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Minority Men's Health

An Examination of Lower Extremity Function and its Correlates in Older African American and White Men

Olivio J. Clay, PhD; Roland J. Thorpe, Jr., PhD; Larrell L. Wilkinson, PhD; MSPH; Eric P. Plaisance, PhD; Michael Crowe, PhD; Patricia Sawyer, PhD; Cynthia J. Brown, MD, MSPH

Objective: Maintaining functional status and reducing/eliminating health disparities in late life are key priorities. Older African Americans have been found to have worse lower extremity functioning than Whites, but little is known about potential differences in correlates between African American and White men. The goal of this investigation was to examine measures that could explain this racial difference and to identify race-specific correlates of lower extremity function.

Methods: Data were analyzed for a sample of community-dwelling men. Linear regression models examined demographics, medical conditions, health behaviors, and perceived discrimination and mental health as correlates of an objective measure of lower extremity function, the Short Physical Performance Battery (SPPB). Scores on the SPPB have a potential range of 0 to 12 with higher scores corresponding to better functioning.

Results: The mean age of all men was 74.9 years (SD=6.5), and the sample was 50% African American and 53% rural. African American men had scores on the SPPB that were significantly lower than White men after adjusting for age, rural residence, marital status, education, and income difficulty ($P<.01$). Racial differences in cognitive functioning accounted for approximately 41% of the race effect on physical function. Additional models stratified by race revealed a pattern of similar correlates of the SPPB among African American and White men.

Conclusions: The results of this investigation can be helpful for researchers and clinicians to aid in identifying older men who are at-risk for poor lower extremity function and in planning targeted interventions to help reduce disparities. *Ethn Dis.*2015;25(3):271-278.

Introduction

The number of older adults has been rapidly increasing and life expectancy has continued to rise. Preventing disability within the older adult population is a major public health concern.[1] In 2012, 23.6% of adults aged ≥65 years had difficulty with at least one basic action or one complex activity.[2] Numerous studies have shown the importance of maintaining physical functioning in older adults. For example, findings from the Health, Aging, and Body Composition (Health ABC) Study revealed that inability to complete a 400m walk was associated with a higher risk of mortality, incident cardiovascular disease, and incident mobility limitation.[3] Additionally, other measures of poor lower extremity functioning have been shown to be related to subsequent functional limitation and disability, institutionalization, and mortality.[4,5] Among African Americans (AA), lower extremity disability has been found to be associated with poorer self-rated health, fear of falling, and clinically relevant levels of depression.[6] Therefore, maintaining functional status in late life is a key priority.

Racial differences in self-report and objective measures of lower extremity functioning have been observed. In an examination of data from the Chicago Health and Aging Project (CHAP), a longitudinal investigation examining the risk factors

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From the Department of Psychology, University of Alabama at Birmingham (OJC, MC); Department of Health, Behavior and Society, Program for Research on Men's Health, Hopkins Center for Health Disparities Solutions, Johns Hopkins Bloomberg School of Public Health (RJT); Department of Human Studies, University of Alabama at Birmingham (LLW); Department of Human Studies, Nutrition Obesity Research Center, Center for Exercise Medicine, University of Alabama at Birmingham (EPP); Birmingham/Atlanta VA Geriatric Research Education and Clinical Center (CJB); Department of Medicine, Division of Gerontology, Geriatrics, and Palliative Care, University of Alabama at Birmingham (CJB); and The UAB Comprehensive Center for Healthy Aging, Department of Medicine, University of Alabama at Birmingham (PS).

Address correspondence to Olivio J. Clay, PhD; Department of Psychology, University of Alabama at Birmingham, 415 Campbell Hall, 1720 2nd Avenue South, Birmingham, AL 35294; (205) 934-2728; (205) 975-6110 (fax); oclay@uab.edu

associated with chronic conditions and incident Alzheimer's disease diagnosis, researchers found that older African Americans had worse lower extremity scores when compared to Whites over 6 years of follow-up.[7] Results from the Women's Health and Aging Study indicated that community-dwelling older African American women had worse lower extremity functioning than community-dwelling older White women.[8] Also, using data from the Health ABC Study, Thorpe and colleagues reported that well-functioning older African Americans had slower walking speed at baseline than Whites but similar rates of decline over time.[9] These findings, in conjunction with higher mortality rates for African American men compared with White men and women and African American women, provide additional evidence that African American men are an at-risk group and correlates of their lower extremity function should be examined.

The relationship between several medical conditions and lower extremity function has also been well-established. Findings from the Function, Living, Outcomes, and Work (FLOW) Study among 1,202 persons aged 40 – 65 years found a positive association between chronic obstructive pulmonary disease (COPD) and poorer lower extremity function, even when adjusted for age, sex, race, height, smoking history, and educational attainment.[10] Additionally, poorer lower extremity functioning was positively associated with cardiovascular disease biomarkers, such as C-reactive protein, even when controlling for demographics, health behaviors, and cardiovascular treatment in research covering nearly 10 years of US national data.[11]

Our investigation examined correlates of lower extremity function within a sample of older African American and White men while incorporating a life course perspective.

Our investigation adds to the literature by providing an initial look at correlates of lower extremity function within a sample of older African American and White men while incorporating a life course perspective. The life course perspective is a multidisciplinary approach that examines an individual's history and incorporates the setting the individual lives in, as well as, transitions, events, and roles over one's lifetime that may affect longitudinal health outcomes.[12] Areas of interest for this investigation include: 1) the historical and socioeconomic context of an individual's life; 2) health conditions the individual may be dealing with; 3) health behaviors that may contribute to or impede better outcomes; 4) any recent mistreatment because of race or skin color; and 5) current emotional and mental state. Our hypotheses were: 1) African American men would exhibit worse lower extremity function compared with White men; 2) medical conditions, poor health behaviors, perceived discrimination, low cognitive function, and poor mental health would be associated with suboptimal levels of lower extremity function in both racial groups of men; and 3) cognitive function would partially mediate the relationship between race and lower extremity function.

Methods

Procedures

The University of Alabama at Birmingham (UAB) Study of Aging is a longitudinal observational study designed to examine racial differences in patterns of mobility, to examine short-term and long-term predictors of mobility limitation for African Americans and Whites and to determine if mobility limitations predict subsequent nursing home placement and death. A stratified random sample of community-dwelling adults aged ≥65 years was selected from a list of Medicare beneficiaries from five counties in central Alabama. This study oversampled African Americans, men, and rural residents to provide a balanced sample in terms of race, sex, and urban–rural residence, with all individuals possessing some form of health care coverage. A total sample of 1,000 participants, 50% African Americans, 51% rural residence, and 50% men were recruited. Initial data were collected during an in-home assessment (1999–2001), and follow-up data were collected every 6 months via telephone interview. Data from the baseline assessment were used to assess

the correlates of lower extremity function within African American and White men. All procedures were approved by the Institutional Review Board of the University of Alabama at Birmingham.

Measures

The Short Physical Performance Battery (SPPB) includes timed tests of balance, walking, and the ability to rise from a chair. The SPBB was used to measure lower extremity function.[4,13] Persons were ranked by standards set by Guralnik and associates[4]; a person unable to perform a given task was assigned a score of 0 for that task and 4 represented the highest level of performance. The composite score, calculated as the sum of the three rankings, ranged from 0 to 12, with higher scores indicating better performance. The internal consistency of the scale for the entire UAB Study of Aging sample, as assessed by Cronbach alpha, was .76.[14]

The baseline questionnaire collected self-reported data on demographics including age (years) and sex. Ethnicity was self-reported and divided into two categories: non-Hispanic African American and non-Hispanic White. Marital status was analyzed as married vs not married (widowed, separated, divorced, and never married). Education was defined using ordinal categories from 6 to 17. For example, grade 6 or less corresponded to a score of 6, high school diploma or GED was scored a 12, college graduate was scored a 15, and graduate or professional degree was scored as 17. Income difficulty was assessed by asking participants, "All things considered, would you say your income?" 1) allows you to do more or less what you want; 2) keeps you comfortable but permits no luxuries; 3) gives you just enough to get by on; or 4) is not enough to make ends meet. Higher scores correspond to more income difficulty.

Urban vs rural community status was categorized by using geocoding. Once a latitude–longitude coordinate was assigned, the address was displayed on a map or used in a spatial search to locate the nearest medical facilities or linked to census data to track population density. Individuals with missing data for this measure (n= 3) were categorized as living in an urban vs rural community based on the county in which they lived.

Individual medical conditions and a comorbidity score were assessed in this investigation. A comorbidity count was created giving one point for each disease category of the Charlson Comorbidity Index, without consideration of severity.[15] Participants were asked whether a physician had told them that they had congestive heart failure (CHF), myocardial infarction, valvular heart disease, peripheral artery disease, hypertension, diabetes mellitus, chronic obstructive pulmonary disease or asthma, kidney failure, stroke, liver disease, cancer, neurological disease, or gastrointestinal or gall bladder disease. Conditions were considered verified if the participant was taking medication for this condition or if the condition was confirmed by a questionnaire sent to the participant's primary care physician or was listed on hospital or emergency room discharge summary. Only verified conditions were considered for the comorbidity score. Obesity was assessed by an individual's BMI, but it was not included in the comorbidity index total.

Physical activity was measured using the leisure-time physical activity assessment from the Cardiovascular Health Study.[16] Participants reported frequency and duration of participation in 15 different types of activities during the past two weeks, with a resulting score of kilocalories expended per week. Examples of these activities included: walking for exercise, calisthenics, and dancing; engaging in strenuous household chores; and performing outside tasks such as mowing or raking the lawn.

To assess smoking, pack years were calculated from the number of years and average number of cigarettes per day a participant reported smoking.

Perceived discrimination was measured by asking participants, "In the last six months, have you experienced any discrimination based on your race or skin color?" Response options were no (0) and yes (1).

Cognitive functioning was assessed using the Mini-Mental State Examination (MMSE). The MMSE is a brief and objective screening measure of cognitive impairment that has been proven to be valid and reliable across clinical, epidemiological, and community survey studies. The higher the score from 0 to 30, there is reduced likelihood of cognitive impairment.[17]

Depressive symptoms were assessed using the Geriatric Depression Scale-Short Form (SF), a 15-item self-report questionnaire designed to measure common symptoms of depression.[18] Using a yes/no format, the respondents were asked if they had experienced symptoms in the past

week. The scale has a range of 0 to 15, with higher scores on the questionnaire suggestive of clinical depression.

Analyses

All analyses were conducted using SAS V9.3.[19] T-tests and chi-square were utilized to examine unadjusted racial differences on study variables. Multivariate linear regression models were utilized to examine correlates of lower extremity function, racial differences, and potential mediators. Initially, a regression model was conducted to determine if there were racial differences in lower extremity function after controlling for demographic measures. Next, a series of regression models that controlled for demographic measures assessed the associations between lower extremity function and medical conditions, health behaviors, and psychosocial measures. Finally, medical conditions, health behaviors, or psychosocial measures associated with lower extremity function *(P*<.01) and exhibiting differences by racial category *(P*<.01) were added to the initial model to determine if they mediated the effect of race on lower extremity function.

Results

Participants

Of the 501 men in the UAB Study of Aging, 251 (50%) were African American. When compared with their White counterparts in bivariate analyses, African American men were less likely to be married, reported fewer years of education, and had more income difficulty. Additionally, a higher percentage of African American men had hypertension when compared with White men (74% vs. 59%). African American men also had a higher BMI, worse cognitive functioning, were more likely to report perceived discrimination in the past 6 months, and had worse lower extremity function, all *Ps* < .01 (Table 1).

Correlates of Lower Extremity Function

African American men had worse lower extremity function when compared with White men, even after controlling for demographic factors (B=-0.157, *P*=.0012, Table 2). Older age (B=-0.228, *P*<.0001), being unmarried (B=.101, *P*=.0206), and having more income difficulty (B=-0.143, *P*=.0015) were also associated with lower scores on the SPPB. The results of additional multivariate linear regression models, which adjusted for demographics and examined the associations of medical conditions, health behaviors, perceived discrimination, and mental health measures with performance on the SPPB revealed that the correlates were the same for both groups of men (Table 3). Specifically, having diabetes, congestive heart failure, stroke, an increased number

Table 1. Racial differences on study variables

Variable	African American (*n*=251)	White (*n*=250)	*P*
Age, mean (SD)	75.34 (6.60)	74.50 (6.32)	.1490
Rural status, *n* (%)	124 (49.40)	142 (56.80)	.0971
Married, *n* (%)	147 (58.57)	200 (80.00)	<.0001
Education, mean (SD)	9.01 (3.21)	11.88 (2.75)	<.0001
Income Difficulty, mean (std)	1.65 (.78)	1.24 (.51)	<.0001
Diabetes, *n* (%)	65 (25.90)	58 (23.20)	.4832
Congestive heart failure, *n* (%)	45 (17.93)	34 (13.60)	.1838
Stroke, *n* (%)	33 (13.15)	33 (13.20)	.9861
Hypertension, *n* (%)	185 (73.71)	148 (59.20)	.0006
Comorbid conditions, mean (SD)	2.33 (1.65)	2.38 (1.66)	.7390
BMI, mean (SD)	28.17 (5.43)	26.85 (4.94)	.0049
Kcal, mean (SD)	1080.8 (1810.9)	1755.4 (6511.7)	.1145
Years smoking, mean (SD)	28.16 (22.90)	28.35 (21.86)	.9249
Perceived discrimination, *n* (%)	24 / 246 (9.76)	3 (1.20)	<.0001
Cognitive function, mean (SD)	22.54 (5.41)	26.57 (3.65)	<.0001
Depressive symptoms, *n* (%)	2.35 (2.20)	2.11 (2.27)	.2298
Short Physical Performance Battery, mean (SD)	6.34 (3.35)	8.00 (3.02)	<.0001

BMI, body mass index; Kcal, kilocalorie.

of comorbid conditions, less energy expenditure, lower levels of cognitive functioning, and a higher number of depressive symptoms were all associated with poor lower extremity function in both racial groups. The only exception was hypertension, which was significant for White men, but not for African American men.

In an attempt to explain the racial difference on lower extremity function, cognitive function was added to the model that included race and the other demographic factors. In the previous bivariate analyses, there was a racial difference in cognitive function with African American men performing worse than White men, and there was also an association between cognitive function with lower extremity function (poor cognitive function was associated with poor lower extremity function). It was found that cognitive function partially accounted for, or partially mediated, the association between African American race and poor lower extremity function. The main effect of race on lower extremity function remained significant, B = -0.092, *P*=.0482, with cognitive function accounting for 41.33% of the association.

Table 2. Covariate-adjusted race effect on lower extremity function

Variable	B	b	SE	t-statistic	*P*
Intercept	0	16.526	1.967	8.40	<.0001
Age	-.228	-.116	.022	-5.32	<.0001
Rural status	-.008	-.055	.283	-.19	.8457
Married	.101	.717	.309	2.32	.0206
Education	.037	.037	.049	.75	.4552
Income difficulty	-.143	-.684	.214	-3.19	.0015
Race	-.157	-1.030	.316	-3.26	.0012

B, standardized beta; b, unstandardized beta.

Discussion

Our findings provide additional evidence for a racial disparity in lower extremity function, a domain that is crucial for maintaining independence in older adulthood. Specifically, older African American men showed worse performance than White men on the Short Physical Performance Battery, an objective and validated measure of lower extremity function. Both racial groups of men were found to have the same correlates of function, with the exception of hypertension being associated with lower extremity function in White men but not for African American men. We propose that this lack of association was due to a ceiling effect within African Americans; approximately 74% of African American men were verified as having hypertension. The finding that a higher number of comorbid conditions was associated with worse lower extremity functioning is consistent with prior findings from the Patterns of Cognitive Aging study, which is part of a larger group of aging studies known as the Baltimore Study of Black Aging. Reporting two or more medical conditions was associated with mobility limitation as assessed by self-report of limitations with climbing one flight of stairs or walking several blocks in African American men and women.[20]

In our study, CHF, diabetes, and stroke were each significantly associated with poor lower extremity function in both racial groups. The relationship between CHF and lower extremity function is likely due to poor cardiorespiratory fitness (peak oxygen uptake; peak VO_2) in individuals with CHF compared with controls.[21] The reduction in cardiorespiratory fitness is a component of both impaired cardiac output (CO) and arterio-venous oxygen (a-VO_2) difference. The capacity of skeletal muscle to extract oxygen from arterial circulation (a-VO_2 difference) appears to be the strongest predictor of peak VO_2.[21] Therefore, suboptimal skeletal muscle mass and structural/metabolic impairments could also be responsible for the associations between health conditions and poor lower extremity function observed in the current investigation. Finally, individuals with diabetes and those who have experienced a stroke may have complications from these conditions that

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Table 3. Covariate-adjusted associations[a] between medical conditions, health behaviors, psychosocial measures and lower extremity function by race

	African American		White	
Variable	B	*P*	B	*P*
Diabetes	-.17	.0062	-.23	.0002
Congestive heart failure	-.13	.0308	-.16	.0075
Stroke	-.16	.0082	-.30	<.0001
Hypertension	-.09	.1619	-.14	.0209
Comorbid conditions	-.22	.0002	-.34	<.0001
BMI	-.05	.4392	-.10	.1045
Kcal	.21	.0006	.18	.0022
Years smoking	-.01	.8106	-.05	.4028
Perceived Discrimination	.11	.0922	-.02	.7651
Cognitive function	.42	<.0001	.27	.0003
Depressive symptoms	-.32	<.0001	-.34	<.0001

a. Each association is adjusted for age, urban vs. rural living status, marital status, education, and income difficulty.
B, standardized beta; BMI, body mass index; Kcal, kilocalorie.

directly affect lower extremity function (eg, neuropathy or hemiparesis).

Indicators of both mental and cognitive health were associated with lower extremity function. The relationship found between reporting a high number of depressive symptoms and poor lower extremity function also supports the findings of Thorpe and colleagues.[20] This finding may be due to individuals who have a higher number of depressive symptoms being less motivated to perform at their greatest capacity on the assessments of lower extremity function. On the other hand, having mobility limitations that restrict independence and activities may also lead to higher depressive symptoms. Cognitive functioning partially mediated the racial difference on lower extremity function. African American men had worse performance on tests of cognitive function compared with White men, and lower performance was associated with poor lower extremity function. Buchman and associates[22] suggested that the relationship between cognition and mobility impairments may be a temporal one. Lower levels of cognitive function were predictive of incident mobility impairments in their study of 1,154 community-dwelling older adults suggesting that poor cognitive function may lead to later mobility problems. Nevertheless, researchers must consider that the current investigation looks at cross-sectional findings and that the relationships between depressive symptoms and lower extremity function and between cognitive function and lower extremity functioning may be bidirectional.

Limitations and Advantages

When attempting to generalize these findings to other settings and populations, researchers should take into account that the participants were Medicare beneficiaries from five counties in central Alabama. The purpose of the UAB Study of Aging was to examine the longitudinal trajectories of mobility in older African Americans and Whites. Examining the effects of perceived discrimination was not one of the original aims and therefore it was not comprehensively assessed. Utilizing a theory-guided approach to select a more appropriate measure to assess perceived discrimination within the sample of older adults could have potentially identified a relationship between perceived discrimination and lower extremity function.[23] Advantages of the current study include an oversampling of African American men and an objective measure of lower extremity function.

Conclusion

The results of this investigation can help clinicians and researchers to identify older men who are at-risk for poor lower extremity function and to plan targeted interventions for men to preserve mobility. Early identification of men who are at-risk for lower extremity function deficits can be a warning sign to clinicians that additional assessments and potential physical therapy services may be needed for these men. Correlates of lower extremity function were the same for both groups, suggesting that properly designed interventions may be effective within both groups. Performance on cognitive tests as a partial mediator of the relationship between race and lower extremity function suggests that interventions aimed to improve cognition in older adults (eg, speed of processing training) may not

only show benefits related to cognitive function, but also may be useful in helping African American men maintain adequate lower extremity function. Additional studies to assess this relationship are needed.

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Dr. Wilkinson is a current Deep South RCMAR scholar, and Dr. Plaisance is a Deep South RCMAR pilot grant awardee.

Dr. Crowe is a former Deep South RCMAR scholar. Dr. Sawyer is a Deep South RCMAR investigator and currently serves as a Research Advisor.

Author Contributions

Research concept and design: Clay, Thorpe, Wilkinson, Crowe
Acquisition of data: Sawyer
Data analysis and interpretation: Clay, Thorpe, Plaisance, Brown
Manuscript draft: Clay, Thorpe, Wilkinson, Plaisance, Crowe, Sawyer, Brown
Statistical expertise: Clay, Thorpe, Wilkinson
Acquisition of funding: Crowe, Sawyer,
Administrative: Clay, Plaisance, Brown
Supervision: Clay

References

1. U.S. Department of Health and Human Services. Older Adults. *Healthy People 2020.* 2015. http://www.healthypeople.gov/2020/topics-objectives/topic/older-adults. Accessed January 29, 2015.
2. National Center for Health Statistics. Health, United States, 2013: With special feature on prescription drugs. Hyattsville, MD: US Department of Health and Human Services, 2014.
3. Newman AB, Simonsick EM, Naydeck BL, et al. Association of long-distance corridor walk performance with mortality, cardiovascular disease, mobility limitation, and disability. *JAMA.* 2006;295(17):2018-2026. http://dx.doi.org/10.1001/jama.295.17.2018. PMID:16670410.
4. Guralnik JM, Ferrucci L, Pieper CF, et al. Lower extremity function and subsequent disability: consistency across studies, predictive models, and value of gait speed alone compared with the short physical performance battery. *J Gerontol A Biol Sci Med Sci*. 2000;55(4):M221-M231. http://dx.doi.org/10.1093/gerona/55.4.M221. PMID:10811152.
5. Morris DR, Rodriguez AJ, Moxon JV, et al. Association of lower extremity performance with cardiovascular and all-cause mortality in patients with peripheral artery disease: a systematic review and meta-analysis. *J Am Heart Assoc*. 2014;3(4):e001105. http://dx.doi.org/10.1161/JAHA.114.001105. PMID:25122666.
6. Wolinsky FD, Miller TR, Malmstrom TK, et al. Four-year lower extremity disability trajectories among African American men and women. *J Gerontol A Biol Sci Med Sci*. 2007;62(5):525-530. http://dx.doi.org/10.1093/gerona/62.5.525. PMID:17522357.
7. Mendes de Leon CF, Barnes LL, Bienias JL, Skarupski KA, Evans DA. Racial disparities in disability: recent evidence from self-reported and performance-based disability measures in a population-based study of older adults. *J Gerontol B Psychol Sci Soc Sci*. 2005;60(5):S263-S271. http://dx.doi.org/10.1093/geronb/60.5.S263. PMID:16131627.
8. Thorpe RJ Jr, Kasper JD, Szanton SL, Frick KD, Fried LP, Simonsick EM. Relationship of race and poverty to lower extremity function and decline: findings from the Women's Health and Aging Study. *Soc Sci Med.* 2008;66(4):811-821. http://dx.doi.org/10.1016/j.socscimed.2007.11.005. PMID:18164113.
9. Thorpe RJ Jr, Koster A, Kritchevsky SB, et al. Race, socioeconomic resources, and late-life mobility and decline: Findings from the Health, Aging, and Body Composition Study. *J Gerontol A Biol Sci Med Sci.* 2011; 66A(10):1114-1123.
10. Eisner MD, Blanc PD, Yelin EH, et al. COPD as a systemic disease: impact on physical functional limitations. *Am J Med*. 2008;121(9):789-796. http://dx.doi.org/10.1016/j.amjmed.2008.04.030. PMID:18724969.
11. Kuo HK, Al Snih S, Kuo YF, Raji MA. Chronic inflammation, albuminuria, and functional disability in older adults with cardiovascular disease: the National Health and Nutrition Examination Survey, 1999-2008. *Atherosclerosis*. 2012;222(2):502-508. http://dx.doi.org/10.1016/j.atherosclerosis.2012.03.004. PMID:22460050.
12. Elder GH Jr. Time, Human Agency, and Social Change: Perspectives on the Life Course. *Soc Psychol Q*. 1994;57(1):4-15. http://dx.doi.org/10.2307/2786971.
13. Guralnik JM, Simonsick EM, Ferrucci L, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. *J Gerontol*. 1994;49(2):M85-M94. http://dx.doi.org/10.1093/geronj/49.2.M85. PMID:8126356.
14. Peel C, Sawyer Baker P, Roth DL, Brown CJ, Brodner EV, Allman RM. Assessing mobility in older adults: the UAB Study of Aging Life-Space Assessment. *Phys Ther*. 2005;85(10):1008-1119. PMID:16180950.
15. Charlson ME, Sax FL, MacKenzie CR, Fields SD, Braham RL, Douglas RG Jr. Assessing illness severity: does clinical judgment work? *J Chronic Dis*. 1986;39(6):439-452. http://dx.doi.org/10.1016/0021-9681(86)90111-6. PMID:3086355.
16. *Cardiovascular Health Study. Manual of Operations.* Vol 1 and 2. Seattle, WA: CHS Coordinating Center; 1989.
17. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975;12(3):189-198. http://dx.doi.org/10.1016/0022-3956(75)90026-6. PMID:1202204.
18. Yesavage JA, Brink TL, Rose TL, Adey M. The geriatric depression rating scale: comparison with other self-report and psychiatric rating scales. In: Crook T, Ferris SH, Bartus R, eds. *Assessment in Geriatric Psychopharmacology.* New Canaan, CT: Mark Powley Associates; 1983:153-165.
19. SAS Institute. SAS 9.1.3. Procedures Guide. Cary, NC, USA, 2006.
20. Haykowsky MJ, Brubaker PH, Morgan TM, Kritchevsky S, Eggebeen J, Kitzman DW. Impaired aerobic capacity and

physical functional performance in older heart failure patients with preserved ejection fraction: role of lean body mass. *J Gerontol A Biol Sci Med Sci*. 2013;68(8):968-975. http://dx.doi.org/10.1093/gerona/glt011. PMID:23525477.

21. Thorpe RJ Jr, Clay OJ, Szanton SL, Allaire JC, Whitfield KE. Correlates of mobility limitation in African Americans. *J Gerontol A Biol Sci Med Sci*. 2011;66(11):1258-1263. http://dx.doi.org/10.1093/gerona/glr122. PMID:21798864.
22. Buchman AS, Boyle PA, Leurgans SE, Barnes LL, Bennett DA. Cognitive function is associated with the development of mobility impairments in community-dwelling elders. *Am J Geriatr Psychiatry*. 2011;19(6):571-580. http://dx.doi.org/10.1097/JGP.0b013e3181ef7a2e. PMID:21606900.
23. Thrasher AD, Clay OJ, Ford CL, Stewart AL. Theory-guided selection of discrimination measures for racial/ ethnic health disparities research among older adults. *J Aging Health*. 2012;24(6):1018-1043. http://dx.doi.org/10.1177/0898264312440322. PMID:22451527.