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Original research

Accelerometer measured sedentary behavior and physical activity in white and black adults: The REGARDS study

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ABSTRACT

Objectives: Health disparities between subgroups may be partially due to differences in lifestyle behaviors such as sedentariness and physical activity. To obtain a more accurate description of these two lifestyle behaviors, accelerometry was employed among a large sample of white and black adults (ages 49–99 years) living in the United States.
Design: Cross-sectional.
Methods: 7967 participants from the REasons for Geographic and Racial Differences in Stroke cohort wore an Actical™ accelerometer ≥10 h/day for ≥4 days. Time (mean minutes/day and proportion of total wear time) spent in sedentary behavior, light intensity physical activity, and moderate-vigorous intensity physical activity was compared by sex, age, body mass index, race, and geographic location.
Results: Proportion of total wear time spent in sedentary behavior was 75–90%, light intensity physical activity was 10–23%, and moderate-vigorous intensity physical activity was 0–1.7% across subgroups. Mean moderate-vigorous intensity physical activity was 0–16 min/day and associated with 3–12% accumulating ≥150 min/wk using a 10-min bout criterion. Persons ≥85 years, those classified obese, persons living in the southeastern United States, and black women were the most inactive. The proportion achieving at least one 10-min bout of moderate-vigorous intensity physical activity per week was only 36%. The number of 10-min bouts/week was 1.5 ± 0.08 bouts/week. The distribution of weekly moderate-vigorous intensity physical activity was similar across nearly all subgroups with a distinct reverse J-shaped configuration.
Conclusions: The vast majority of white and black midlife and older adults in this study engaged sparingly in moderate-vigorous intensity physical activity, accumulated tremendous amounts of sedentary behavior, and seldom engaged in continuous bouts of health-enhancing physical activity.

1. Introduction

Many adults in the Unites States (U.S.) do not achieve the recommended amount of physical activity (PA) to fully realize health benefits.[1,2] Adult women, blacks, and persons residing in the Southeast U.S. self-report the lowest levels of PA.[1,3,4] However, self-reported PA is prone to recall biases, imprecise quantification of intensity, and cultural biases in perceived desirability of PA, which can lead to misclassification of individual and population PA levels.[5,6] Misclassification of PA may be particularly concerning when using self-report in racial/ethnic minorities for whom subgroup-specific questionnaires have not been developed. In addition, older adults are more likely to engage in light intensity activities that are challenging to accurately capture via self-report.[7] To help avoid misclassification and other difficulties, objective measures of PA can be employed.

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Emerging evidence also reveals the need to measure sedentary behavior as it exerts an effect independent of PA on several health-related outcomes.[8,9] As with PA, objective measures of sedentary behavior are recommended to supplement self-reported assessments.[7,10] However, little is known about objectively measured levels of sedentary behavior among subgroups of adults living in the U.S. What has been reported in much smaller samples than the current study suggests older adults are the most sedentary with little difference noted between white and black older adults.[3,11]

Our aim was to obtain objective measures of sedentary behavior (i.e., activities expending <1.5 METs) and PA in a large sample of white and black midlife and older adults living in the U.S. It is possible that health disparities between subgroups are partially due to differences in lifestyle behaviors such as sedentariness and PA. Thus, a more accurate description of these two lifestyle behaviors among midlife and older adults is desirable.

2. Methods

The REasons for Geographic and Racial Differences Study (REGARDS) comprises a general population sample in the U.S. with oversampling from the Stroke Belt in the Southeast U.S. (comprising the states of North Carolina, South Carolina, Georgia, Tennessee, Mississippi, Alabama, Louisiana, and Arkansas). REGARDS was designed to prospectively examine racial and regional disparities in stroke risk and mortality with methods described elsewhere.[12] Overall, 30,239 black and white participants, aged >45 years, were recruited from 2003 to 2007 and screened for eligibility during a phone interview. Following verbal consent, using a computer-assisted telephone interview (CATI), demographic and medical information was obtained. An in-person physical examination including blood pressure, height and weight measures was conducted 3–4 weeks later, and written informed consent obtained.

Objective measures of sedentary behavior and PA were collected from May 2009 to January 2013 for an ancillary study with procedures previously described.[13] During follow-up CATI calls, prospective participants were asked whether or not on a typical day they were able to go outside their house and walk as an indicator of their functional capacity. Following an affirmative response, the ancillary study was explained and the participant asked if he/she would be willing to wear an accelerometer and complete a log sheet for seven consecutive days. If the participant agreed (i.e., verbal consent provided), the CATI unit notified staff responsible for implementing the accelerometer protocol. Each investigator's Institutional Review Board approved the study methods, which due to previous written consent provided for the REGARDS parent study, required only verbal consent.

Staff initialized an Actical™ accelerometer to collect data in 60-s epochs, secured it to a nylon belt, and mailed it to the participant with a cover letter, written and visual wear instructions, log sheet, and pre-addressed and postage-paid return envelope. Participants were instructed to start wearing the device the day after they received it, remove at bedtime and reattach upon awakening, position the device snugly over the right hip, complete the log sheet daily, and return the device immediately after completing the protocol.

Participants were asked to complete a log sheet daily with two elements: the date the Actical™ was first worn, and the time(s) put on and taken off each day. A record was excluded for: (1) missing or illegible time(s) or date(s); or (2) self-reported wear dates not corresponding with valid data in the Actical™ file. Other data were excluded due to device failure or errors (e.g. activity counts >20,000 or lengthy strings of repeated counts). Compliant participants wore the device >10 h/day on at least four days.[14] Nonwear periods were defined as >150 consecutive minutes of 0 activity counts.[15] Activity counts of 0–49 counts per minute (cpm), 50–1064 cpm, and >1065 cpm distinguished sedentary behavior, light intensity PA (LIPA), and moderate or higher intensity PA (MVPA), respectively.[16]

Characteristics collected during initial enrollment into the parent REGARDS study included hypertension (SBP >140 mmHg, DBP >90 mmHg, or use of antihypertensive medications), diabetes (fasting serum glucose ≥126 mg/dL [7.0 mmol/L], non-fasting serum glucose ≥200 mg/dL [11.1 mmol/L], or medication use for diabetes), and body mass index (BMI) (using measured height and weight; underweight [<18.5 kg m^2], normal weight [18.5–24.9 kg m^2], overweight [25–29.9 kg m^2] and obese [>30.0 kg m^2]). Age, race, sex, education level, annual household income, and smoking were derived from initial CATI data.

The cohort for this ancillary study has been described previously.[13] Briefly, 20,076 eligible participants from the original sample of 30,239 were able to be contacted and invited to participate: 12,146 (60.5%) consented, 7312 (36.4%) declined, and 618 (3.1%) deferred without the opportunity to be recruited again. Accounting for lost, defective or non-worn devices (n = 2173), and excluding those with device errors, missing log sheets, or invalid wear time (n = 1877), usable data was provided by 8096. Excluding those missing any covariates of interest (n = 129) left 7967 for analyses.

Descriptive analyses included adjusted means (±SE) for wear time, nonwear time, sedentary minutes/day, LIPA minutes/day, and MVPA minutes/day. Time spent in a defined intensity (sedentary, light, or MVPA) was determined by summing minutes in a day when the activity count met the criterion for that intensity. To reflect the importance of accumulation, time spent in LIPA or MVPA is presented for every minute meeting the specific criterion. Duration of MVPA occurring in >10-min bouts was also calculated. A >10-min bout was defined as >10 consecutive minutes above the MVPA activity count threshold with allowance of 1–2 min below threshold.[2,17] Proportion of wear time spent in sedentary behavior, LIPA, and MVPA was calculated by dividing the sum of time for a given outcome by total wear time.

Overall difference between race/sex and other demographic groups for age, mean valid wear days, and mean total daily wear time was examined by ANOVA with paired Tukey tests. Differences between race/sex for daily mean sedentary time, mean LIPA, and mean MVPA, and number of >10 min bouts/day was explored with linear regression followed by paired Tukey tests. Covariates adjusted for included age, education, BMI, diabetes, hypertension, and smoking. Results were presented as mean ± standard error (SE). Differences in distributions within and/or across race/sex groups and other demographics, achieving >150 min/wk of MVPA or not, and with at least one 10-min bout of MVPA or not were tested by Chi-square. To explore patterns of accumulated weekly MVPA, we included any activity count >1065 cpm and used categories of <37, 38–74, 75–112, 113–149 and >150 min/wk. Significance was set at P < 05. Analyses were conducted using SAS version 9.3 (SAS Institute, Cary, NC).

3. Results

Table 1 displays demographic and accelerometer compliance characteristics. There was a statistically significant difference among race/sex groups for mean age, valid wear days and daily wear time. The mean age for white men was significantly higher than other race/sex groups who did not vary by age. There were significant differences in the distribution of proportions within and across race/sex groups for income, education, BMI, diabetes, hypertension, and smoking. White men and women had significantly higher mean valid wear days than black men and women, and black men had significantly higher mean valid wear days than black women. Absolute mean differences for valid wear days (0.1–0.3