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ELDERLY MEXICANS HAVE LESS MUSCLE AND GREATER TOTAL AND TRUNCAL FAT COMPARED TO AFRICAN-AMERICANS AND CAUCASIANS WITH THE SAME BMI

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Abstract

Background—How body composition, specifically skeletal muscle mass, compares in Mexican elderly to other ethnic groups has not previously been reported. We tested the hypothesis that older adults from Northwest Mexico (Mex) would have similar total appendicular skeletal muscle (TASM) compared with New York dwelling Caucasians (Cauc) and African-Americans (AA).

Methods—Two hundred and eighty nine Mex (135 males and 154 females), 166 AA (36 males and 130 females) and 229 Cauc (64 males and 165 females), aged 60–98 years were assessed. Total and regional fat and lean tissues were measured by whole-body dual energy X-ray absorptiometry where TASM is the sum of arm and leg bone-free and fat-free lean tissue. Differences in TASM were tested by ANCOVA, with age, height, and body mass index (BMI) as covariates.

Results—TASM adjusted for ethnicity, age, height and BMI, were 22.6 ± 0.2 kg and 17.8 ± 0.1 kg for males and females, respectively ($p<0.001$). Among males with similar age, height, and BMI, Mex had less TASM compared with AA and Cauc ($p<0.001$). Total body fat and truncal fat were higher ($p< 0.001$) and FFM lower ($p<0.001$) in Mex compared to both AA and Cauc males after adjusting for age and BMI. Among females, Mex had higher total and truncal fat ($p<0.001$) after adjusting for age and BMI, and significantly lower TASM ($p<0.001$) after adjusting for age, height, and BMI compared to AA and Cauc females.

Conclusions—Elderly Mex have a different body composition compared with AA and Cauc of a similar BMI and age. Mex have significantly less TASM with greater total and truncal fat. In the long-term, Mex elderly may be at greater risk for sarcopenic obesity compared to other ethnic groups.

Keywords

Appendicular skeletal muscle; fat mass; BMI; elderly; ethnicity

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Introduction

Body composition, more specifically lean tissue and fat masses, over the course of the adult years, are in a dynamic state, with greater changes occurring in some components at specific ages compared to others (1–3). With regard to lean tissue mass of which skeletal muscle constitutes the largest component, the most significant negative changes occur in the senescence phase (aged over 60 y) (4). While body weight reflects the sum of fat and fat free mass (FFM), a stable body weight over time does not infer stability in these two components, as a negative change in FFM concomitant with a positive change in fat mass can result in a stable body weight (5). Thus body weight or body mass index (BMI) should be used with caution as surrogate measures of body composition. Moreover, the well established changes in body composition that occur with advancing age (1–2) combined with the established differences in fat distribution and muscle mass that exist in some ethnic/race groups indicate that BMI is not an appropriate tool for use in individuals or in populations in whom body composition proportions may be different (6–7). Recently, Romero-Corral et al. (8) reported that BMI has a good general correlation with percentage body fat, but it fails to discriminate between body fat and FFM, especially in men and the elderly.

Currently, there is much interest in understanding skeletal muscle mass and its determinants across the age span. Skeletal muscle mass is one of the metabolic and functional components of FFM and it is well known that skeletal muscle is influenced by age, height and gender (9). Longitudinal studies on total appendicular skeletal muscle (TASM) as a proxy for total body muscle mass have shown a significant effect of age in both men and women over age 60 years (2,5). The clinical implication of the loss of skeletal muscle mass or sarcopenia below a critical threshold relates to impaired functional status and physical disability in older persons (10–12). More recently, sarcopenia has been proposed as an important component of the frailty syndrome in elderly (13).

TASM like other body components differs across ethnicities (14–18). A cross-sectional study in African-American and Caucasian adults (aged 20–70 years) using dual energy X-ray absorptiometry (DXA) estimates of TASM reported an impact of age, gender, and ethnicity, whereby African-American men and women had significantly higher TASM values after adjustment for height, body weight and age, compared with Caucasian groups (14).

The study aim was to test the hypothesis that elderly from Northwest Mexico (Mex) have similar TASM compared with New York dwelling Caucasians (Cauc) and African-Americans (AA). A secondary aim was to ascertain whether arm and leg skeletal muscle differs between these three ethnic groups.

Methods

Subjects

Two data sets containing several anthropometric and body composition variables were pooled. Measurement techniques were considered comparable. Data on African-American and Caucasian elderly came from studies performed at the Body Composition Unit, St Luke's-Roosevelt Hospital, New York, NY between 1993 and 2005. Data on Mexican elderly came from two studies performed in Hermosillo, Sonora, Mexico, between 2003 and 2007.

Six hundred and eighty-four subjects (289 Mex, 135 males and 154 females; 166 AA; 36 males and 130 females and 229 Cauc; 64 males and 165 females) aged 60–98 years were included in the analysis. Subjects were healthy, physically independent, and self-reported weight stable (less than 2 kg change over past 6 months), and were not involved in any type of routine or structured exercise program at the time of the study. Subjects reported to the laboratory in the morning having fasted for a minimum of eight hours, and underwent a medical examination and screening blood test. Subjects were free of known type 2 diabetes, cancer, and heart disease, and were not taking any medication known to affect body composition. Ethnicity for the USA sample was defined as previously reported (18), and the Mexican group was required to report being Mexican from Northwest Mexico. All studies were approved by the Institutional Review Boards at each participating institution, and all subjects gave written consent to participate.

Body composition measurements

Anthropometry

Body weight was measured using an electronic scale (Mexico: Body Composition System Life Measurement Instruments, Concord, CA, USA; New York: Weight Tronix, New York, NY, USA) with subjects barefoot wearing either a tight fitting bathing suit or a hospital gown. At both sites, the standing height was recorded to the nearest 0.5 cm (Mexico) or 0.1 cm (New York) using a Holtain stadiometer (Holtain Ltd., Dyfed, Wales, UK). Body mass index (BMI) kg/m^2 was determined from these measurements.

Dual energy X-ray absorptiometry measurements

For all participants, TASM, total body fat (TBF) and regional fat mass, particularly truncal fat, and FFM were estimated by dual energy X-ray absorptiometry (DXA) using GE Lunar DPX-MD+ (Mexico), DPX and DPX-L (New York), GE Lunar Co; Madison, WI, USA. To minimize technical error relating to scan analysis, the scans from Mexico were analyzed by a single technician in the Body Composition Unit in New York using the software version 9.30 for Prodigy. The New York data were analyzed using software versions 1.3z, 3.6y, 4.7d, and 4e.

Subjects were measured in a supine position with arms positioned parallel to the body. The feet were strapped together using a velcro strap as per the manufacturers guidelines. The instruments were calibrated daily using the manufacturer's spine phantom and laboratory soft tissue phantoms as previously described (18).

Body composition analysis was performed according to the defined guidelines with special emphasis on separating the arms and legs from the trunk region (19). The cut lines were placed to distinguish arms from chest, legs from trunk and pelvis from trunk. Appendicular skeletal muscle mass is the sum of bone-free lean tissue in the arms and legs. DXA-derived TASM (kg) assumes that this entity represents limb skeletal muscle mass, with a further assumption that limb skeletal muscle mass represents 75% of total body skeletal muscle mass (20).

Statistical analysis

To test the hypothesis that elderly from Northwest Mexico have a similar TASM compared with Cauc and AA, and to ascertain whether skeletal muscle in the arms and legs differs between these three ethnic groups, an analysis of covariance (ANCOVA) was used, with age, height, and body mass index as covariates. Fisher's LSD multiple comparison test was used to make pair-wise comparisons among the means. Significant differences between groups for age, anthropometric and body composition variables were tested by analysis of variance. An ANCOVA was used to test for significant differences among the races in TBF, truncal fat, arm fat, and leg fat using age and BMI as covariates, and in FFM using age, height, and BMI as covariates. Correlation analysis was used to test the association between TASM and height, body weight, and age by group. Statistical significance was set at $p \leq 0.05$ for all tests. Data were analyzed using the statistical program NCSS 2001 (Number Cruncher Statistical System for Windows, Kaysville, UT, USA).

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Results

The study sample included a total of 684 subjects (235 men and 449 women) aged 60–98 years, from three different ethnic groups. The age and gender adjusted mean values for BMI were 26.7 ± 0.3 kg/m^2 (Mex), 27.8 ± 0.4 kg/m^2 (AA) and 27.2 ± 0.3 kg/m^2 (Cauc), which were not significantly different across groups (p=0.08). The mean values for total body fat adjusted for age, and BMI, were 26.4 ± 0.2 kg (Mex), 23.8 ± 0.4 kg (AA) and 24.5 ± 0.3 kg (Cauc), where total body fat was significantly higher for Mex compared to the other two groups (p<0.001).

TASM and other variables across gender

TASM was negatively associated with age (r=−0.1114; p=0.0035) and positively associated with body weight (r=0.6565; p=0.0001) and height (r=0.7792; p=0.0001) in the total sample. Within each gender, when TASM was adjusted for ethnicity, age, body mass index and height, men had approximately 5 kg more TASM than women (p<0.001).

After adjustment for ethnic group, there was an effect of gender on several variables: men had significantly higher mean values for age, body weight, and height, but significantly lower BMI compared with women. TASM adjusted for race, age, body mass index, and height was higher in men than women (men 22.6 ± 0.2 kg and women 17.8 ± 0.1 kg of TASM; p<0.001).

Among men, Mex were significantly younger compared with AA (p<0.001) with no between group differences in body weight (Table 1). However, after adjustment for age, Mex weight less than Cauc (p<0.05), and were shorter (p<0.001) than Cauc and AA. However, BMI was not statistically different across ethnic groups in men, even with adjustment for age (p=0.98).

Among women, Mex were significantly younger than AA, had lower body weight, and were shorter (p<0.0001) than Cauc and AA after adjusting for age (Table 1). After adjustment for age, BMI was not significantly different across the three ethnic groups (p=0.063).

TASM and other estimates across ethnic groups

Among men, TASM was significantly lower in Mex (Table 2) compared with AA and Cauc after adjustment for age, height, and body mass index (p<0.001). There were significant between-group differences in arm skeletal muscle where Cauc had less arm skeletal muscle compared to Mex and AA (p<0.001), and AA men had significantly higher values compared to Cauc and Mex (p<0.001). Leg skeletal muscle was lower in Mex compared with AA and Cauc men (p<0.001).

Among women, TASM and leg skeletal muscle were significantly lower in Mex compared with AA and Cauc (p<0.001) after adjusting for age, height, and BMI. Cauc had lower arm skeletal muscle compared with Mexican and AA after adjustment for age, height, and body mass index (p<0.001). AA had significantly higher values for TASM, arm and leg lean tissue (Table 2) compared with both Cauc and Mex after adjusting for age, height, and BMI.

FFM was significantly lower in Mex men and women even after adjustment for age, height and body weight (p<0.001) compared to AA and Cauc groups (Table 2)

Total body fat and truncal fat were higher in Mex men and women (Table 2) compared with AA and Cauc men and women (p<0.0001; adjusted for age, and BMI).

Discussion

To our knowledge, this is the first report that compares estimates of skeletal muscle mass and body composition compartments in apparently healthy, non-institutionalized older Northwest

Mexicans, to African-American and Caucasian older adults living in New York City. The main finding of this study is that older Mexican men and women have dissimilar amounts of skeletal muscle mass in spite of similar BMI's.

Within each gender, for a similar BMI, Mex men and women compared with AA and Cauc had significantly greater amounts of total and truncal fat. These findings are consistent with those reported by Fernández et al. (21) who found that the relationship between body fat and BMI in Hispanic-Americans women differed from that of European-American and African-American women, where Hispanic-Americans had a greater total body fat for the same BMI. A number of early studies have shown that ethnicity is an important factor when interpreting the relationships between body fat and BMI (16,22). Among Chinese, Malay and Indian adults, for the same BMI, the Chinese had the lowest, and Indians the highest body fat (23).

A significant effect of ethnicity was found for other body composition components too. There was an effect of ethnicity on FFM and TASM where Mex men and women had significantly lower TASM and FFM, and higher total and truncal fat compared with AA and Cauc men and women. Recently, it was reported that BMI has a good general correlation with percentage body fat, but BMI fails to discriminate between body fat and FFM, especially in men and the elderly (8). The current study yet again demonstrates the inability of BMI to discriminate between persons who differ significantly in body composition. The latter has implications for the usefulness of using BMI alone when investigating body composition in relation to metabolic disease risk (eg, total and regional fat distribution effects on metabolic derangements) or physical function limitation (sarcopenia or osteopenia/osteoporosis) (24).

It is well recognized that muscle mass is influenced by age, height, body weight, gender, and ethnicity (9,14,25–26). The finding of significantly less TASM in Mex for a similar BMI may be related to differences in environmental conditions. It is well recognized that low muscle mass or sarcopenia is related to age, gender, body size or mass, levels of physical activity, and heritability (27–31). Information on levels of physical activity, nutritional intake, and genetic admixture were unavailable in these cohorts.

With respect to the TASM subcompartments in the arms and legs, Mex men and women had significantly less leg muscle compared to AA and Cauc, whereas Cauc men and women had significantly less arm muscle compared to Mex and AA ($p<0.0001$). The current study cannot address associations between levels of skeletal muscle mass and incidence of physical disability as these data were not collected. However, given that lower extremity muscle mass is an important determinant of physical performance among functionally-limited elders (32), a clinically relevant recommendation arising from the current data is that an intervention program targeted at increasing leg muscle mass in elderly Mex men and women could have merit in avoiding physical disabilities. It is important to point out that independent of ethnicity, increases in physical activity and resistance training are the most effective interventions to retard the loss of skeletal muscle mass in the elderly (33–34). An increase in muscle mass and strength in healthy elderly may have little effect on a specific physical performance, but a small increase in muscle mass among sarcopenic elderly could result in a significant improvement in physical performance despite a relatively small increase in muscle strength (35).

The finding of significantly less TASM in older Mexican compared to AA and Cauc men and women highlights the need to have specific cut-off points for TASM to define sarcopenia in the Mexican population. It is likely that young adult Caucasians and African-Americans have higher levels of skeletal muscle mass compared with age matched Mexican and Latin-American ethnic groups.

In the present study, Mex men and women had higher total body and truncal fat, with less muscle and FFM compared to the other ethnic groups. With respect to FFM, Obisesan et al.

(17) using representative data from NHANES III reported an effect of age and ethnicity on FFM. Overall FFM and FFM-index (FFM-index defined as FFM (kilograms) divided by the square of body height (meter2) were significantly higher in black compared with white women, but similar in black compared to white men. In the current study, AA women had significantly higher FFM compared with Mex and Cauc, whereas in men there were no significant differences in FFM between AA and Cauc men. Previously, Casas et al. (15) reported that healthy Hispanic women have higher adiposity and lower amounts of FFM compared with white women. These findings suggest the need to look for sarcopenic obesity instead of sarcopenia alone in some ethnic groups. A recent longitudinal study reported that the elderly with sarcopenic obesity at baseline were two to three times more likely to report onset of disability in instrumental activities of daily living during follow-up than lean sarcopenic or nonsarcopenic obese subjects and those with normal body composition (36).

Limitations of the study

These results should be interpreted with caution due to the cross-sectional design of the study, a relatively small number of subjects per group, and reliance on self-report of ethnicity (especially for AA group where genetic admixtures is likely greater).

Conclusion

Mexican elderly have different body compositions compared with African-American and Caucasian adults of similar BMI and age. Within gender, Mexicans have significantly less TASM and FFM than Caucasian and African-American, for similar age and BMI. Both Mexican men and women have greater total and truncal fat. Overall, Mexicans may be at a greater risk for sarcopenic obesity. For Mexicans, both cross-sectional and longitudinal studies investigating the impact of age and ethnicity and physical activity patterns on skeletal muscle mass are warranted.

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References

1. Kyle UG, Genton L, Hans D, Karsegard VL, Michel JP, Slosman DO, Pichard C. Total body mass, fat mass, fat-free mass, and skeletal muscle in older people: cross-sectional differences in 60-year-old persons. J Am Geriatr Soc 2001;49:1633–40. [PubMed: 11843996]

2. Raguso CA, Kyle U, Kossovsky MP, Roynette C, Paoloni-Giacobino A, Hans D, et al. A 3-year longitudinal study on body composition changes in the elderly: role of physical exercise. Clin Nutr 2006;25:573–80. [PubMed: 16330136]

3. He Q, Heo M, Heshka S, Wang J, Pierson RN Jr, Albu J, et al. Total body potassium differs by sex and race across the adult age span. Am J Clin Nutr 2003;78:72–7. [PubMed: 12816773]

4. Kyle UG, Genton L, Hans D, Karsegard L, Slosman DO, Pichard C. Age-related differences in fat-free mass, skeletal muscle, body cell mass and fat mass between 18 and 94 years. Eur J Clin Nutr 2001;55:663–672. [PubMed: 11477465]

5. Gallagher D, Ruts E, Visser M, Heshka S, Baumgartner RN, Wang J, et al. Weight stability masks sarcopenia in elderly men and women. Am J Physiol Endocrinol Metab 2000;279:366–75.

6. Cook Z, Kirk S, Lawrenson S, Sandford S. Use of BMI in the assessment of undernutrition in older subjects: reflecting on practice. Proc Nutr Soc 2005;64:313–7. [PubMed: 16048662]

7. McCargar L. New insights into body composition and health through imaging analysis. Can J Diet Pract Res 2007;68:160–5. [PubMed: 17784977]

8. Romero-Corral A, Somers VK, Sierra-Johnson J, Thomas RJ, Collazo-Clavell ML, Korinek J, et al. Accuracy of body mass index in diagnosing obesity in the adult general population. Int J Obes 2008;32:959–66.
9. Janssen I, Heymsfield SB, Wang ZM, Ross R. Skeletal muscle mass and distribution in 468 men and women aged 18–88 yr. J Appl Physiol 2000;89:81–8. [PubMed: 10904038]
10. Morley JE, Baumgartner RN, Roubenoff R, Mayer J, Nair KS. Sarcopenia. J Lab Clin Med 2001;137:231–43. [PubMed: 11283518]
11. Roubenoff R. Origins and clinical relevance of sarcopenia. Can J Appl Physiol 2001;26:78–89. [PubMed: 11291626]
12. Janssen I. Influence of sarcopenia on the development of physical disability: the Cardiovascular Health Study. J Am Geriatr Soc 2006;54:56–62. [PubMed: 16420198]
13. Bortz WM II. A conceptual framework of frailty: a review. J Gerontol A Biol Sci Med Sci 2002;57:283–8.
14. Gallagher D, Visser M, De Meersman RE, Sepúlveda D, Baumgartner RN, Pierson RN, et al. Appendicular skeletal muscle mass: effects of age, gender, and ethnicity. J Appl Physiol 1997;83:229–39. [PubMed: 9216968]
15. Casas YG, Schiller BC, Desouza CA, Seals DR. Total and regional body composition across age in healthy Hispanic and white women of similar socioeconomic status. Am J Clin Nutr 2001;73:13–8. [PubMed: 11124743]
16. Deurenberg P, Yap M, van Staveren WA. Body mass index and percent body fat: a meta analysis among different ethnic groups. Int J Obes Relat Metab Disord 1998;22:1164–71. [PubMed: 9877251]
17. Obisesan TO, Aliyu MH, Bond V, Adams RG, Akomolafe A, Rotimi CN. Ethnic and age-related fat free mass loss in older Americans: the Third National Health and Nutrition Examination Survey (NHANES III). BMC Public Health 2005;5:41. [PubMed: 15840167]
18. Wu CH, Heshka S, Wang J, Pierson RN Jr, Heymsfield SB, Laferrère B, et al. Truncal fat in relation to total body fat: influences of age, sex, ethnicity and fatness. Int J Obes 2007;31:1384–91.
19. Heymsfield SB, Smith R, Aulet M, Bensen B, Lichtman S, Wang J, Pierson RN Jr. Appendicular skeletal muscle mass: measurement by dual-photon absorptiometry. Am J Clin Nutr 1990;52:214–8. [PubMed: 2375286]
20. Hansen RD, Raja C, Aslani A, Smith RC, Allen BJ. Determination of skeletal muscle and fat-free mass by nuclear and dual-energy x-ray absorptiometry methods in men and women aged 51–84 y. Am J Clin Nutr 1999;70:228–33. [PubMed: 10426699]
21. Fernández JR, Heo M, Heymsfield SB, Pierson RN Jr, Pi-Sunyer FX, Wang ZM, et al. Is percentage body fat differentially related to body mass index in Hispanic Americans, African Americans, and European Americans? Am J Clin Nutr 2003;77:71–5. [PubMed: 12499325]
22. Gallagher D, Heymsfield SB, Heo M, Jebb SA, Murgatroyd PR, Sakamoto Y. Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. Am J Clin Nutr 2000;72:694–701. [PubMed: 10966886]
23. Deurenberg-Yap M, Schmidt G, van Staveren WA, Deurenberg P. The paradox of low body mass index and high body fat percentage among Chinese, Malays and Indians in Singapore. Int J Obes Relat Metab Disord 2000;24:1011–17. [PubMed: 10951540]
24. St-Onge MP. Relationship between body composition changes and changes in physical function and metabolic risk factors in aging. Curr Opin Clin Nutr Metab Care 2005;8:523–8. [PubMed: 16079623]
25. Gallagher D, Heymsfield SB. Muscle distribution: variations with body weight, gender, and age. Appl Radiat Isot 1998;49:733–4. [PubMed: 9569594]
26. Doherty TJ. Invited review: Aging and sarcopenia. J Appl Physiol 2003;95:1717–27. [PubMed: 12970377]
27. Morley JE, Baumgartner RN, Roubenoff R, Mayer J, Nair KS. Sarcopenia. J Lab Clin Med 2001;137:231–43. [PubMed: 11283518]
28. Marcell TJ. Sarcopenia: causes, consequences, and preventions. J Gerontol A Biol Sci Med Sci 2003;58:M911–6. [PubMed: 14570858]
29. Baumgartner RN, Waters DL, Gallagher D, Morley JE, Garry PJ. Predictors of skeletal muscle mass in elderly men and women. Mech Ageing Dev 1999;107:123–36. [PubMed: 10220041]

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30. Arden NK, Spector TD. Genetic influences on muscle strength, lean body mass, and bone mineral density: a twin study. J Bone Miner Res 1997;12:2076–81. [PubMed: 9421240]
31. Gerace L, Aliprantis A, Russell M, Allison DB, Buhl KM, Wang J, et al. Skeletal differences between black and white men and their relevance to body composition estimates. Am J Hum Biol 1994;6:255–62.
32. Reid KF, Naumova EN, Carabello RJ, Phillips EM, Fielding RA. Lower extremity muscle mass predicts functional performance in mobility-limited elders. J Nutr Health Aging 2008;12:493–8. [PubMed: 18615232]
33. Vincent KR, Braith RW, Feldman RA, Magyari PM, Cutler RB, Persin SA, et al. Resistance exercise and physical performance in adults aged 60 to 83. J Am Geriatr Soc 2002;50:1100–7. [PubMed: 12110072]
34. Skelton DA, Young A, Greig CA, Malbut KE. Effects of resistance training on strength, power, and selected functional abilities of women aged 75 and older. J Am Geriatr Soc 1995;43:1081–7. [PubMed: 7560695]
35. Rolland Y, Czerwinski S, Van Kan Abellan G, Morley JE, Cesari M, Onder G, et al. Sarcopenia: its assessment, etiology, pathogenesis, consequences and future perspectives. J Nutr Health Aging 2008;12:433–50. [PubMed: 18615225]
36. Baumgartner RN, Wayne SJ, Waters DL, Janssen I, Gallagher D, Morley JE. Sarcopenic obesity predicts instrumental activities of daily living disability in the elderly. Obes Res 2004;12:1995–2004. [PubMed: 15687401]

Table 1

Descriptive characteristics of elderly women and men

	Mexican		African-American		Caucasian	
Variables	**Women (n= 154)**	**Men (n= 135)**	**Women (n= 130)**	**Men (n= 36)**	**Women (n= 165)**	**Men (n= 64)**
Age, years	68.2 ± 0.5^{a}	69.4 ± 0.5^{a}	71.0 ± 0.7^{b}	73.6 ± 1.0^{b}	69.6 ± 0.7^{ab}	71.6 ± 1.1^{b}
Body weight, kg	66.8 ± 1.0^{a}	74.7 ± 1.1^{a}	73.0 ± 1.3^{b}	76.6 ± 2.1^{a}	70.8 ± 1.2^{b}	78.4 ± 1.7^{a}
Height, cm	155.8 ± 0.5^{a}	168.6 ± 0.5^{a}	159.9 ± 0.6^{b}	171.6 ± 1.3^{b}	159.3 ± 0.5^{b}	172.9 ± 1.0^{b}
BMI, kg/m^2	27.5 ± 0.4^{a}	26.2 ± 0.3^{a}	28.5 ± 0.5^{a}	26.0 ± 0.7^{a}	28.0 ± 0.5^{a}	26.2 ± 0.5^{a}

BMI= Body mass index. Data are unadjusted mean ± standard error; Within sex between group differences are depicted by different letters ($p<0.05$).

Table 2

Appendicular skeletal muscle and other body composition estimates in elderly men and women

	Men			Women		
Variables	**Mexican (n= 135)**	**African-American (n= 36)**	**Caucasian (n= 64)**	**Mexican (n= 154)**	**African-American (n= 130)**	**Caucasian (n= 165)**
TASM, kg	22.6 ± 0.2[a]	25.7 ± 0.3[b]	24.1 ± 0.2[c]	16.0 ± 0.1[a]	18.1 ± 0.1[b]	16.9 ± 0.1[c]
Arms LT, kg	6.3 ± 0.1[a]	6.6 ± 0.1[b]	6.1 ± 0.1[c]	4.1 ± 0.0[a]	4.4 ± 0.0[b]	4.0 ± 0.0[c]
Legs LT, kg	16.3 ± 0.1[a]	19.1 ± 0.2[b]	18.0 ± 0.2[c]	11.9 ± 0.1[a]	13.7 ± 0.1[b]	12.8 ± 0.1[c]
FFM,kg	52.8 ± 0.3[a]	57.6 ± 0.6[b]	56.6 ± 0.4[b]	38.3 ± 0.2[a]	42.5 ± 0.2[b]	41.6 ± 0.2[c]
Total fat, kg	22.2 ± 0.3[a]	18.4 ± 0.6[b]	19.9 ± 0.5[b]	29.6 ± 0.3[a]	27.9 ± 0.3[b]	27.9 ± 0.3[b]
Truncal fat, kg	13.9 ± 0.2[a]	10.1 ± 0.4[b]	11.2 ± 0.3[c]	15.5 ± 0.2[a]	12.5 ± 0.2[b]	13.2 ± 0.2[c]
Arms fat, kg	1.9 ± 0.0[ab]	1.7 ± 0.1[a]	2.0 ± 0.1[b]	3.2 ± 0.1[a]	2.9 ± 0.1[b]	3.1 ± 0.1[ab]
Legs fat, kg	5.8 ± 0.1[a]	5.8 ± 0.3[a]	5.8 ± 0.2[a]	10.1 ± 0.2[a]	11.4 ± 0.2[b]	10.7 ± 0.2[c]

TASM= Total appendicular skeletal muscle, LT= Lean tissue, FFM= Fat- free mass; Data presented are adjusted mean ± standard error; Within gender between group differences are depicted by different letters by row ($p<0.05$).