Published in final edited form as:

J Am Geriatr Soc. 2008 March ; 56(3): 553–557. doi:10.1111/j.1532-5415.2007.01595.x.

Relevance of Race and Ethnicity for Self-Reported Functional Limitation

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Abstract

It is unclear whether older adults of different race or ethnicity vary in the ways they perceive functional limitations. Variation in such self-reports may be relevant clinically, because many diagnoses (and subsequent care) depend on self-reported disability. To examine this question, self-reported hand function was compared with performance-based assessment of strength (hand dynamometer) and dexterity (Moberg Pick-Up Test) in white ($n = 102$), African-American ($n = 67$), and Hispanic ($n = 196$) elderly people. Participants were Medicare beneficiaries from northern Manhattan, New York City, aged 70 and older. In adjusted analyses, self-reported hand function was associated with weaker grip strength in African-American and Hispanic participants but not in white participants. Self-reported difficulty with hand function was associated with poorer dexterity in all three groups. Similar results were observed in the subsample of participants with arthritis. These results suggest that culture or socioenvironmental differences associated with culture may influence reports of functional limitation.

Keywords

functional limitation; ethnicity; disability; grip strength

Researchers studying late-life disability have become increasingly interested in “upstream” functional limitation, that is, deficits in performance that precede and increase risk of disability in activities of daily living (ADLs). Although disability has declined in racial and ethnic minorities, health disparities remain.^{1–4} Developing a better understanding of functional limitation and consequent disability in diverse groups of elderly people is consistent with the two *Healthy People 2010* goals—to eliminate health disparities between different segments of

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Author Contributions: Dr. Spencer and Dr. Albert developed the study concept and design, interpreted data, and prepared the manuscript. Dr. Spencer conducted data analyses. Dr. Bear-Lehman and Dr. Burkhardt helped in the overall design of the SITE study and acquisition of subjects. All authors critically reviewed the manuscript and take full responsibility for the integrity of data and analyses.

Sponsor’s Role: The sponsors had no role in the design, methods, subject recruitment, data collection, or analysis and preparation of paper.

the population and to increase quality and years of healthy life.⁵ An area in need of further investigation is the degree to which older adults vary in the ways they perceive functional limitations.

Researchers measure functional limitation using objective (performance-based) and subjective (self-report) measures. Self-reports are less expensive and easier to administer and can reflect underlying health problems; performance-based measures are less influenced by culture and education, can discriminate between high-functioning participants, and can be used to detect preclinical conditions.^{6,7} The two approaches are complementary and when combined add prognostic value to the information gained by relying on a single approach.⁶

Although self-report and performance-based measures of function are highly correlated,⁶ the strength of the association varies according to sociodemographic features. For example, women are more likely to disclose disability and men less likely, which may attenuate the association between subjective and objective measures.⁸ Differences in the relationship between self-report and performance-based measures have also been found for race. Health pessimism refers to poorer self-assessments of health of African Americans even when they do not differ from elderly white people in objective measures of health status.⁹ Hispanic subjects may overreport ADL dependency more than white subjects with the same number of observed ADL limitations.¹⁰ A more-comprehensive understanding of the relationship between measures of function and sociocultural factors will be important for advancing research on functional limitation.

One important domain of functional limitation that has not been examined in this context is hand function. Hand function is critical for the successful completion of ADLs and can affect an older adult's ability to live independently.^{11–14} Hand function has also been characterized as the most important aspect of upper extremity ability and declines as a result of normal aging and age-associated disorders.¹⁵ The most common performance-based measure of hand functioning in older adulthood is isometric (grip) strength. Grip strength has been used as an indicator of muscle strength and as a construct of frailty in large epidemiological studies of aging.^{16–19} Studies have demonstrated that grip strength can predict future disability and all-cause mortality in diverse populations.^{16,19–22}

Differences in self-reported hand functioning and how variation in self-report relates to objective measures of strength and dexterity in older adults of different racial or ethnic groups were examined. Because arthritis of the hand can have functional consequences (including reduced hand mobility and sensation, poorer grip strength, and problems in multiple activity domains),²³ a secondary objective was to examine cultural variation in self-reports of older adults with arthritis.

METHOD

Sample

Data for this sample were drawn from the Sources of Independence in the Elderly (SITE) project. SITE participants were recruited from the Washington Heights-Inwood Columbia Aging Project, which sampled community-dwelling Medicare beneficiaries in northern Manhattan, New York City. Participants were included in the SITE study if they were aged 70 and older, were not depressed, and did not meet criteria for dementia. Depression status was based on scores on the Patient Health Questionnaire,²⁴ and presence of dementia was based on a cognitive screening procedure. SITE participants were also selected to have mild to moderate disability, defined as reporting limitations in one to three of the following domains: upper extremity function, lower extremity or mobility function, ADLs, and instrumental ADLs.²⁵ Details on recruitment, response rates, and measures used in the SITE cohort have been reported elsewhere.²⁶

Approximately 63% of SITE participants reported that a doctor had told them that they had arthritis. Participants with arthritis differed from those without arthritis on a number of demographic characteristics. They were significantly more likely to be female (χ^2 (1, $N = 375$) = 15.00, $P < .001$), Hispanic (χ^2 (2, $N = 369$) = 8.27, $P = .02$), and less educated (χ^2 (2, $N = 375$) = 9.30, $P = .01$) and were more likely to report difficulty grasping and handling (χ^2 (1, $N = 375$) = 4.06, $P = .04$).

Measures

Trained bilingual interviewers administered the survey used in the SITE project. Demographic items included race or ethnicity, age, sex, educational attainment, and living arrangement. For race or ethnicity, participants self-identified as African American, white, or Hispanic.

Among measures of physical status, arthritis was assessed with a single item, "Has a doctor ever told you that you had arthritis?" Body mass index (BMI) was calculated by dividing self-reported weight in kilograms by self-reported height in meters squared. Three BMI categories were defined according to national guidelines ($< 25 \text{ kg/m}^2$ = normal, $25\text{--}30 \text{ kg/m}^2$ = overweight, and $> 30 \text{ kg/m}^2$ = obese).²⁷ BMI was included as a covariate because of its known association with grip strength. Self-reported hand limitation was assessed using a single question, "Do you have difficulty using your fingers to grasp and handle?" with response categories 0 = no and 1 = yes.

Performance measures of hand function included grip strength (kg), measured using a Jamar dynamometer (BK-7498, Sammons Preston, Bolingbrook, IL), and hand dexterity (combined sensory and motor task), assessed using the Moberg Pick-Up Test.²⁸ Two trials of force generated on the dynamometer with the dominant hand were averaged. Two participants were unable to complete the test because of pain and were excluded from analyses involving this measure. In the Moberg Pick-Up Test, participants were timed as they picked up 12 standard small objects (e.g., paperclip, wing-nut, coin, key) and moved them between containers. The test was conducted with and without vision occluded. Nine people could not complete the test in the allotted time (180 seconds) while their vision was occluded and were given the maximum score.

Procedure

The purpose of the SITE project was to examine factors associated with the onset of disability and recovery from disability in a tri-ethnic sample of older adults. The protocol involved a telephone interview to determine eligibility, followed by a 90-minute in-home visit. The Columbia University-New York Presbyterian institutional review board approved the study protocol.

Analyses

Initial descriptive analyses examined means and 95% confidence intervals for demographic characteristics and hand function according to race or ethnicity. To test for group differences across race or ethnicity, chi-square tests were used for categorical variables and analysis of variance for continuous variables. A univariate $3 \text{ (race)} \times 2 \text{ (sex)} \times 2 \text{ (self-reported difficulty)}$ analysis of covariance, adjusted for age, BMI, and education, was then used to examine group differences in grip strength and dexterity based on self-reported hand limitation. The analyses were conducted using the full sample and the subsample reporting arthritis. All analyses were performed using SPSS Version 11 statistical software (SPSS Inc., Chicago, IL).

RESULTS

Sample Characteristics

Summaries of demographic characteristics of the entire sample and the arthritis subsample are presented in Table 1. The mean age $\pm$ standard deviation for the entire sample ($n = 371$) was 79.0 ± 5.8 (range 68.4–98.7); 45.5% of participants lived alone, 69.9% were female, and 28.8% reported post-high school education; 18.1% were African American, 27.5% white, and 52.8% Hispanic. Six participants (1.6%) reported a race or ethnicity that did not fall into the above three groups and were therefore excluded from analyses, leaving 365 for analyses. The majority of the sample (66.0%) was overweight or obese, and 13.4% reported a limitation in hand functioning.

A greater proportion of minority older adults than of whites were women ($\chi^2 (1, N = 365) = 6.82, P = .03$). African Americans were more likely to live alone than Hispanic and white subjects ($\chi^2 (1, N = 358) = 10.15, P = .01$). Of those with arthritis, African Americans were more likely to report difficulty using their hands ($\chi^2 (1, N = 230) = 8.70, P = .01$). A greater proportion of white participants reported having received post-high school education, whereas 75.0% of Hispanic subjects reported fewer than 8 years of formal schooling ($\chi^2 (2, N = 365) = 166.63, P < .001$). On average, Hispanic and African-American participants had a higher BMI than white participants ($\chi^2 (2, N = 365) = 12.97, P = .01$), with a greater proportion of minority subjects classified as overweight or obese.

Self-Reports and Hand Performance

Adjusted means and 95% confidence intervals for isometric strength stratified according to race, sex, and self-reported disability are presented in Table 2. Multivariate analyses revealed expected main effects for sex ($F (1, 348) = 39.56, P < .001$) and self-reported difficulty ($F (1, 348) = 11.73, P < .001$). Men exhibited significantly greater adjusted grip strength than women, and those who reported difficulty in grasping and handling had a significantly weaker grip than those who reported no difficulty.

A significant interaction between race and difficulty ($F (2, 348) = 6.76, P < .001$) also emerged, which is shown in Figure 1. African-American participants who reported difficulty grasping and handling objects had grip strength that was lower than those who reported no difficulty. A similar trend was found in Hispanic participants. For white participants, by contrast, self-reported difficulty was not significantly related to grip strength. The same results were evident in the arthritis subsample (race $\times$ difficulty interaction, $F (2, 213) = 4.19, P = .02$).

Dexterity, as measured using the Moberg Pick-Up Test, was also poorer in people reporting trouble grasping and handling. Time to complete the test in the unoccluded vision condition was 20.5 ± 15.8 seconds in people not reporting difficulty and 23.2 ± 12.9 seconds in people reporting difficulty ($P = .26$), and 43.4 ± 24.9 versus 56.3 ± 35.2 in the occluded vision condition ($P = .02$). In the vision occluded condition, white participants showed greater dexterity (41.7 ± 24.0 seconds vs 48.1 ± 32.8 seconds in African Americans and 45.7 ± 26.9 Hispanics; $P = .03$). Using the same set of predictors and covariates in multivariate analyses, no evidence was found of an interaction between race and self-reported difficulty in dexterity in the full sample or the arthritis subsample.

DISCUSSION

This research found concordance between perceived difficulty in hand function and grip strength in older African-American and Hispanic subjects but not in White subjects. Race and ethnicity did not influence self-reports of hand function relative to dexterity. The discordance between perceived and actual hand functioning in white subjects was an unexpected finding

and may indicate that strength is not a critical factor for older white adults when asked about hand functioning. The consistent association between dexterity and self-reported hand function across racial or ethnic groups may indicate the greater saliency of dexterity in self-reports of hand function.

Recent work suggests that a number of contextual factors, including how a person perceives his or her personal performance in the usual environment, influence self-reported function.²⁹ In contrast to findings for hand strength, racial or ethnic group did not alter the relationship between self-report and performance in the case of dexterity. Thus, cultural variation in reported limitation in hand function was not general but was visible only relative to particular objective indicators. Why should strength be less salient to older white people in thinking about hand function? Data to address this question are not yet available, but it is possible that assistive devices or features of the home environment may more easily address strength limitations than changes in dexterity. If older white people have greater access to such environmental supports, which is consistent with their greater education and better economic condition, then strength deficits may be less salient to them in thinking about hand limitation.

A notable strength of the current study was the selection of hand functioning as the outcome of interest. Impairments in hand function can lead to functional limitations, because the majority of ADLs require the ability to pinch, grasp, and manipulate objects. A recent review of self-report and performance-based measures recommended that research in this area should focus on activities that best predict future functioning.²⁹ Although grip strength is not the only component of hand function,¹¹ it has been widely used in studies of functional ability in older adulthood and is considered a global measure of functional integrity. Grip strength is also highly predictive of all-cause mortality, even as far as 24²¹ and 30 years²² in advance of the person's death. The association between grip strength and future disability is also striking, with a documented relationship between a declining gradient of grip strength and increasing severity of disability.¹⁸ These findings suggest that grip strength provides a powerful and relatively inexpensive way to identify older adults who are at risk for negative health outcomes.

Greater concordance was also found between self-report and performance in minority elders when analyses were limited to the arthritis subsample. Recognition of differences in concordance across cultural groups may be important for clinicians who provide services. Occupational therapists in the field of arthritis have noted that understanding the concordance between objective and subjective measures of hand functioning is critical.³⁰

Limitations of the current study include a small sample limited to a single metropolitan area, with inclusion criteria intended to capture older adults with mild to moderate disability. In addition, self-identified Hispanic older adults in this sample included a variety of ethnicities, such as Dominicans, Cubans, and Puerto Ricans; the sample was inadequate to examine such "subcultural" variation. Self-reported difficulty was assessed using a single item, which prohibits a more-detailed examination of specific hand limitations. Also, self-reports of arthritis were relied on and types (rheumatoid, psoriatic, or osteoarthritis, for example) could not be distinguished or confirmed with radiographic measures. Finally, mean grip strength in the SITE cohort was lower than reported for other aging cohorts, perhaps as a result of study inclusion criteria (i.e., all participants reported mild to moderate disability). Still, by measuring multiple aspects of objective performance relative to self-reports, subtle sociocultural-environmental differences were identified that will likely need to be considered as clinical interventions are designed for an increasingly multicultural elderly population.

Acknowledgements

Conflict of Interest: The research was supported by National Institutes of Health Grant AG018234 and University of Pittsburgh Claude D. Pepper Older Americans Independence Center Grant P30 AG024827. Dr. Spence is a Kellogg

Scholar. The editor in chief has reviewed the conflict of interest checklists provided by the author and has determined that none of the authors have any financial or any other kind of personal conflicts with this manuscript.

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Figure 1. (A and B) Mean adjusted grip strength according to self-reported difficulty and race or ethnicity of older adults ($F(2, 348) = 6.76$; $P < .001$).

Table 1
Demographic Characteristics of Older Adults with and without Arthritis According to Race or Ethnicity

Characteristic	African American (n = 67)	White (n = 102)	Total Sample Hispanic (n = 196)	Total (n = 365) n (%)	African American (n = 36)	White (n = 57)	Arthritis Subsample Hispanic (n = 137)	Total (n = 230) n (%)
Female *,†	49 (73.1)	61 (59.8)	74.0 (145)	69.9 (255)	31 (86.1)	38 (66.7)	78.8 (108)	77.0 (177)
Age								
< 75	17 (25.4)	24 (23.5)	64 (32.7)	28.8 (105)	8 (22.2)	13 (22.8)	46 (33.6)	67 (29.1)
75–79	18 (26.9)	37 (36.3)	63 (32.1)	32.3 (118)	9 (25.0)	19 (33.3)	43 (31.4)	71 (30.9)
80–84	19 (28.4)	19 (18.6)	44 (22.4)	82 (22.5)	11 (30.6)	9 (15.8)	32 (23.4)	52 (22.6)
≥85	13 (19.4)	22 (21.6)	25 (12.8)	60 (16.4)	8 (22.2)	16 (28.1)	16 (11.7)	40 (17.4)
Lives alone **	41 (62.1)	47 (46.1)	75 (39.5)	45.5 (163)	25 (71.4)	29 (50.9)	52 (39.4)	47.3 (106)
Body mass index **								
Normal	24 (35.8)	48 (47.1)	52 (26.5)	34.0 (124)	17 (47.2)	22 (38.6)	27 (19.7)	66 (28.7)
Overweight	26 (38.8)	31 (30.4)	81 (41.3)	37.8 (138)	11 (30.6)	21 (36.8)	61 (44.5)	93 (40.4)
Obese	17 (25.4)	23 (22.5)	63 (32.1)	28.2 (103)	8 (22.2)	14 (24.6)	49 (35.8)	71 (30.9)
Educational attainment, years								
< 8	10 (14.9)	11 (10.8)	75.0 (147)	46.0 (168)	5 (13.9)	6 (10.5)	75.9 (104)	50.0 (115)
9–12	34 (50.7)	28 (27.5)	30 (15.3)	92 (25.2)	18 (50.0)	22 (38.6)	21 (15.3)	61 (26.5)
>12	23 (34.3)	63 (61.8)	19 (9.7)	28.8 (105)	13 (36.1)	29 (50.9)	12 (8.8)	54 (23.5)
Self-reported limitation ††	13 (19.4)	17 (16.7)	19 (9.7)	49 (13.4)	11 (30.6)	11 (19.3)	15 (10.9)	37 (16.1)

* $P \leq .05$.

** $P \leq .01$.

† $P \leq .05$ for the total sample.

†† $P \leq .05$ for the arthritis-only group.

‡ 4–6 cases of missing data.

Table 2
Adjusted* Means and 95% Confidence Intervals for Grip Strength of Older Adults

Difficulty	African American		Participant Race or Ethnicity White		Hispanic
	Mean	95% Confidence Interval	Mean	95% Confidence Interval	
Total sample					
Men					
No difficulty	29.5	(26.5–32.5)	27.3	(25.2–29.4)	(26.2–29.7)
Difficulty	16.3	(7.9–24.7)	29.4	(23.3–35.4)	(12.1–28.9)
Women					
No difficulty	20.7	(18.7–22.7)	16.8	(15.0–18.6)	(16.2–18.6)
Difficulty	14.9	(11.3–18.5)	17.8	(14.4–21.1)	(11.4–17.4)
Arthritis subsample					
Men					
No difficulty	23.0	(16.3–29.7)	27.1	(24.1–30.1)	(25.4–29.9)
Difficulty	16.6	(8.4–24.9)	30.5	(23.7–37.3)	(12.4–28.8)
Women					
No difficulty	20.7	(18.1–23.3)	16.3	(14.1–18.6)	(16.4–19.1)
Difficulty	13.9	(10.1–17.8)	17.4	(13.2–21.7)	(10.1–16.8)

Note: Isometric strength based on the mean score of two trials using the dominant hand. Grip strength in the dominant hand ranged from 2 to 55 kg. “Difficulty” refers to self-report of difficulty grasping or handling objects.

* Adjusted for age, body mass index, and education.