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Life-Space Mobility Among Mexican Americans Aged 75 Years and Older

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Abstract

OBJECTIVE—To examine the factors associated with life-space mobility in older Mexican Americans.

DESIGN—Cross-sectional study involving a population-based survey.

SETTING—Hispanic Established Population for the Epidemiologic Study of the Elderly survey conducted in the southwestern of United States (Texas, Colorado, Arizona, New Mexico, and California).

PARTICIPANTS—728 Mexican American men and women aged 75 years and older.

MEASUREMENTS—In-home interviews assessed socio-demographic factors, self-reported physician-diagnoses of medical conditions (arthritis, diabetes, heart attack, stroke, hip fracture, and cancer), depressive symptoms, cognitive function, body mass index (BMI), upper and lower extremity muscle strength, short physical performance battery (SPPB), activities of daily living (ADLs), instrumental activities of daily living (IADLs), and the life-space assessment (LSA).

RESULTS—Mean age of participants was 84.2 years (SD, 4.2). Sixty-five percent were female. Mean score of LSA was 41.7 (SD, 20.9). Multiple regression analysis showed that older age, being female, limitation in ADLs, stroke, high depressive symptoms and BMI ≥35 kg/m^2 were significantly associated with lower scores in LSA. Education and high performances in lower extremity function and in muscle strength were factors significantly associated with higher scores in LSA.

CONCLUSION—Older Mexican Americans had restricted life-space with approximately 80% limited to their home or neighborhood. Age, gender, stroke, high depressive symptoms, BMI ≥ 35 Kg/m^2, and ADL disability were related to decreased life-space. Future studies are needed to examine the association between life-space and health outcomes and to characterize the trajectory of life-space over time in this population.

Keywords

mobility; life-space; older adults; Mexican American

INTRODUCTION

Independent mobility is fundamental to maintaining active aging and linked to health status and quality of life. Traditional mobility assessment has focused on evaluating a person's ability to carry out personal activities of daily living (ADL) such as bathing, dressing, toileting, as well as instrumental activities of daily living (IADL) that involve tasks such as shopping or social contact. [1] The mobility demanded by these activities reflects the motor function and coordination needed to carry them out. Other approaches to mobility assessment include the evaluation of gait, stair climbing, postural stability and identification of risk factors for falls. [1] These methods provide useful information; however, they fail to fully capture the person's ability to move within the environment as it extends from one's home, to the neighborhood, and to engagement in the larger community.

The assessment of life-space in older adults has been proposed as a complementary approach to examine mobility and community engagement in older adults.[1] Life-space defines movement from within one's home to movement beyond one's town or geographic region. [2] Several instruments have been used to assess life-space in older adults including the *Life-Space Diary* (LSD),[3] the *Nursing Home Life-Space Diameter* (NHLSD),[4] the *Life-Space Questionnaire* (LSQ),[1] and the *Study of Aging Life-Space Assessment* (LSA).[2] Baker and colleagues [2] introduced the University Alabama at Birmingham (UAB) Study of Aging LSA, which assesses mobility during the month before the interview and involves a single interview instead of a record of activities in a diary.

All of these instruments have been used to assess life-space among Non-Hispanic white and Non-Hispanic black older adults. Little is known about factors associated with life-space in older Mexican Americans, a population with high rates of disabling conditions such as diabetes and obesity. The objective of this study was to examine factors associated with life-space in community living Mexican Americans aged 75 years and older. We hypothesized that older age, medical conditions, and physical impairment would be associated with decreased life-space.

METHODS

Sample and procedures

Data were from the Hispanic Established Populations for Epidemiologic Study of the Elderly (H-EPESE), an ongoing longitudinal study of Mexican Americans aged 65 and over at baseline residing in Texas, New Mexico, Colorado, Arizona and California. Participants in the original sample were selected by area probability sampling procedures that involved selecting counties, census tracts, and households within selected census tracts. Sampling procedures and sample characteristics have been reported previously. [5;6] The original H-EPESE sample consisted of 3050 participants who were interviewed in 1993–1994 at

baseline and continue to be followed. In 2004–2005, 1167 participants 75 years and older from the original cohort were re-interviewed. A new cohort of 902 respondents aged 75 years and older was added in 2004–2005, using sampling procedures similar to those used in 1993–1994. Both cohorts received identical evaluations at baseline and follow-up (sociodemographics, health conditions, psychosocial characteristics of the subject, blood pressure, anthropometric measures, and physical function measures). In 2005–2006 a subsample aged 75 years and older (N=1013) from the 2004–2005 H-EPESE cohort was randomly selected to study frailty in this population. The inclusion criteria were the ability to respond to questions and complete performance tasks essential to the frailty index (e.g., short walk) (no proxy respondents were allowed).[7]

Data were collected from this sub-sample in 2008–2009 using the Life-Space Assessment[2] to examine mobility and community engagement in older adults. From the 1013 participants in the sub-study in 2005–2006, 731 were interviewed in 2008–2009 using the Life-Space Assessment. [2] One hundred and eighty-seven of the 1013 participants were confirmed dead through the National Death Index and by relatives, and 97 were lost to follow-up or refused to be re-interviewed in 2008–2009. Information from two of the interviews was incomplete, resulting in a total sample of 728 participants available for analysis. The participants included the sub-study for frailty were less likely to report heart attack, stroke, hip fracture, and ADL disability than participants not included. Participants in the sub-sample were more likely to report hypertension and to have higher scores on the short physical performance battery. There were no significant differences by socio-demographics, arthritis, diabetes, cancer, body mass index (BMI), high depressive symptoms, and grip strength between participants included versus not included in the sub-sample.

Participants were interviewed and examined in their homes by interviewers employed by Harris Interactive, Inc. (New York, NY) and trained by H-EPESE investigators. The interviews were conducted in Spanish or English, depending on the respondent preference. The study received approval from the university's institutional review board.

Measures

Life-space mobility—Life-space mobility was assessed by asking participants: [2] "During the past 4 weeks, have you: (1) been to other rooms in your home besides the room where you sleep (level 1); (2) been to an area outside of your home, such as your porch, deck or patio, hallway of an apartment building, or garage (level 2); (3) been to places in your neighborhood other than your own yard or apartment building (level 3); (4) been to places outside your neighborhood, but within your town (level 4); and (5) been to places outside your own town (level 5)." For each life-space level, participants were asked how often within the week (less than once a week, 1–3 times each week, 4–6 times each week, daily) they attained that level, and if they needed help from assistive devices or another person ("yes" vs "no") to move to that level. A composite score was calculated on the basis of life-space level, the frequency of attaining each level, and the degree of independence in achieving each level. The composite scores ranged from 0 (mobility confined to one's bedroom) to 120 (traveled out of town every day without assistance from another person or an assistive device).[2]

Sociodemographic characteristics included age, sex, education (number of years of schooling), and marital status.

Medical conditions were assessed with series of questions that asked if subjects had ever been told by a doctor that they had arthritis, diabetes, hypertension, heart attack, stroke, cancer or hip fracture.

BMI was computed as weight in kilograms divided by height in meters squared. BMI was grouped according to the National Institutes of Health (NIH) obesity standards (< 18.5 Kg/m^2 =underweight, 18.5 – 24.9 = normal weight, 25.0 – 29.9 = overweight, 30.0 – 34.9 = obesity category I, ≥ 35.0 = obesity category II. [8]

Cognitive function was as assessed using the 30-item *Mini Mental State Examination* (MMSE).[9] The English and Spanish versions of the MMSE were adopted from the Diagnostic Interview Scale and have been used in prior community surveys. [10] Scores range from 0 to 30, with scores from 22 to 30 considered to indicate good cognitive ability.[9–11] Similar to previous studies on cognitive aging, especially in populations with low educational attainment, the MMSE score was dichotomized as < 21 (impaired or poor cognition) and 21 or greater (normal or unimpaired cognition).[12;13]

Depressive symptomatology was assessed using the *Center for Epidemiologic Studies Depression Scale* (CES-D).[14] The CES-D contains 20 items, with potential total scores ranging from 0 to 60. Participants with a score ≥ 16 were considered to experience high depressive symptomatology. [14]

Upper and lower extremity muscle strength was tested in 6 groups (hand grip, shoulder abduction, shoulder adduction, hip abduction, hip flexion, and knee extension) and measured in kilograms (kg) using a hand-held dynamometer (Jaymar Hydraulic Dynamo-meter model # 5030J1- J.A. Preston Corp., Jackson, MI) for hand grip, and the Nicholas Manual Muscle Tester (Lafayette Instruments, Lafayette, IN) for the other muscle groups (shoulder, hip, and knee). Description of the procedure for each muscle group has been reported previously. [15;16] Two trials with brief pauses were allowed for hand grip with the higher of the 2 measures used in the analysis. Three trials with brief pauses were allowed for the rest of the muscle groups tested with the highest of 3 measures used in the analysis. The testing positions and reliability of the procedure have been tested in older adults. [14] A summary score was created for upper and lower muscle strength groups. The individual and summary strength scores were correlated [upper (r = 0.81–0.87) and lower (r = 0.89–0.94)].[17]

Lower body function was assessed with the short physical performance battery (SPPB).[18;19] The SPPB is based on summary performance in 3 areas: standing balance, chair stands, and walking a short distance (8-foot). The combined scores ranged from a low of 0 (unable to perform) to a high of 12. The SPPB validity and reliability have been established and the tool has been used successfully with older Mexican Americans. [19;20]

Functional disability was assessed by using 7 items from a modified version of the Katz *Activities of Daily Living* (ADL) scale.[18] ADLs include walking across a small room, bathing, grooming, dressing, eating, transferring from a bed to a chair, and using the toilet.

Test-retest reliability over the short-term has been found to be high (95% to 98%),[21] and the 7-item scale in this study has a high internal reliability (alpha 0.90). Subjects were asked if they could perform the ADL activity without help, if they needed help, or if they were unable to do the activity. For the analysis, ADL disability was dichotomized as no help needed versus needing help or unable to perform 1 or more of the 7 ADL activities.

Statistical Analysis

Chi-square, Fisher's exact, and ANOVA tests were used to examine the distribution of covariates for subjects. Multiple regression analyses were used to examine the factors associated with LSA mobility. Four models were constructed: Model 1 included age, gender, education, marital status, and language of interview. In Model 2, upper and lower extremity muscle strength, SPPB, and limitations in ADL were added to Model 1. In Model 3, medical conditions (arthritis, diabetes, hypertension, stroke, heart attack, hip fracture, and cancer), high depressive symptoms, cognitive function, and BMI were added. Model 4 included all variables (full Model). All analyses were performed using the SAS System for Windows, version 9.2 (SAS Institute, Inc., Cary, NC).

RESULTS

Mean age was 84.2 years (SD = 4.2 years), 64.5% were female, 35.9% were married, and 88.9% had less than 12 years of formal education. The most common medical conditions were hypertension (70.3%), arthritis (64.1%), and diabetes (32.7%). Nineteen percent had high depressive symptoms, 33% had cognitive impairment (MMSE <21), 38% had a BMI of 25 to <30 kg/m^2, and 35.6% reported ADL disability. Means for upper and lower extremity muscle strength were 84.5 kg (SD = 29.1) for men and 59.2 kg (SD = 25.8) for women. The mean for the SPPB was 5.2 (SD = 3.5). The total mean score of the LSA was 41.7 (SD = 20.9).

Table 1 includes descriptive information for the LSA by sample characteristics. Older subjects (≥ 85 years), those who were married, reported high depressive symptoms, and had a BMI <18.5 or ≥35 kg/m^2, were significantly more likely to have low LSA scores. Participants in the lowest quartile of muscle strength and SPPB and those who reported any ADL disability were more likely to have low LSA scores (Table 2).

Table 3 presents the multiple regression analyses for LSA. Older age and being female were negatively associated with LSA in Model 1, while education (≥ 12 years) was positively associated with LSA. When muscle strength, SPPB, and ADL disability (Model 2) were added, we found that high performance in muscle strength and SPPB were positively associated with LSA, while ADL disability was negatively associated with LSA. In Model 3, arthritis, stroke, hip fracture, high depressive symptoms, cognitive impairment (MMSE <21), and BMI <18.5 or ≥35 kg/m^2 were negatively associated with LSA. In the full model (Model 4), older age, female gender, education, muscle strength, SPPB, ADL disability, stroke, high depressive symptoms, and BMI ≥ 35 kg/m^2 remained significant factors associated with LSA. Model 2 (43%) and Model 4 (40%) demonstrated the largest shared variance with life-space scores.

DISCUSSION

This study examined factors associated with life-space mobility among Mexican Americans aged 75 years and older. The majority of participants had restricted life-space with approximately 80% limited to their home or neighborhood. The mean LAS of 41.7 (Table 1) reflects those whose daily mobility is limited their home including porch, deck or patio.

Assessing the contribution of socio-demographic factors to life-space, we found that older age and being female were associated with restricted life-space when compared to younger and male participants. These findings are consistent with those previously reported among Non-Hispanic whites and Non-Hispanic blacks. [2;22;23] A high level of education (≥ 12 years) was associated with higher LSA scores, a finding consistent with Barnes and colleagues among mostly Non-Hispanic white's participants [22], but not widely reported in the literature.

When we analyzed the association of medical conditions controlling for socio-demographic factors, we found that subjects with arthritis, stroke, hip fracture, high depressive symptoms, cognitive impairments, and BMI < 18.5 or ≥ 35 Kg/m^2 were more likely to report decreased life-space. Our findings regarding the impact of arthritis, stroke, and depression on limiting life-space are consistent with those reported by Allman and colleagues. [24]

High performance in muscle strength and the SBPP were associated with high life-space while ADL disability was associated with decreased life-space, findings consistent with the majority of studies in life-space among Non-Hispanic whites and Non-Hispanic blacks.[2–4;22–24] Our findings on cognitive impairment and decreased life-space were generally consistent with previous research.[1;2;22–24] In Model 4, however, cognitive impairment as well as arthritis, hip fracture, and underweight (BMI ≤ 18.5 kg/m^2) were no longer associated with decreased life-space. These complex relations are best examined over time, which we were not able to do in this cross sectional study, but such should be the focus of future research.

The study strengths include the assessment of life-space in a large cohort of Mexican Americans aged 75 years and older, and the ability to examine the association of several prospective performance based factors related to mobility.

In summary, this study is the first investigation in older Mexican Americans that assessed factors associated with life-space assessment. We found that age, gender, stroke, high depressive symptoms, BMI ≥ 35 Kg/m^2, and ADL disability were related to decreased life-space. Education and high performance in physical function were related to higher life-space. Future studies are needed to examine the association between life-space and health outcomes and to characterize the trajectory of life-space over time in this population.

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Table 1

Mean and Standard Deviation of Life-Space Assessment (LSA) by sample characteristics (N = 728)

Variables	N	Mean (±SD)	*P*-value
Total LSA	728	41.7 ± 20.9	
Age (years)			<.0001
<80	63	45.9 ± 20.2	
80 to <85	379	45.1 ± 21.4	
≥85	286	36.3 ± 19.2	
Gender			.099
Female	473	37.9 ± 19.6	
Male	255	48.6 ± 21.4	
Education (years)			.092
<12	611	40.6 ± 20.1	
≥12	76	48.5 ± 23.1	
Marital status			.038
Married	262	39.8 ± 19.9	
Unmarried	466	45.1 ± 22.2	
Language of interview			.424
English	96	40.3 ± 19.7	
Spanish	632	41.9 ± 21.1	
Arthritis			.304
Yes	450	39.9 ± 20.4	
No	258	44.9 ± 21.5	
Diabetes			.326
Yes	238	39.9 ± 21.6	
No	490	42.6 ± 20.5	
Heart attack			.525
Yes	17	39.2 ± 22.8	
No	711	41.7 ± 20.8	
Stroke			.218
Yes	15	23.5 ± 15.7	
No	712	42.1 ± 20.8	
Hypertension			.868
Yes	512	41.2 ± 20.9	
No	216	42.8 ± 20.7	
Cancer			.628
Yes	23	48.7 ± 20.9	
No	700	41.5 ± 19.1	
Hip fracture			.064
Yes	8	19.3 ± 20.8	
No	715	41.9 ± 10.7	
High depressive symptoms (CES-D ≥ 16)			.016

Variables	N	Mean (±SD)	*P*-value
Yes	141	31.4 ± 20.9	
No	587	44.2 ± 20.9	
Cognitive impairment (MMSE <21)			.360
Yes	193	37.8 ± 19.6	
No	452	44.8 ± 19.8	
BMI (kg/m^2) categories			.0003
<18.5	12	29.9 ± 13.2	
18.5<25	245	43.1 ± 20.0	
25 to<30	262	45.2 ± 21.3	
30 to <35	117	43.8 ± 19.0	
≥35	53	32.9 ± 17.7	

CES-D = Center for Epidemiological Studies Depression Scale

MMSE = Mini Mental State Examination

BMI = Body Mass Index

Table 2

Mean and Standard Deviation of Life-Space Assessment by Muscle Strength, Short Physical Performance Battery, and Disability (N = 728)

Variables	N	Mean (± SD)	*P*-value
ULEMS, kg (quartiles)			<.0001
Men			
<65.0	65	35.3 ± 22.8	
65.0 to < 82.0	62	47.3 ± 18.8	
82.0 to <101.0	61	52.9 ± 18.4	
≥101.0	66	59.2 ± 18.1	
Women			<.0001
<40.0	90	25.7 ± 15.5	
40.0 to <54.0	121	33.2 ± 17.7	
54.0 to <73.0	117	43.0 ± 19.6	
≥73.0	142	45.6 ± 18.1	
SPPB (quartiles)			<.0001
1st (0 to <3, lowest)	207	24.6 ± 14.3	
2nd (3 to <6)	180	41.8 ± 16.1	
3rd (6 to <9)	182	48.8 ± 19.5	
4th (≥9 highest)	158	55.9 ± 18.9	
Any ADL disability			<.0001
Yes	259	26.5 ± 18.9	
No	469	50.1 ± 14.9	

ULEMS = Upper and lower extremity muscle strength

SPPB = Short physical performance battery

ADL = Activities of Daily Living

Table 3

Multiple Regression Analysis for Life-Space Assessment (continuous) (N = 728)

Variables	Model 1 β (SE) n = 687	Model 2 β (SE) n =685	Model 3 β (SE) n = 574	Model 4 β (SE) n = 574
Intercept	141.2 (15.98) *	74.23 (13.65) *	151.10 (17.99) *	87.38 (17.09) *
Age	−1.16 (0.18) *	−0.54 (0.15) †	−1.18 (0.19) *	−0.62 (0.18) †
Gender (Female)	−10.66 (1.72) *	−5.56 (1.50) †	−7.87 (1.78) *	−5.86 (1.69) †
Education (≥ 12 years)	7.73 (2.41) †	3.18 (1.98)	6.61 (2.50) †	4.22 (2.24) ‡
Marital status (married)	−1.06 (1.72)	−1.12 (1.39)	0.03 (1.79)	−0.83 (1.59)
Language of interview (Spanish)	2.47 (2.24)	2.43 (1.84)	2.91 (2.27)	3.24 (2.02)
ULEMS		0.10 (0.02) *		0.08 (0.03) †
SPPB		1.77 (0.23) *		1.29 (0.27) *
Any ADL disability		−11.71 (1.65) *		−11.19 (1.86) *
Arthritis			−3.18 (1.61) ‡	0.12 (1.47)
Diabetes			−2.93 (1.69)	−0.55 (1.52)
Heart attack			−0.74 (5.03)	0.74 (4.48)
Stroke			−20.98 (5.55) †	−13.60 (4.97) †
Hypertension			−0.92 (1.77)	−0.11 (1.58)
Cancer			−4.05 (4.40)	−2.65 (3.91)
Hip fracture			−18.62 (8.14) ‡	−10.97 (7.26)
High depressive symptoms (CES-D ≥ 16)			−7.74 (2.06) †	−4.14 (1.86) ‡
Cognitive impairment (MMSE <21)			−4.29 (1.69) ‡	−0.30 (1.54)
BMI (kg/m^2)				
<18.5			−15.77 (5.88) †	−6.52 (5.30)
18.5 to <25			Reference	Reference
25 to <30			−2.07 (1.83)	−1.97 (1.63)
30 to <35			−3.32 (2.33)	−3.10 (2.09)
≥35			−12.70 (3.11) *	−6.28 (2.83) ‡
R^2	0.12 *	0.43*	0.24 *	0.40 *

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Note: "N" varies across Models due missing value for variables

P-value <.0001 *,

† <.001,

‡ <.01

CES-D = Center for Epidemiological Studies Depression Scale

MMSE = Mini Mental State Examination

BMI = Body Mass Index

ADL = Activities of Daily Living

ULEMS = Upper and lower extremity muscle strength

SPPB = Short physical performance battery