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Association between Lower Extremity Performance and Health-Related Quality of Life in Elderly Mexican Americans

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Abstract

Objective—To examine the longitudinal association between levels of lower extremity performance (LEP) and health-related quality of life (HRQoL) in older Mexican Americans aged 72 years or older participating in the Hispanic Established Population for the Epidemiological Study of the Elderly (2000-2006).

Method—LEP was measured in 621 non-institutionalized participants with the Short Physical Performance Battery (SPPB). Participants were divided into high (SPPB score 10-12), intermediate (SPPB score 7-9), and low (SPPB score 0-6) groups based on LEP. HRQoL was assessed using the Medical Outcomes Study Short Form (SF-36), which includes a Physical Composite Scale (PCS) and a Mental Composite Scale (MCS).

Results—Participants in the high LEP group had slower rates of decline in the PCS, and those in the intermediate LEP group had slower rates of decline in the MCS score over time.

Discussion—Increased LEP was associated with slower rates of decline in physical and mental HRQoL in older Mexican Americans.

Keywords

elderly; quality of life; lower extremity; Mexican Americans

The elderly Hispanic population in the United States is increasing at a rate double that of the non-Hispanic White population and is projected to reach 17 million by 2050 (Federal Interagency Forum on Aging-Related Statistics, 2010). Approximately three quarters of the Hispanic population are Mexican Americans (Ennis, Ríos-Vargas, & Albert, 2011). Older Mexican Americans are characterized by low income, few years of formal education, low physical activity, high rates of obesity, diabetes and disability, and longer life expectancy

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Declaration of Conflicting Interests

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(Markides et al., 1999). With this population growth of aging Mexican Americans, there is an increase in the prevalence of morbidity and disability.

Lower extremity performance (LEP) is a good predictor of hospitalization, falls, disability, and mortality compared with upper extremity performance, especially among the elderly (Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995; Marsh et al., 2006; Penninx et al., 2000; Puthoff & Nielsen, 2007). However, few studies have examined whether LEP is associated with quality of life in older adults (Davis et al., 2012; Fagerstrom & Borglin, 2010; Roh, Kim, Paik, Kim, & Gong, 2012). For example, findings from the Lifestyle Interventions and Independence for Elders-Pilot Study (LIFE-P) showed mobility strongly correlated with health-related quality of life (HRQoL; Groessl et al., 2007). Similarly, ability to walk was strongly associated with better HRQoL in a Swedish cohort of 1,128 older adults (Fagerstrom & Borglin, 2010). A recent cross-sectional study also reported a strong association between limitation in LEP and HRQoL in a sample of 215 older adults who attended the Vancouver Falls Prevention Clinic (Davis et al., 2012).

Previous reports from the Hispanic Established Populations Epidemiological Study of the Elderly (EPESE) indicated that diabetes (Graham et al., 2007) and arthritis (Bindawas et al., 2011) are associated with poor physical and mental HRQoL. No previous studies have examined the impact of LEP on physical and mental HRQoL in this population. The purpose of this study was to examine whether LEP is associated with HRQoL over time in elderly Mexican Americans, participating in the Hispanic Established Population for the Epidemiological Study of the Elderly (2000-2006). We hypothesized that higher LEP would be associated with a higher level of physical and mental health over time, after controlling for demographics and health-related covariates.

Method

Participants are from the Hispanic EPESE, an ongoing population-based longitudinal study of Mexican Americans aged 65 years or older, residing in Texas, New Mexico, Colorado, Arizona, and California. The original probability-based sample was representative of approximately 500,000 older Mexicans Americans living in the Southwest in the mid-1990s. The demographics and characteristics of the sample have been described elsewhere (Markides et al., 2001; Markides et al., 1999; Markides et al., 1996; Rudkin, Markides, & Espino, 1997). In the current study, we included 621 participants from the Hispanic EPESE cohort who were enrolled in a sub-study of disability in 2000/2001 in which the respondents completed the SF-36 and had the ability to independently complete the *Short Physical Performance Battery* (SPPB; Bindawas et al., 2011).

At baseline (2000/2001—Wave 1 for this subsample), 621 participants were interviewed at home in either Spanish or English depending on their preference. In Wave 2 (2001/2002), 549 participants were re-interviewed in person and 2 by proxy. Forty-eight refused to be interviewed or were lost in follow-up, and 22 were confirmed dead through either the National Death Index (NDI) or reports from relatives. In Wave 3 (2005/2006), 359 participants were re-interviewed in person and 39 by proxy. Thirty refused to be interviewed or were lost in the follow-up, and 121 were confirmed dead (Figure 1). Proxy interviews

were excluded from the present analysis because they were not able to complete the physical performance tests involving the upper and lower extremities. Participants with missing information at any of the follow-ups were significantly more likely to be older; be unmarried; report heart attack, hip fracture, high depressive symptoms; and have lower scores on the *Mini-Mental State Exam*, *SPPB*, total body muscle strength, and the physical and mental components of the SF-36 compared with those participants without missing information ($p < .05$).

Measurements

Lower extremity performance—For the present study, the *SPPB* was used to measure LEP (Guralnik et al., 1994). The *SPPB* includes three lower body tests (Guralnik et al., 1995). Standing balance was assessed by asking participants to try to stand with their feet side-by-side, in semi-tandem (with the heel of one foot next to the big toe of the other foot) and in tandem (with the heel of one foot directly in front of the other foot), for 10 s each. Standing balance scores ranged from 0 to 4, with 0 indicating no standing balance and 4 indicating full-tandem standing for 10 s. Walking speed was assessed by measuring the time (nearest second) for the participants to walk 8 ft. Scores ranged from 0 to 4, with 0 reflecting an incomplete walk and 1 to 4 indicating quartiles by completion times (higher scores indicating faster completion). The time for repeated chair stands (5 in total) was estimated to the nearest 10th of a second based on the ability to rise from a sitting position with arms folded across the chest. These scores also ranged from 0 (reflecting no chair stands completed) to 1 to 4, reflecting quartiles related to completion time (higher scores indicating faster completion).

The final *SPPB* score was calculated by combining the results of the three tests (with a possible range of 0-12), with higher scores indicating greater LEP functioning. The *SPPB* has excellent reliability and sensitivity (Ostir, Kuo, Berges, Markides, & Ottenbacher, 2007; Ostir, Volpato, Fried, Chaves, & Guralnik, 2002). For the present study, participants were divided into three groups based on LEP performance: low (*SPPB* score 0-6), intermediate (*SPPB* score 7-9), and high (*SPPB* score 10-12), as recommended by previous studies (Ostir et al., 2007; Ostir et al., 2002).

Health-related quality of life—The SF-36 is the most commonly used scale to assess HRQoL in the elderly (Kosinski, Keller, Ware, Hatoum, & Kong, 1999). It allowed us to determine HRQoL by measuring participants' perceived physical and mental health (Centers for Disease Control and Prevention, 2000) rather than broader components of quality of life such as income, satisfaction, and quality of the environment (Schalock, Bonham, & Verdugo, 2008). The SF-36 has been translated into many languages, including Spanish. The Spanish version of the SF-36 is a valid measure of self-reported health status for Mexican Americans as well as for other Hispanic groups (Graham et al., 2007; Peek, Ray, Patel, Stoenbner-May, & Ottenbacher, 2004).

The SF-36 consists of 36 items and 8 domains relating to an individual's physical and mental status (Hart, 1999; Keller, Majkut, Kosinski, & Ware, 1999; Peek et al., 2004; Vetter, 2007). The Physical Composite Scale (PCS) is a summary of physical functioning (PF), role

limitation because of physical function (RP), bodily pain (BP), and general health (GH) ratings. The Mental Composite Scale (MCS) is a summary of general mental health (MH), role limitations because of emotional problems (RE), social functioning (SF), and vitality (VT) ratings (Peek et al., 2004; Schalock et al., 2008). The PCS and MCS are global scores that range from 0 to 100, with higher values reflecting better HRQoL (Khanna & Tsevat, 2007; Kosinski et al., 1999; Peek et al., 2004). The scales demonstrate good discriminate validity (Ware, Kosinski, & Keller, 1994). The Cronbach's alpha for the SF-36 in the Hispanic EPESE cohort ranged from 0.76 to 0.96 (Peek et al., 2004). The minimum clinically important difference (MCID) for various geriatric conditions ranges between 5 and 10 points for each SF-36 domain score and between 2.5 and 5 points for the PCS and MCS scores (Khanna & Tsevat, 2007).

Covariate Variables

Socio-demographic variables included age, sex, marital status, years of formal education, nativity (foreign born vs. U.S. born), and language of interview (English or Spanish). Height was measured using a tape measure placed against the wall, and weight was measured using a Metro 9,800 scale. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (Barrera et al., 2004).

Depressive symptoms were measured using the *Center for Epidemiologic Studies Depression Scale* (CES-D; Radloff, 1977). This instrument assesses depression symptoms using scores ranging from 0 to 60. Participants with a CES-D score of ≥ 16 were considered to have high depressive symptoms (Angel & Guarnaccia, 1989; Radloff, 1977). Cognitive status was measured using the 30-item *Mini-Mental State Exam* (MMSE) with scores ranging from 0 to 30. Lower scores indicate poorer cognitive ability (Folstein, Folstein, & McHugh, 1975). The MMSE score was analyzed as a dichotomized variable (<21 vs. ≥ 21), using a cut-point frequently used for populations with lower levels of education (Uhlmann & Larson, 1991). Participants with MMSE scores <21 were classified as having low cognitive ability.

The presence of various medical conditions was assessed with a series of questions asking participants if they had ever been told by a physician that they had diabetes, heart attack, stroke, hypertension, arthritis, or cancer. Total body muscle strength was measured using two instruments: the Nicholas Manual Muscle Tester (NMMT; Lafayette Instruments; Ottenbacher et al., 2002) and the Jamar Hydraulic Dynamometer (Lafayette Instruments; Alfaro-Acha et al., 2006; Al Snih, Markides, Ottenbacher, & Raji, 2004; Al Snih, Markides, Ray, Ostir, & Goodwin, 2002; Peolsson, Hedlund, & Oberg, 2001). The total body muscle strength measure was a sum of the strength of the following muscle groups: hip abductors, hip flexors, knee extensors, shoulder abductors, and grip strength. In a previous study, we found that the test-retest reliability of the Nicholas Manual Muscle Tester in measuring upper- and lower-extremity muscle strength, in this sample, were greater than 0.90 (Ottenbacher et al., 2002).

Statistical Analyses

Chi-square and analysis of variance (ANOVA) were used to examine the distribution of participant characteristics and covariates according to LEP groups at baseline. General linear mixed models using the MIXED procedure in SAS^c were used to examine the association between SPPB and both physical and mental component scales of the SF-36 over time (2000/2001, 2001/2002, and 2005/2006), controlling for age, sex, marital status, education, nativity, language of interview, BMI, high depressive symptoms, low cognitive status, total body muscle strength, and medical conditions (diabetes, heart attack, stroke, hypertension, arthritis, and cancer). Time was analyzed as a categorical variable with baseline (Wave 1) as a reference.

General linear mixed models provide an outline for the analysis of repeated measures. In the presence of missing repeated measures for a subject, the MIXED procedure does not exclude this subject from the analysis; instead, it uses all the available data. This method leads to a valid analysis when the missing data can be assumed missing at random (Littell, Milliken, Stroup, Wolfinger, & Schabenberger, 2006; Patetta, 2002). All variables were analyzed as time-dependent covariates except for age, gender, education, nativity, and SPPB. The mixed-model approach was chosen for several reasons. First, it is the model that best accounts for missing or incomplete observations. Second, it allows for modeling of time-dependent changes in variables as well as time-dependent changes in the magnitude of association between variables. Finally, mixed models allow flexibility in modeling the effect of time on the outcome (Zeger & Liang, 1986).

Two mixed models were constructed to test the relationship between LEP levels and both PCS and MCS over a 6-year period. Model 1 included socio-demographic variables (age, sex, marital status, education, nativity, and language of interview), LEP, time, and the interaction between LEP and time. In Model 2, BMI, high depressive symptoms, low cognitive status, total body muscle strength, and medical conditions (diabetes, heart attack, stroke, hypertension, arthritis, and cancer) were added to the variables included in Model 1 to examine whether these variables modify the association between LEP and HRQoL. All analyses were from unweighted data and performed using the SAS System for Windows, Version 9.1.3. All analyses were from unweighted data and performed using the SAS System for Windows, Version 9.1.3.

Results

The baseline sample consisted of 60% women and 40% men, with a mean age of 78 years. Two hundred twenty-two (35.8%) participants had low LEP, 230 (37%) had intermediate LEP, and 169 (27.2%) had high LEP (Table 1). Participants in the lower LEP group were significantly more likely to be older, female, married, have lower levels of education, higher depressive symptoms, lower cognitive status, more medical (comorbid) conditions, lower total body muscle strength, and poorer physical and mental HRQoL than those in the intermediate or high LEP groups (Table 1). The average mean of the SPPB at each wave was 7.0 ($SD = 3.4$), 6.7 ($SD = 3.7$), and 5.7 ($SD = 3.7$), respectively. The average mean of the 8-foot walk test at each wave was 5.5 ($SD = 3.1$), 6.7 ($SD = 3.3$), and 8.2 ($SD = 6.1$),

respectively. The average mean of the chair-repeated stand test at each wave was 13.9 ($SD = 4.7$), 12.2 ($SD = 4.4$), and 14.9 ($SD = 6.7$), respectively.

Table 2 presents the results of the general linear mixed-model estimates of physical HRQoL as a function of baseline LEP groups over a 6-year period. The association between LEP groups and PCS score at baseline (intercept of PCS score) was statistically significant for the intermediate and high LEP groups after adjusting for time and socio-demographic variables (Estimate = 7.99, $SE = 0.95$, $p < .0001$; and Estimate = 10.66, $SE = 1.04$, $p < .0001$, respectively). The association decreased but remained statistically significant after adjusting for BMI, high depressive symptoms, low cognitive status, total body muscle strength, and medical conditions (Estimate = 5.97, $SE = 1.00$, $p = .0001$; and Estimate = 6.20, $SE = 1.10$, $p = .0001$, respectively). The interaction term between LEP groups and time of follow-up (slope of total PCS score over 6 years) was statistically significant for the intermediate and high LEP groups. Adjusting for socio-demographic variables (Model 1), both groups had slower rates of decline in the PCS score at Wave 2 (Estimate = 2.48, $SE = 1.22$, $p = .0429$; and Estimate = 4.31, $SE = 1.26$, $p = .0006$, respectively) compared with Wave 1. The association remained statistically significant after adjusting for all covariates only for the high LEP group (Estimate = 5.11, $SE = 1.46$, $p = .0005$) compared with Wave 1. High scores in muscle strength were associated with slower rates of decline in the PCS score (Estimate = 0.14, $SE = 0.02$, $p < .0001$) while high BMI (Estimate = -0.29 , $SE = 0.07$, $p = .0002$) and high number of medical conditions (Estimate = -2.45 , $SE = 0.45$, $p < .0001$) were associated with greater decline in the PCS score over time.

Table 3 presents the results of the general linear mixed-model estimates of mental HRQoL as a function of baseline LEP groups over a 6-year period. The association between LEP groups and MCS score at baseline (intercept of MCS score) was statistically significant for the high LEP group (Estimate = 3.95, $SE = 0.85$, $p = .0001$), than those in the low or intermediate LEP groups adjusting for time and socio-demographic variables.

When BMI, high depressive symptoms, low cognitive status, total body muscle strength, and medical conditions were added to Model 1, the association in Model 2 decreased but remained statistically significant (Estimate = 3.41, $SE = 0.91$, $p = .0002$). The interaction term between LEP groups and time of follow-up (slope of total MCS score over 6 years) was statistically significant for the intermediate and high LEP groups. Participants in the intermediate LEP group had slower rates of decline in the MCS score at Waves 2 and 3 (Estimate = 2.26, $SE = 1.07$, $p = .0353$; and Estimate = 4.61, $SE = 1.45$, $p = .0016$, respectively) compared with Wave 1 (Model 1). The association remained statistically significant only at Wave 3 (Estimate = 2.64, $SE = 1.25$, $p = .0355$) after adjusting for all covariates (Model 2). Participants in the high LEP group had slower rates of decline in the MCS score at Wave 3 (Estimate = 4.24, $SE = 1.51$, $p = .0051$) compared with Wave 1 (Model 1), but the association was no longer statistically significant when all covariates were added in the equation (Model 2). Being female (Estimate = 2.89, $SE = 0.89$, $p = .0014$), married (Estimate = 1.45, $SE = 0.72$, $p = .0444$), and those who performed high in muscle strength (Estimate = 0.04, $SE = 0.01$, $p = .0284$) were associated with slower rates of decline in MCS score, while those interviewed in Spanish (Estimate = -2.01 , $SE = 0.90$, $p = .0263$)

and who reported high depressive symptoms (Estimate = -10.38 , $SE = 1.12$, $p < .0001$) were associated with greater decline in MCS score over time

The unadjusted and adjusted mean distributions of the PCS and MCS scores over the three time points according to LEP status are shown in Figures 2 and 3. The Figures indicate that participants in the low LEP group had the lowest PCS and MCS scores at each time point. Moreover, participants in the high LEP group had stable PCS and MCS scores over the 6 years.

Discussion

This study examined the association between LEP and health-related quality of life (HRQoL) among older Mexican Americans over 6 years. Participants in the high LEP group had slower rates of decline in the PCS over time compared with participants in the low or intermediate LEP groups. Participants in the intermediate LEP group had slower rates of decline in the MCS over time than those in the low or high LEP group. In this sample, LEP was associated with HRQoL independent of demographics factors, medical conditions, BMI, high depressive symptoms, cognitive status, and muscle strength. We also found high muscle strength was associated with slower rates of decline in both the physical and MCS scores over time. Being a woman or being married were factors associated with slower rates of decline in the MCS over time.

Our findings are similar to those reported in the literature. For example, Groessl et al. (2007) examining 424 older adults from the LIFE-P study found that high performance in balance, chair stands, and 400-m walk time tests were associated with better HRQoL. Ekstrom et al., examining 155 older adults from the “Good Aging in Skane” study, found slower gait speed and timed get-up-and-go (TUG) scores associated with poorer physical and mental HRQoL (Ekstrom, Dahlin-Ivanoff, & Elmstahl, 2011). Findings from the Boston Area Community Health (BACH)/Bone Survey showed poor lower extremity physical function measured with timed walk and chair stand test associated with lower physical HRQoL (Hall, Chiu, Williams, Clark, & Araujo, 2011).

Our findings regarding muscle strength are similar to those reported in the literature. For example, Samuel et al. found among 84 older adults that high performance in muscle strength (upper and lower extremities) was associated with high PCS scores in the SF-36 (Samuel, Rowe, Hood, & Nicol, 2012). Sayer et al. found lower performance in hand grip strength associated with reduced HRQoL among 2,987 older adults (Sayer et al., 2006).

High BMI, depressive symptoms, and a high number of medical conditions have also been reported in the literature associated with decreased HRQoL. For example, Giuli et al. (2014) found overweight and obesity associated with lower PCS scores among 205 older adults. Gallegos-Carrillo et al. (2009) found in a random sample of 1,085 beneficiaries of the Mexican Institute of Social Security in Mexico City aged 60 years and older that high depressive symptoms and comorbidities were associated with decreased HRQoL (Gallegos-Carrillo et al., 2009).

It is widely understood that LEP declines significantly with age (Forrest, Zmuda, &Cauley, 2006). Studies are needed, however, to determine whether interventions to maintain or increase LEP can improve both physical and mental components of quality of life in older adults. Interventions designed to improve LEP may be particularly effective in the management of chronic conditions such as diabetes, obesity, and arthritis. These conditions are prevalent in older Mexican Americans. A randomized controlled trial of older adults with hip fracture found that extended outpatient rehabilitation, including whole-body progressive resistance training improved quality of life as measured by SF-36 (Binder et al., 2004). Similar findings have been reported regarding the effectiveness of walking programs, strengthening exercise, or hydrotherapy in elderly patients with lower extremity limitations due to fractures and osteoarthritis (Fransen, Nairn, Winstanley, Lam, & Edmonds, 2007; Hale, Waters, &Herbison, 2012; Loew et al., 2012; Sylliaas, Brovold, Wyller, &Bergland, 2011)

The current investigation has a number of limitations. First, using older participants makes follow-up studies inherently biased, as unhealthy participants are less likely to be included over time. However, we used mixed models, an analytic approach that allows the use of available data and evaluates time-dependent effects (Littell et al., 2006; Patetta, 2002). Second, as this sample was not randomly selected from 7-year survivors of the original Hispanic EPESE, the findings may not be generalizable to the larger population of older Mexican Americans. This study also has several strengths including the prospective design and its large well-defined community sample of older Mexican Americans in the United States (Markides, Rudkin, Angel, & Espino, 1997). To our knowledge, this is the first investigation to examine the longitudinal association of LEP and HRQoL in older Mexican Americans.

Implications

Our findings suggest that health care professionals should measure HRQoL to better understand how physical limitations, particularly those involving the lower extremities, might affect broader areas of physical and cognitive functions (Tulsky& Rosenthal, 2002). At the public health level, it would also be valuable to emphasize the importance of developing prevention programs targeting older populations with poor LEP to maximize HRQoL. HRQoL has been identified as an important topic area in *Healthy People 2020* (Koh, 2010; U.S. Department of Health and Human Services).

Conclusion

Our results suggest that higher levels of LEP were associated with better physical and mental HRQoL in older Mexican Americans over time. Future research is required to determine whether interventions to improve LEP will lead to enhanced physical function and better HRQoL in high-risk and underserved older adults.

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Figure 1.
Status of the sample at baseline and follow-up.

Figure 2.

(A) Unadjusted and (B) Adjusted mean PCS scores (range = 0-100) over time according to low, intermediate, and high lower extremity performance (adjusted for all covariates with main and interaction effects). *Note.* PCS = Physical Composite Scale.

Figure 3.

(A) Unadjusted and (B) Adjusted mean MCS scores (range = 0-100) over time according to low, intermediate, and high lower extremity performance (adjusted for all covariates with main and interaction effects). *Note.* MCS = Mental Composite Scale.

Table 1 Descriptive Characteristics of Participants by LEP Groups at Baseline ($n = 621$).

Explanatory variables	Lower extremity performance levels			<i>p</i> value
	Low	Intermediate	High	
	(SPPB score 0-6)	(SPPB score 7-9)	(SPPB score 10-12)	
	<i>n</i> = 222	<i>n</i> = 230	<i>n</i> = 169	
Age (years)	79.7 ± 6.0	77.1 ± 4.3	77.2 ± 4.5	<.001
Sex (% Men)	35.1	36.1	52.1	.002
Married (%)	52.3	51.7	40.8	.040
Nativity (% U.S. born)	41.9	37.8	37.2	.570
Education (years)	4.8 ± 3.6	5.2 ± 3.9	5.6 ± 3.8	.001
No. English interview (%)	13.51	20	18.93	.150
BMI (kg/m ²)	28 ± 6	28.5 ± 5	27.7 ± 5.4	.030
High depressive symptoms (CES-D 16) (%)	16.2	12.6	4.73	<.001
Low cognitive status (MMSE < 21) (%)	48.6	32.6	20.1	<.001
Number of medical conditions	1.3 ± 0.9	1.2 ± 1	0.8 ± 0.8	<.001
TBMS (Kg)	56.9 ± 18.5	70.3 ± 22.6	77.3 ± 21.5	<.001
SF-36 physical functioning	38.4 ± 32.1	67.6 ± 29	81.2 ± 20.9	<.001
SF-36 role of physical	46.8 ± 44.6	73.6 ± 39.9	85.7 ± 31.4	<.001
SF-36 bodily pain	57.8 ± 25.1	73.9 ± 24.9	78.8 ± 22.1	<.001
SF-36 general health	48.7 ± 19.6	62.6 ± 21.2	72.5 ± 18.2	<.001
SF-36 vitality	54.7 ± 18.4	67.5 ± 19.2	75.5 ± 17.1	<.001
SF-36 social functioning	70.3 ± 26.9	84.8 ± 21.5	92 ± 15	<.001
SF-36 role of emotion	71.7 ± 41.1	81.1 ± 35.7	93.9 ± 21.1	<.001
SF-36 mental health	75.4 ± 16.9	80.9 ± 16.5	87.9 ± 13.3	<.001
PCS	33.1 ± 12.1	44 ± 11.2	48.2 ± 9	<.001
MCS	53.5 ± 8.9	54.6 ± 9.2	57.9 ± 6.1	<.001

Note. LEP = lower extremity performance; SPPB = Short Physical Performance Battery; BMI = body mass index; CES-D = Center for Epidemiological Studies Depression; MMSE = Mini-Mental State Examination; TBMS = total body muscle strength; SF = short form; PCS = SF-36 Physical Component Summary; MCS = SF-36 Mental Component Summary.

Table 2

General Linear Mixed Models Estimates for Physical Health-Related Quality of Life as a Function of Baseline LEP Groups Over a 6-Year Period (2000-2006).

Explanatory variables	Model 1		Model 2	
	β (SE)	<i>p</i> value	β (SE)	<i>p</i> value
Intercept	51.82 (7.37)	<.0001	50.19 (8.28)	<.0001
Time 0	Reference		Reference	
Time 1	-8.94 (7.69)	.2454	-10.51 (9.61)	.2749
Time 2	-6.26 (11.01)	.5699	1.63 (14.81)	.9125
LEP groups				
Low	Reference		Reference	
Intermediate	7.99 (0.95)	<.0001	5.97 (1.00)	<.0001
High	10.66 (1.04)	<.0001	6.20 (1.10)	<.0001
Intermediate $\times$ Time 0	Reference		Reference	
Intermediate $\times$ Time 1	2.48 (1.22)	.0429	1.51 (1.39)	.2764
Intermediate $\times$ Time 2	-0.58 (1.52)	.7052	-1.52 (1.71)	.3732
High $\times$ Time 0	Reference		Reference	
High $\times$ Time 1	4.31 (1.26)	.0006	5.11 (1.46)	.0005
High $\times$ Time 2	2.60 (1.56)	.0972	3.42 (1.83)	.0624
Age	-0.24 (0.091)	.0091	-0.13 (0.092)	.1578
Sex	2.89 (0.98)	.0035	-1.40 (1.14)	.2184
Marital status	0.059 (0.94)	.9502	1.08 (0.92)	.2395
Education in years	0.13 (0.097)	.1704	0.088 (0.097)	.3636
Nativity (foreign born vs. U.S. born)	1.01 (0.74)	.1738	1.44 (0.71)	.045
English or Spanish interview	-2.18 (1.10)	.0478	-1.24 (1.12)	.2700
BMI			-0.29 (0.079)	.0002
High depressive symptoms			-1.66 (1.37)	.2224
Low cognitive status			-1.72 (0.89)	.054
Medical conditions			-2.45 (0.45)	<.0001
Total body muscle strength			0.14 (0.024)	<.0001

Note. Model 1 included age, gender, marital status, education, nativity, and language of interview.

Model 2 included BMI, high depressive symptoms, low cognitive status, total body muscle strength, and medical conditions (diabetes, heart attack, stroke, hypertension, arthritis, and cancer) along with variables in Model 1. LEP = lower extremity performance; *B* = coefficient estimates; *SE* = standard error; BMI = body mass index.

Table 3

General Linear Mixed Models Estimates for Mental Health-Related Quality of Life as a Function of Baseline LEP Groups Over a 6-Year Period (2000-2006).

Explanatory variables	Model 1		Model 2	
	β (SE)	<i>p</i> value	β (SE)	<i>p</i> value
Intercept	56.60 (5.63)	<.0001	45.50 (6.45)	<.0001
Time 0	Reference		Reference	
Time 1	-6.17 (6.95)	.375	4.25 (8.31)	.6095
Time 2	-12.95 (10.97)	.2387	-3.89 (10.87)	.7205
LEP groups				
Low	Reference		Reference	
Intermediate	1.25 (0.78)	.1101	1.18 (0.83)	.1526
High	3.95 (0.85)	<.0001	3.41 (0.91)	.0002
Intermediate $\times$ Time0	Reference		Reference	
Intermediate $\times$ Time 1	2.26 (1.07)	.0353	-0.10 (1.13)	.9303
Intermediate $\times$ Time 2	4.61 (1.45)	.0016	2.64 (1.25)	.0355
High $\times$ Time 0	Reference		Reference	
High $\times$ Time 1	1.26 (1.11)	.2575	-0.77 (1.21)	.525
High $\times$ Time 2	4.24 (1.51)	.0051	1.15 (1.36)	.3985
Age	-0.052 (0.069)	.4565	0.075 (0.071)	.2918
Sex	-0.74 (0.75)	.3202	-2.89 (0.89)	.0014
Marital status	2.20 (0.73)	.0028	1.45 (0.72)	.0444
Education in years	-0.008 (0.071)	.8987	-0.032 (0.064)	.6141
Nativity (foreign born vs. U.S. born)	1.20 (0.54)	.0264	0.77 (0.47)	.1008
English or Spanish interview	-3.17 (0.89)	.0004	-2.01 (0.90)	.0263
BMI			0.034 (0.062)	.5819
High depressive symptoms			-10.4 (1.12)	<.0001
Low cognitive status			0.40 (0.73)	.5796
Medical conditions			-0.23 (0.36)	.5304
Total body muscle strength			0.043 (0.02)	.0284

Note. Model 1 included age, gender, marital status, education, nativity, and language of interview.

Model 2 included BMI, high depressive symptoms, low cognitive status, total body muscle strength, and medical conditions (diabetes, heart attack, stroke, hypertension, arthritis, and cancer) along with variables in Model 1. LEP = lower extremity performance; *B* = coefficient estimates; *SE* = standard error; BMI = body mass index.