis or measured blood pressure >140/90 mmHg. Smoking status (never, former, current) and total energy intake (<1600, 1600– <2400, ≥2400 kcal/day) were self-reported.

Health history correlates included prior diagnosis of six health conditions: diabetes, cardiovascular disease, cancer, emphysema, arthritis, and asthma. Diabetes was defined as self-reported diagnosis, glycated hemoglobin ≥6.5%, or fasting plasma glucose ≥126 mg/dL at NHANES exam. Cardiovascular disease included angina, coronary heart disease, heart failure, myocardial infarction, and stroke. Cancer included all cancers except skin cancer. Health conditions were dichotomized (yes/no). Additional health history correlates were self-rated health (poor/fair, good, very good/excellent) and difficulty walking without special equipment (yes/no).

Correlates of physical activity and sedentary behavior latent classes were identified using multinomial logistic regression. Initial models included all potential correlates, and then a backward elimination strategy was applied. Variables were evaluated by overall correlate group (socio-demographic, acculturation, cardiovascular, health history) to test for statistical significance. Next, variables within statistically significant groups were dropped individually from the model using backward selection, until all remaining variables were statistically significant predictors ($p < 0.05$). Variables that were statistically significant were retained even if zero counts in some latent classes resulted in instability of some odds ratio estimates (e.g., emphysema). Unstable estimates are not reported in tables. Odds ratios were interpreted as the relative odds of being in a more active compared to the least active latent class (referent) for individuals in the index (e.g., female) versus referent (e.g., male) level of each correlate. For example, an odds ratio of 0.5 would mean that the odds of a woman being in the weekend warrior latent class was half the odds of a man being in the least active latent class (referent).

Percentages and means were weighted to the 2000 census using the 4-year sample weights provided by NHANES to account for the differential probability of selection. The data were nested (i.e., screener, household interview, examination), such that non-response and post-stratification adjustments were applied. Analyses were performed in SAS, version 9.3 (Cary, NC).

Results

Participants (N=7,236) had a mean age of 47, were 53% female, and were likely to be non-Hispanic white (73%), married (60%), have more than a high school education (58%), and be employed (67%, Supplemental Table 1). Most participants completed the NHANES interview in English (95%), spoke English at home (88%), and were born in the US (85%). Half of participants (50%) were never smokers, 33% were obese, and 39% had hypertension. Mean total energy intake was 2,197 kcal/day. The prevalence of chronic disease ranged from 2% (emphysema) to 26% (arthritis) with 17% of participants reporting fair or poor health.

Participants averaged a median of 285 counts/min per day, and engaged in a median of 14 min/day of MVPA (≥2020 counts/min) and 451 min/day (7.5 hours/day) of sedentary behavior (<100 counts/min). Latent class patterns are illustrated in Supplemental Figure 1.

For latent classes based on average intensity of physical activity, 14 of 21 variables were statistically significant correlates of class membership (Figure 1, Supplemental Table 2). Lower odds of being in more active compared to the least active latent class (referent) were associated with female sex, older age, higher BMI, hypertension, diabetes, cardiovascular disease, emphysema, and needing special equipment to walk. Higher odds of being in more active compared to the least active latent class (referent) were associated with non-Hispanic black race, Hispanic ethnicity, being married, employed, greater energy intake, and better self-rated health.

For latent classes based on MVPA (≥2020 counts/min), there were 14 statistically significant correlates (Figure 2, Supplemental Table 3). Lower odds of being in more active compared to the least active latent class (referent) were associated with female sex, older age, current smoking, higher BMI, hypertension, diabetes, cardiovascular disease, emphysema, and needing special equipment to walk. Higher odds of being in more active compared to the least active class (referent) were associated with Non-Hispanic black race, Hispanic ethnicity, being employed, having been born outside of the US, and better self-rated health. However, non-Hispanic black race and Hispanic ethnicity were associated with lower odds of being in the "weekend warrior" class (class 3) compared to the least active class (referent).

Using a lower cutpoint of ≥760 counts/min to define MVPA to allow for more lifestyle activities, 17 correlates were statistically significant (Supplemental Figure 2, Supplemental Table 4). Among the 14 correlates also identified using the higher MVPA threshold (≥2020 counts/min), associations were similar and consistent in direction. The three additional statistically significant correlates of MVPA latent classes based on the lower threshold were education, marital status, and energy intake. Being married and greater energy intake were associated with higher odds of being in more active latent classes while greater education was associated with lower odds of being in more active compared to the least active latent class (referent).

For classes based on sedentary behavior, 15 of 21 potential correlates were statistically significant (Figure 3, Supplemental Table 5). Lower odds of being in less sedentary compared to the most sedentary latent class (referent) were associated with older age, higher education, BMI ≥35 kg/m^2, diabetes, cardiovascular disease, cancer, emphysema, and needing special equipment to walk. Higher odds of being in less sedentary compared to the most sedentary latent class (referent) were associated with female sex, non-Hispanic black race, Hispanic ethnicity, being married, employed, higher energy intake, and better self-rated health.

Sensitivity analyses using alternative categorizations of marital status (living with a partner vs. not), employment (not working, retired, working), language spoken at home (English, Spanish, English and Spanish, other), hypertension (no hypertension, pre-hypertensive, hypertensive), and diabetes (non-diabetic, pre-diabetic, diabetic) did not substantially change results (data not shown). Including angina, coronary heart disease, congestive heart failure, myocardial infarction, and stroke separately in the model instead of a single term for cardiovascular disease did not substantially change results and reduced precision (data not shown).

Discussion

Correlates of day-to-day patterns of physical activity and sedentary behavior over a week were identified in multiple domains. Older age, female sex, higher BMI, and a history of chronic disease were consistently associated with lower odds of being in more active compared to the least active latent class. In contrast, being employed and having better self-rated health were consistently associated with higher odds of being in more active compared to the least active latent class.

Correlates associated with being in more active classes also were associated with being in less sedentary classes, except for female sex. Compared to men, women were less likely to be in more active compared to the least active latent class, but more likely to be in less sedentary compared to the most sedentary latent class. While MVPA prevalence is lower among women compared to men,[10] women may be less sedentary because of participation in light physical activities such as household chores and caregiving.[22] However, the overall pattern that most correlates were positively associated with MVPA and negatively associated with sedentary behavior suggests that interventions that seek both to promote physical activity and to reduce sedentary behavior may be appropriate.

The "weekend warrior" pattern of physical activity was differently associated with education and race/ethnicity compared to other more active latent classes. These findings underscore the importance of understanding patterns in physical activity in addition to a summary of time in a given intensity. Greater education was associated with lower odds of being in the two most active relative to the least active latent class based on average intensity of physical activity (average counts/min per day). The non-statistically significant positive association with the "weekend warrior" class may be consistent with positive associations between education and self-reported leisure time physical activity.[20] Meanwhile, workplace sedentary behavior may explain lower odds of being in less sedentary latent classes among more educated participants.[23,24] In contrast, greater occupational physical activity may explain the higher odds of people with less education belonging to latent classes representing more physical activity on most days of the week.

Occupational activity also likely contributes to observed racial/ethnic differences in physical activity patterns. Hispanics were more likely to engage in more physical activity across all days of the week but as or less likely than non-Hispanic whites to be in the "weekend warrior" pattern for MVPA. Almost all Hispanic participants grouped into more active latent classes were employed. Hispanic participants in NHANES 2003–2004 also were employed in more active occupations and had higher mean activity counts compared to non-Hispanic whites, particularly among people with low incomes.[25] However, minority race/ethnicity was negatively associated with self-reported leisure time physical activity[20] and a "weekend warrior" pattern based on self-reported data.[4,15,24]

Occupational and leisure time physical activity may have different health impacts due to differences in duration, repetitiveness, and the environmental and psychological context in which activity occurs.[26] However, NHANES data did not allow us to distinguish accelerometer-recorded activity occurring in occupational versus leisure settings when assigning participants to latent classes. Addressing occupational and leisure time behavior patterns will require different strategies. Modification of the office environment may be one approach to successfully reducing prolonged and overall sitting time.[27] Incorporation of regular, short physical activity bouts into organizational culture also may help to promote physical activity.[28] Meanwhile, environmental and policy interventions to increase access to recreational resources may promote leisure time physical activity.[29]

Strengths of this analysis include participation of a nationally representative sample of adults, identification of behavioral patterns beyond cumulative time, and sensitivity analyses to further explore correlates. For example, latent classes were derived using two MVPA cutpoints (≥760 and ≥2020 counts/min). Also, we created latent classes separately from the identification of correlates to facilitate cross-study comparisons. An alternative approach is to include correlates in latent class analysis models.[14] While that approach may identify unique patterns for specific subgroups (e.g., women), the resulting classes cannot be compared across studies. Using our approach, no participants were grouped into the most active or least sedentary latent classes for some correlate values, including prior diagnosis of emphysema, cancer, or cardiovascular disease, requiring special equipment to walk, and BMI <18.5 kg/m^2. In these cases, we could not estimate stable odds ratios due to zero counts. However, given physical limitations associated with diseases such as emphysema it is reasonable to expect that few if anyone with these conditions would achieve high patterns of physical activity.

A limitation of this work is the reliance on cross-sectional data. A longitudinal design with regular monitoring of physical activity and sedentary behavior would help to determine whether maintaining one compared to another pattern was more beneficial to health. Moreover, the NHANES data represent a single moment in time. Thus, we were unable to explore the potential impact of technological changes (e.g., increased prevalence of smartphones) or cultural differences between age cohorts on physical activity and sedentary behavior patterns. Also, some potentially important correlates were not available in NHANES such as history of neuromuscular conditions or chronic obstructive pulmonary disease, and characteristics of the social and physical environment.[10,21]

An additional limitation is the extent of data gathered from this specific hip-worn accelerometer. Hip-worn uniaxial accelerometers under count some activities (e.g., cycling, lifting), and the protocol indicated that the accelerometer should not be worn during water activities. The ActiGraph AM7164 did not allow access to the raw accelerometer data to attempt to distinguish broad types of physical activities (e.g., walking vs. household activities) or body position (sitting vs. standing). However, understanding both patterns of physical activity and sedentary behavior and specific activities has the potential to further inform intervention development and supports the use of self-report measures of physical activity in tandem with accelerometer data.[12]

Conclusion

Physical activity and sedentary behavior are modifiable risk factors for chronic disease that can be addressed outside of the medical system, making them an important public health priority.[30] Identifying correlates of physical activity and sedentary behavior patterns can inform interventions to promote public health. Common behavior patterns included little physical activity and large amounts of sedentary behavior on most days of the week. Thus, while identification of correlates of specific patterns may help to inform targeting of interventions, an important message from these data is the overwhelming need to increase physical activity and reduce sedentary behavior among most Americans.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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References

1. US Department of Health Human Services. [Accessed: 10 August 2015] Physical Activity Guidelines for Americans. 2008. Available at: http://www.health.gov/paguidelines/pdf/paguide.pdf
2. Owen N, Healy GN, Matthews CE, et al. Too much sitting: The population health science of sedentary behavior. Exerc Sport Sci Rev. 2010; 38:105–113. [PubMed: 20577058]
3. Prince SA, Adamo KB, Hamel ME, et al. A comparison of direct versus self-report measures for assessing physical activity in adults: A systematic review. Int J Behav Nutr Phys Act. 2008; 5:56. [PubMed: 18990237]
4. Kao MC, Jarosz R, Goldin M, et al. Determinants of physical activity in America: A first characterization of physical activity profile using the National Health and Nutrition Examination Survey (NHANES). PM & R. 2014; 6:882–892. [PubMed: 24631950]
5. Metzger JS, Catellier DJ, Evenson KR, et al. Patterns of objectively measured physical activity in the United States. Med Sci Sports Exerc. 2008; 40:630–638. [PubMed: 18317384]
6. Straker L, Campbell A, Mathiassen SE, et al. Capturing the pattern of physical activity and sedentary behavior: Exposure variation analysis of accelerometer data. J Phys Act Health. 2014; 11:614–625. [PubMed: 23416959]
7. Lee IM, Sesso HD, Oguma Y, et al. The "weekend warrior" and risk of mortality. Am J Epidemiol. 2004; 160:636–641. [PubMed: 15383407]
8. Healy GN, Matthews CE, Dunstan DW, et al. Sedentary time and cardio-metabolic biomarkers in US adults: NHANES 2003-06. Eur Heart J. 2011; 32:590–597. [PubMed: 21224291]
9. Murphy MH, Blair SN, Murtagh EM. Accumulated versus continuous exercise for health benefit: A review of empirical studies. Sports Med. 2009; 39:29–43. [PubMed: 19093694]
10. Bauman AE, Reis RS, Sallis JF, et al. Correlates of physical activity: Why are some people physically active and others not? Lancet. 2012; 380:258–271. [PubMed: 22818938]
11. Evenson KR, Wen F, Metzger JS, et al. Physical activity and sedentary behavior patterns using accelerometry from a national sample of United States adults. Int J Behav Nutr Phys Act. 2015; 12:20. [PubMed: 25889192]
12. Cheung YK, Yu G, Wall MM, et al. Patterns of leisure-time physical activity using multivariate finite mixture modeling and cardiovascular risk factors in the Northern Manhattan Study. Ann Epidemiol. 2015; 25:469–474. [PubMed: 25873383]
13. Sodergren M, Wang WC, Salmon J, et al. Predicting healthy lifestyle patterns among retirement age older adults in the WELL Study: A latent class analysis of sex differences. Maturitas. 2014; 77:41–46. [PubMed: 24144958]
14. Silverwood RJ, Nitsch D, Pierce M, et al. Characterizing longitudinal patterns of physical activity in mid-adulthood using latent class analysis: Results from a prospective cohort study. Am J Epidemiol. 2011; 174:1406–1415. [PubMed: 22074812]
15. Kruger J, Ham SA, Kohl HW 3rd. Characteristics of a "weekend warrior": Results from two national surveys. Med Sci Sports Exerc. 2007; 39:796–800. [PubMed: 17468576]
16. Choi L, Liu Z, Matthews CE, et al. Validation of accelerometer wear and nonwear time classification algorithm. Med Sci Sports Exerc. 2011; 43:357–364. [PubMed: 20581716]
17. Troiano RP, Berrigan D, Dodd KW, et al. Physical activity in the United States measured by accelerometer. Med Sci Sports Exerc. 2008; 40:181–188. [PubMed: 18091006]
18. Matthews CE. Calibration of accelerometer output for adults. Med Sci Sport Exer. 2005; 37:S512–S522.
19. Matthews CE, Chen KY, Freedson PS, et al. Amount of time spent in sedentary behaviors in the United States, 2003–2004. Am J Epidemiol. 2008; 167:875–881. [PubMed: 18303006]
20. Trost SG, Owen N, Bauman AE, et al. Correlates of adults' participation in physical activity: Review and update. Med Sci Sports Exerc. 2002; 34:1996–2001. [PubMed: 12471307]
21. Rhodes RE, Mark RS, Temmel CP. Adult sedentary behavior: A systematic review. Am J Prev Med. 2012; 42:e3–e28. [PubMed: 22341176]

22. Tudor-Locke C, Johnson WD, Katzmarzyk PT. Frequently reported activities by intensity for U.S. Adults: The American Time Use Survey. Am J Prev Med. 2010; 39:e13–e20. [PubMed: 20837277]
23. Bennie JA, Chau JY, van der Ploeg HP, et al. The prevalence and correlates of sitting in European adults - a comparison of 32 Eurobarometer-participating countries. Int J Behav Nutr Phys Act. 2013; 10:107. [PubMed: 24020702]
24. Silverwood RJ, Pierce M, Nitsch D, et al. Is intergenerational social mobility related to the type and amount of physical activity in mid-adulthood? Results from the 1946 British Birth Cohort Study. Ann Epidemiol. 2012; 22:487–498. [PubMed: 22534178]
25. Gay JL, Buchner DM. Ethnic disparities in objectively measured physical activity may be due to occupational activity. Prev Med. 2014; 63:58–62. [PubMed: 24589439]
26. Li J, Siegrist J. Physical activity and risk of cardiovascular disease-a meta-analysis of prospective cohort studies. Int J Environ Res Public Health. 2012; 9:391–407. [PubMed: 22470299]
27. Duncan MJ, Rashid M, Vandelanotte C, et al. Development and reliability testing of a self-report instrument to measure the office layout as a correlate of occupational sitting. Int J Behav Nutr Phys Act. 2013; 10:16. [PubMed: 23379485]
28. Barr-Anderson DJ, AuYoung M, Whitt-Glover MC, et al. Integration of short bouts of physical activity into organizational routine a systematic review of the literature. Am J Prev Med. 2011; 40:76–93. [PubMed: 21146772]
29. Mowen AJ, Baker BL. Park, recreation, fitness, and sport sector recommendations for a more physically active America: A white paper for the United States National Physical Activity Plan. J Phys Act Health. 2009; 6(Suppl 2):S236–S244. [PubMed: 20120132]
30. Leventhal AM, Huh J, Dunton GF. Clustering of modifiable biobehavioral risk factors for chronic disease in US adults: A latent class analysis. Perspect Public Health. 2014; 134:331–338. [PubMed: 23912158]

Practical Implications

- Older age, female sex, higher body mass index, and a history of chronic disease were associated with patterns characterized by low levels of physical activity on all days of the week underscoring the need for physical activity promotion among many population groups
- Most characteristics that were positively associated with physical activity were negatively associated with sedentary behavior, suggesting that interventions that seek both to increase physical activity and to reduce sedentary behavior are appropriate.
- A “weekend warrior” pattern of limited physical activity during the week and higher activity on the weekend was differently associated with some correlates compared to patterns of higher physical activity on most days of the week.

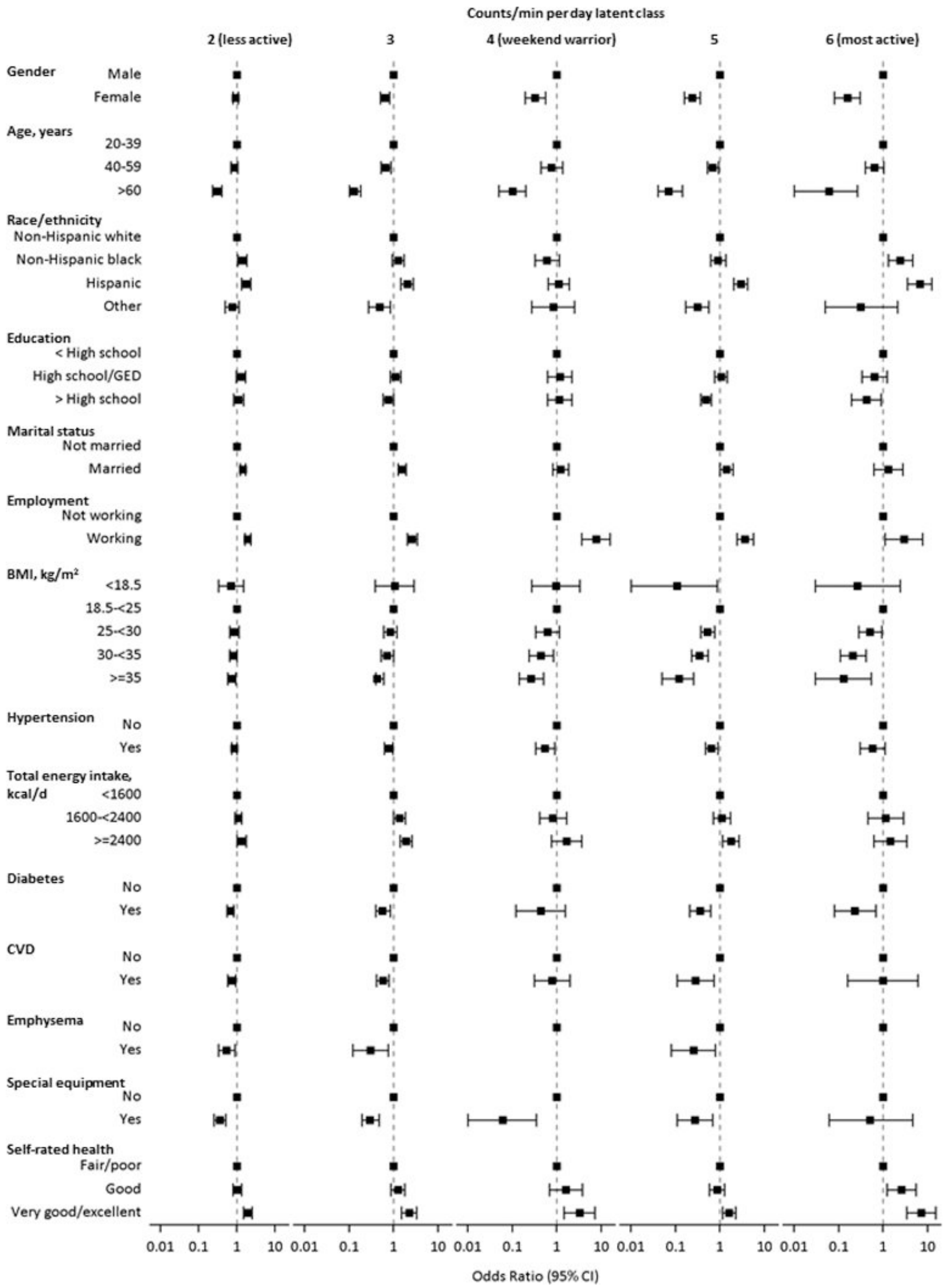

Figure 1.

Relative odds (OR, 95% CI) of being in latent class 2–6 compared to latent class 1 based on average intensity of physical activity (average counts/min per day), NHANES 2003–2006 (N=6,804). Odds ratios are interpreted as the relative odds of being in a more active compared to the least active latent class (referent) for individuals in the index (e.g., female) versus referent (e.g., male) level of each correlate. Abbreviations: BMI body mass index, CVD cardiovascular disease, GED general equivalency diploma

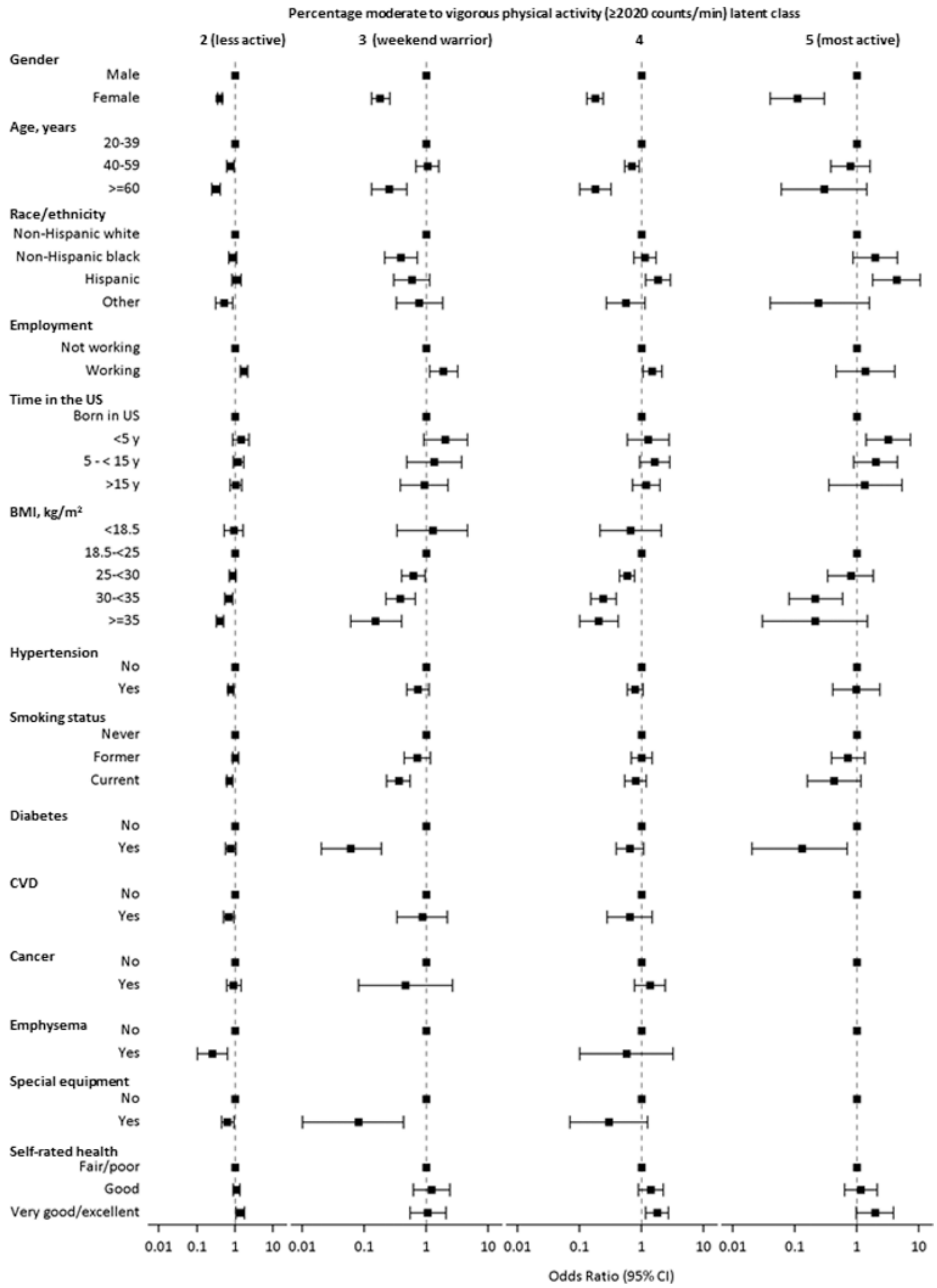

Figure 2.

Relative odds (OR, 95% CI) of being in a more active latent class 2–5 compared to the least active latent class 1 based on percentage of wear time in moderate to vigorous physical activity (≥2020 counts/min),[17] NHANES 2003–2006 (N=7,016). Odds ratios are interpreted as the relative odds of being in a more active compared to the least active latent class (referent) for individuals in the index (e.g., female) versus referent (e.g., male) level of each correlate. Abbreviations: BMI body mass index, CVD cardiovascular disease, US United States

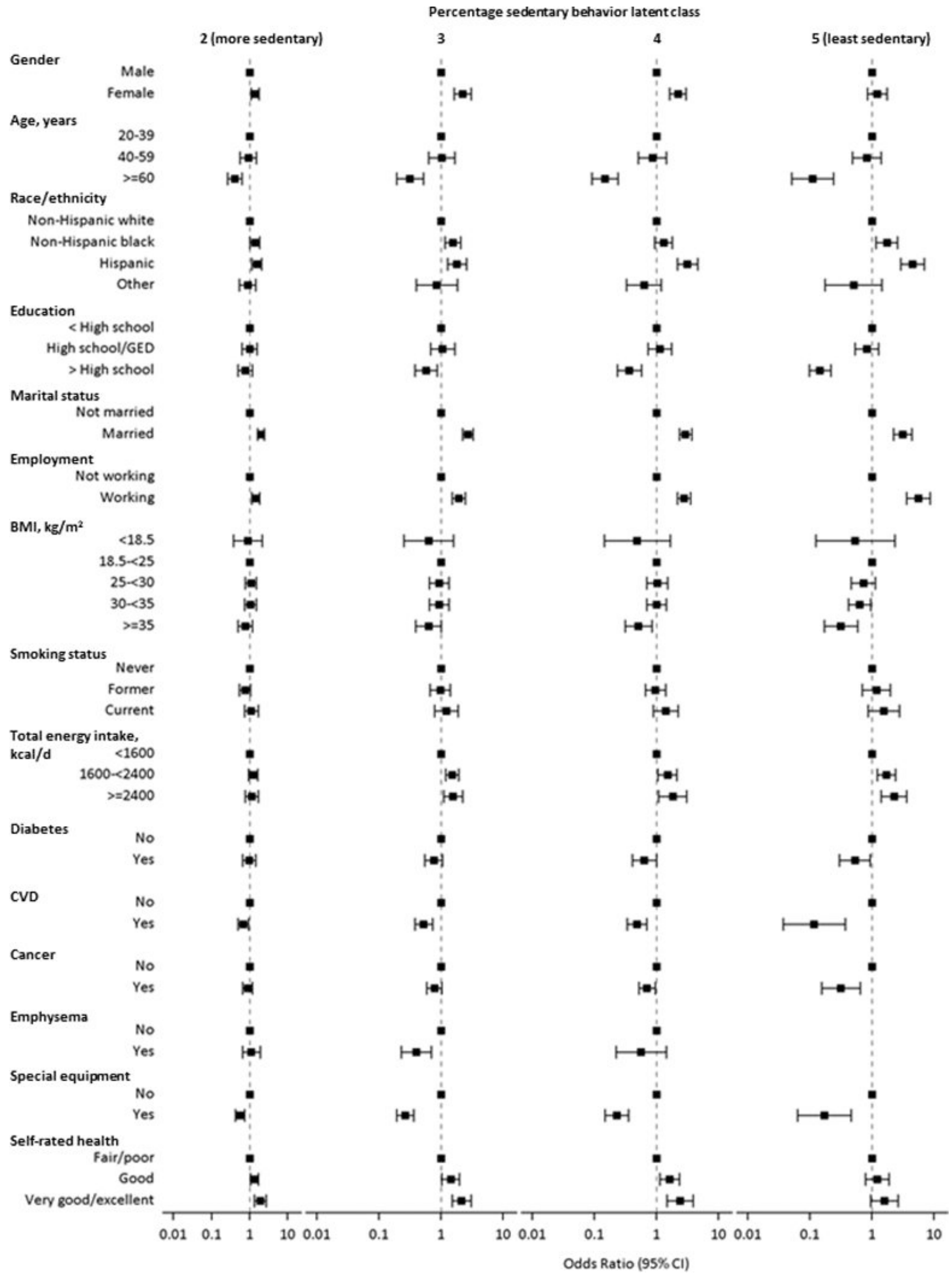

Figure 3.

Relative odds (OR, 95% CI) of being in a less sedentary latent class 2–5 compared to the most sedentary latent class 1 based on percentage of wear time in sedentary behavior (<100 counts/min), NHANES 2003–2006 (N=6,792). Odds ratios are interpreted as the relative odds of being in a less sedentary compared to the most sedentary latent class (referent) for individuals in the index (e.g., female) versus referent (e.g., male) level of each correlate.

Abbreviations: BMI body mass index, CVD cardiovascular disease, GED general equivalency diploma