ORIGINAL RESEARCH

Low Physical Performance is Associated with a Poor Health-Related Quality of Life (HRQOL) in Community-Dwelling Older Mexicans"

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https://doi.org/10.5770/cgj.25.560

ABSTRACT

Objective

Identify the association between low physical performance and quality of life in older adults.

Methods

Cross-sectional analysis of the FraDySMex cohort study (Frailty, Daphnia and Sarcopenia in Mexican Adults). The physical performance was evaluated by Short Physical Performance Battery (SPPB), and the quality of life through the Visual Analogue Scale of the EuroQol-5D for the Health-Related Quality of Life (HRQOL). In addition, other variables such as socio-demographic, comorbidity, cognitive status, depressive symptoms, anxiety, frailty, and functional dependence were evaluated.

Results

624 adults were included, 79.13% (CI 95% 75.72–82.26) women, aged 71.1±9.5 years. The prevalence of low physical performance frequency was 32.47% (CI 95% 28.88–36.31) and low HRQOL of 28.57% (CI 95% 25.05–32.29). The low physical performance was associated with a low HRQOL (OR= 2.09; CI 95% 1.35-3.23; p=.001), adjusted for age, sex, comorbidity index, cognitive, anxiety, and depressive symptoms in the logistic regression.

Conclusion

The low physical performance is associated with a low quality of life in older people.

Key words: health-related quality of life, older adults, physical performance

INTRODUCTION

The Health-Related Quality of Life (HRQOL) in older adults is directly related to the preservation of functionality and independence in the physical, mental and social domains of health.[1]

The physical performance (gait speed, balance, and muscle strength) is a marker with high predictive capacity for negative outcomes in older adults such as falls, functional disability, hospitalizations, and mortality,[2,3] and all this directly affects the quality of life. Physical performance and quality of life represent two major components of multidimensional evaluation in older people and the most important outcomes of any clinical and therapeutical decision.[4,5]

In this regard, López-Teros *et al*.[5] reported the association between the grip strength and functional disability in Mexican older adults (OR=0.96; CI 95% 0.93–0.99), and the association between gait speed and disability (OR= 0.27; CI 95% =0.07–0.99). Markides *et al*.[6] observed that low physical performance and decreased strength in the lower extremities may be good indicators of increased risk of mortality (HR= 3.01; CI 95% =2.34–3.87). Given the importance of the physical performance, the Centers for Disease Control and Prevention's (CDC) developed the STEADI (Stopping Elderly Accidents, Deaths & Injuries) initiative, which included the evaluation of physical performance as an early and essential indicator to classify the risk of falls.[7]

Results derived from the Korean Longitudinal Study of Ageing,[8] in which the quality of life by The Short Form-36 Health Survey (SF-36) was evaluated between 385 older adults. The authors observed that the grip strength was the most powerful indicator in men (beta coefficient = 1. 47, p < .0001) and women (beta coefficient = 1. 71, p < .0001) for the physical scores of SF-36, highlighting the importance of maintaining a good level of physical performance, since it is considered a key element of healthy and active aging.

Data obtained from the Study on Global Ageing and Adult Health (SAGE),[9] in adults of 50 years and older from China, Ghana, India, Mexico, Russia and South Africa, found that physical function was positively associated with perceived well-being (quality of life, mood, and happiness) in older

individuals from lower income nations. The grip strength was associated in China (OR=1.10; CI 95% =1.04–1.16; p<.01) and Ghana (OR=1.15; CI 95% =1.04–1.26); p <.01) with well-being variables; however data in Mexico's results[9] were not significant.

Therefore, there is not enough evidence on the association between low physical performance and low quality of life in older adults. Indeed, some studies indicate that deterioration in the perception of quality of life increases when any of the components of physical performance (muscle strength, gait speed, and balance) is present. Few studies have evaluated these three main components of physical performance on the quality of life in older adults. Therefore, we propose the following objective: identify the association between low physical performance and quality of life in community dwelling older adults of Mexico City.

METHODS

Design and Study Population

It is a secondary cross-sectional analysis of the participants in the study of Frailty, Dynapenia and Sarcopenia in Mexico (FraDySMex study).[10] This study is a cohort of adults living in the community of two municipalities of Mexico City, consisting of men and women over 50 years of age, all of whom are able to move with or without assistive devices and able to answer the questions of the study questionnaire by themselves, or with caregiver assistance if the score of the mini-mental state examination (MMSE) was 10 points or less. Were excluded people with a total functional dependence, since it was required to perform physical performance tests (strength, gait, and balance), presence of edema in their extremities, current intake of diuretics and pacemaker carriers (because body composition was evaluated by electrical bio-impedance and these factors can modify the measurement). As well as people with clinical conditions such as presence of fever, diarrhea, cancer diagnosis of five years or less and participants who would not have physical performance tests were excluded.

The study consisted of objective evaluations by the multidisciplinary team of the Research Laboratory in Functional Evaluation of the National Institute of Geriatrics and Ibero-American University in Mexico City. More details of the design, recruitment, and selection of the FraDySMex study of participants can be found in the Rosas-Carrasco *et al*. study.[10] The current study was approved by the Ethics Committee of the Mocel de Angeles General Hospital and enrolled in the National Institute of Geriatrics with the number DI-PI-002/2014. Informed signed consent was obtained by all individuals before the study. The selection of the study population is shown in Figure 1.

Measurements

The following measurements were taken.

Diagnosis of low physical performance: Physical performance was measured by the Short-Physical Performance Battery (SPPB), with a cut-off point of <8 points, for low physical performance.[11]

Diagnosis of low Health-Related Quality of Life (HRQOL): The HRQOL was measured by the Visual Analogue Scale (VAS) of the EUROQOL-5D (European Quality of Life-5 Dimensions), with the extremes of the scale being the worst perception health status (0) and the best health status perception (100).[12,13] Taking as a reference for this study, values below the first quintile of the study population were considered low quality of life, obtaining a cut-off point <70; this conceptualization was previously used by other authors.[14,15]

Other Variables

Sociodemographic: age (years), sex, schooling (<10 years; >10 years); health conditions: depressive symptoms (was considered if it scored >5) using the CES scale item D-7 (Center for Epidemiologic Studies, Depression Scale, Mexican version).[16] Anxiety was measured using the Goldberg Scale; we considered >4 points for depressive symptoms.[17] Cognitive state was assessed using the MMSE (cognitive impairment was considered when it scored <23 points with <five years of school education, <19 points he/she was in school between one and four years, <16 without schooling or less than one year of schooling.[18,19] Comorbidity was assessed using the Comorbidity Index adapted to Mexican

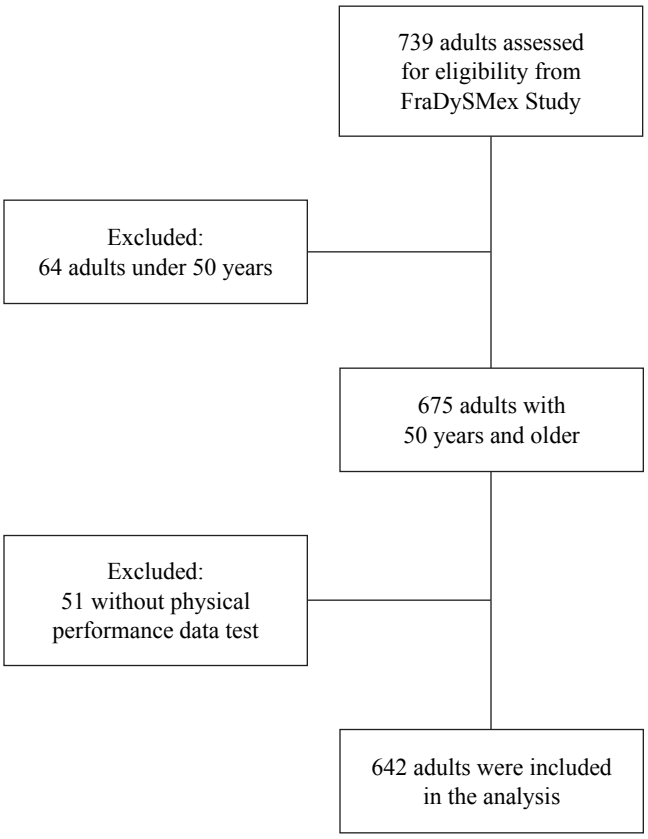

FIGURE 1. Flowchart of frailty, dinapenia and sarcopenia study in Mexican adults (FraDySMex)

Spanish.[20] Information about schooling in years (<10 vs. >10), history of falls (one or more in the last year) was also noted. Functional dependence was also assessed using the Lawton scale for instrumental activities of daily life (IADL) (≥ 1 activities) and the Barthel scale for basic activities of daily living (BADL) (≤95 points).[21,22] Physical frailty was evaluated using the Fried's criteria; a score ≥ 3 was consider as frailty.[10] The grip strength and gait velocity were defined as described in the sarcopenia variable. Low physical activity was defined using the lowest quintile of kilocalories per week obtained through the physical activity questionnaire for older adults (CHAMPS), <545.7 for men and <481.2 kcal/week for women.[2,3] The following question was used for the variables of involuntary weight loss: In the last year, have you unintentionally lost 5 kg (or 5% of your weight) or more? For the low energy or exhaustion variable, two questions of the CES D-7 scale Mexican version were used (Does it feel like everything you do is an effort? Do you consistently feel like doing nothing?). These questions were answered as never or almost never, sometimes (one to two times a week), frequently (three to four days a week) and always or almost always (five to seven days a week).[16] Malnutrition was evaluated with Mini Nutritional Assessment (MNA) scale and the cutoff <23 points was used to define the risk of malnutrition. Other measures of body composition were also obtained through dual-energy X-ray (DXA), such as the percent total body fat considering obesity when calculated as >30% in men and >40% in women, bone mineral density of the hip and spine using the WHO[23] cut-off points to define osteopenia and osteoporosis.[21] In addition, anthropometric measurements were obtained such as weight (kg), height (m), calf and mild arm circumference (cm), and BMI (kg/m^2).

Statistical Analysis

In a post hoc power calculation, we found that our study had more than 90% statistical power to detect a difference in low physical performance prevalence between participants with and without low quality of life of 26%, considering that the prevalence of low physical performance was approximately 47%, with significance level of 0.05, using a two-sided, two-sample test of proportions.

Variables were described by arithmetic means and DE or proportions, as appropriate. Group differences between participants with or without low HRQOL were evaluated using the Student's *t*-test or the Chi-squared test for continuous and categorical variables, respectively. Secondly, logistic regression models were used to determine the association between low physical performance with low HRQOL. The variables included in the final models were those significantly related with HRQOL in bivariate analysis. Differences were considered statistically significant with $p \leq .05$. Confidence intervals (CI) were also reported at 95%. Likewise, collinearity and interaction between variables were also verified for the final models. The goodness-of-fit of the model was assessed by the Hosmer-Lemeshow Goodness of Fit test (Pearson's chi -squared test = 354.94; $p = .0699$). The data fit a given distribution and the area under the receiver operating characteristic curve (AUROC). The data were analyzed using Stata version 18® (Stata Corp, College Station, TX).

RESULTS

This study included a total sample of 624 older adults, of which n = 130 (21%) were men and 494 (79.17%) were women, with a mean age of 71.10 ± 9.45 years.

In the short physical performance test (SPPB), a considerable percentage (54.61%, n=296) was shown to exhibit low physical performance (Table 1). On the other hand, HRQOL measured by means of the Visual Analogue Scale (VAS) had an average of 79.48 ± 16.23 among the study population.

In Table 2, regarding health conditions, we found differences significant between groups: depressive symptoms (57.30% vs. 25.23%, $p = .000$), anxiety (63.13% vs. 37.39%, $p = .000$), comorbidity rate (35.96% vs. 19.59%, $p = .000$), dependence on BADL (10.67% vs. 5.86%, $p = .036$), and

TABLE 1.
General characteristics of the study population (n= 624)

Sociodemographic Characteristics	*Mean ± SD (%)*
Age (yrs)	71.10 ± 9.45
Sex	
Women	494 (79.17)
Men	130 (20.83)
Schooling <10 yrs	112 (18.01)
Healthy Conditions	
Falls, one or more in the last year	258 (41.48)
Cognitive impairment (MMSE adjusted for schooling)	89 (14.31)
Depressive symptoms (CES-D7 ≥5 points)	214 (34.41)
Charlson comorbidity index (>3 comorbidities)	151 (24.28)
Risk malnutrition (MNA ≤23.5 points)	38 (6.11)
BADL dependency (Barthel ≤90 points)	45 (7.23)
IADL dependency (Lawton score ≥1)	136 (21.79)
Polypharmacy (4 or more drugs)	258 (41.35)
Low physical performance, (SPPB ≤8 points)	202 (54.6)
Anxiety	279 (44.8)
Sarcopenia (%)	116 (19.11)
Obesity (%)	443 (70.99)
Health-Related Quality of Life (HRQOL)	
Visual Analogue Scale (VAS, EUROQOL-5D)	79.48 ±16.23

MMSE = Mini-Mental State Examination; CES-D7 = Depression Scale of the Center for Epidemiologic Studies; MNA = Mini-Nutritional Assessment; BADL = basic activities of daily life by Barthel index; IADL = instrumental activities of daily life by Lawton; SPPB = short physical performance battery.

on IADL. (29.21% vs. 18.93, p = .005); as well as physical performance (47.49% vs. 26.29%, p = .000).

Table 3 shows the simple and multiple logistic regression model with HRQL as the dependent variable. In the adjusted model, the variables that were significantly associated with a low HRQOL were: high comorbidity (OR 1.58; 95% CI 1.03–2.41; p = .032), low physical performance (OR 2.09; 95% CI 1.35–3.23; p = .001), anxiety (OR 1.54; 95% CI 0.99–2.39; p = .052), and depressive symptoms (OR 2.83; 95% CI 1.82–4.39; p = .000).

TABLE 2.
Comparison between individuals with high and low HRQOL, measured by AVS with EQ5D

Characteristics	*High HRQOL, measured by VAS n=445 (71.3%) Mean ± SD o n (%)*	*Low HRQOL, measured by VAS n=179 (28.69%) Mean ± SD n (%)*	*P value p<.5*
Sociodemographic			
Age (yrs)	70.6 ±9.1	72.13 ±10.0	.079
Sex:			
Women, n (%)	340 (76.58)	153 (85.39)	.015
Men, n (%)	104 (23.42)	26 (14.61)	
Schooling <10 yrs	74 (16.67)	38 (21.35)	.170
Healthy Conditions			
Cognitive impairment (MMSE adjusted for schooling)	56 (12.61)	33 (18.54)	.056
Depressive symptoms (CES-D7 ≥5 points)	112 (25.23)	102 (57.30)	.000
Anxiety	166 (37.39)	113 (63.13)	.000
High comorbidity (Charlson index ≥3 points)	87 (19.59)	64 (35.96)	.000
Risk malnutrition (MNA ≤23.5 points)	24 (5.41)	14 (7.87)	.247
BADL dependency (Barthel ≤90 points)	26 (5.86)	19 (10.67)	.036
IADL dependency (Lawton score ≥1)	84 (18.93)	52 (29.21)	.005
Low physical performance (SPPB ≤8 points)	117 (26.29)	85 (47.49)	.000
Sarcopenia (%)	84 (19.40)	32 (18.39)	.775
Obesity (%)	350 (78.83)	140 (78.65)	.961

VAS = visual analogue scale; HRQOL = health-related quality of life; EUROQOL-5D (EQ5D-VAS) = visual analogue scale; MMSE = Mini-Mental State Examination; CES-D7 = Depression Scale of the Center for Epidemiologic Studies; MNA = Mini Nutritional Assessment; BADL = basic activities of daily life by Barthel index; IADL = instrumental activities of daily life by Lawton; SPPB = short physical performance battery.

TABLE 3.
Simple and multiple logistic regression model with low HRQOL as the dependent variable

	HRQOL, measured by VAS	
	OR (95% CI) crude, p value	*OR (95% CI) adjusted, p value*
Age (≥50 years)	1.25 (0.88-1.78), 0.204	0.85 (0.55-1.29), 0.452
Sex	1.78 (1.11-2.86), 0.015	1.37 (0.82-2.28), 0.220
High comorbidity (Charlson index ≥3 points)	2.30 (1.56-3.38), 0.000	1.58 (1.03-2.41), 0.032
Low physical performance (SPPB ≤8 points)	2.53 (1.76-3.63), 0.000	2.09 (1.35-3.23), 0.001
Cognitive impairment (MMSE adjusted for schooling)	1.57 (0.98-2.52), 0.058	1.00 (0.58-1.72), 0.977
Anxiety	2.86 (2.00-4.10), 0.000	1.54 (0.99-2.39), 0.052
Depressive symptoms (CES-D7 ≥5 points)	3.97 (2.75-5.73), 0.000	2.83 (1.82-4.39), 0.000
BADL dependency (Barthel ≤90 points)	1.92 (1.03-3.56), 0.039	0.97 (0.47-1.96), 0.936
IADL dependency (Lawton score ≥1)	1.76 (1.18-2.63), 0.006	1.44 (0.89-2.35), 0.136

HRQOL = health-related quality of life; VAS = visual analogue scale; SPPB = short physical performance battery; MMSE = Mini-Mental State Examination; CES-D7 = Depression Scale of the Center for Epidemiologic Studies; BADL = basic activities of daily life by Barthel index; IADL = instrumental activities of daily life by Lawton.

DISCUSSION

This study showed that low physical performance is associated with low HRQOL in older people (OR=2.09; 95% CI=1.35–3.23; p= .001) after adjusted by significant variables such as sex, age, comorbidity, anxiety, depressive symptoms, and cognitive impairment. Similar results were obtained by Fusco *et al*.;[4] all the physical function measures considered (4-meter walking speed, SPPB, ADL, IADL) were significantly associated with quality of life measured by EuroQol 5-D. In the Fusco study, the IADL scale was the physical function measure that more than others influenced the quality of life, especially in women. Although our results show that, if there is a greater association with IADL, it is not significant because in our study the frequency of percentage was lower.

Our result was similar to that reported by Lee *et al*.,[8] where the physical component of grip strength was found associated with HRQOL (p = <.001). Physical performance also includes a dimension of gait speed. In this regard, Gildner and collaborators[9] observed in their study that slow gait speed resulted associated with a low HRQOL scores in South Africa (OR = 1.47, p < .001), these results being very similar to those presented in the current study.

Physical performance has been shown to be predictive for several negative outcomes and poor quality of life. Ikegami et al.[1] observed that the physical component of the HRQOL measurement using The Short Form-8 Health Survey (SF-8) was significantly influenced by components of physical performance, such as knee muscle strength (Impact 2.0; 95% CI 1.1–2.9; p = < .01), grip strength (Impact 1.7; 95% CI 0.8–2.6; p = < .01), time standing on one leg (Impact 1.2; 95% CI 0.3–2.2; p = .01), the test of foot (Impact 1.4; 95% CI 0.6–2.2; p = <.01). So, if one of the components was low, they perceived poor quality of life, and the higher and more preserved physical function was in older adults, the risk of negative health conditions decreases.[2,5,6]

Furthermore, this result is in agreement with Masel *et al*.,[24] who found that being pre-frail (OR 4.03; 95% CI 1.95–8.35; p < .001) or frail (OR 10.58; 95% CI 4.90–22.84; p < .001) was significantly associated with lower scores on all physical HRQOL scales than non-frail people. In comparison with other results, Oh *et al*.[25] found that being older adult men conferred 3.5 times more likelihood (OR= 3.54; 95% CI 1.34–9.35; p = .011) of having low quality of life (EQ-5D) and low physical performance due to SPPB; in older adult women 2.5 times more likelihood (OR= 2.50; 95% CI 1.08–5.76; p = .032), than observed in this study.

Although these results suggest a positive relationship between low physical performance and HRQOL, it should be considered as a limitation the temporality between variables for being a cross-sectional study. It is not possible to ensure a causal relationship between these variables; the suitable course would be confirmation via a longitudinal study. On the other hand, in the scale used for the quality of life measurement provided by EuroQol-5D, VAS is an approximate measure of quality of life. It is simple, practical, and easy to understand, and it has validation in Mexico and other countries. Despite these limitations, we consider that this study has strengths in the sample size, the measurements made, as well as the interaction of the components in the multivariate analysis, and the contribution that it can provide to the Mexican population on the physical performance scene and HRQOL in older people. This assessment can change the medical paradigms from a disease-centered approach to people-centered within the framework of healthy aging.[26]

CONCLUSION

This study reports the association between low physical performance with HRQOL in older people. Identify a low physical performance early in older people can prevent the development of disability and physical dependence, and it could improve the quality of life at the time in older people.

ACKNOWLEDGEMENTS

Not applicable.

CONFLICT OF INTEREST DISCLOSURES

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

FUNDING

Through the National Institute of Geriatrics (INGer) and the Health Department of the Ibero-American University in Mexico City, this project was supported by a grant from the Secretary of Education, Science, Technology and Innovation of Mexico City (CM-SECTEI/041/2020) Collaborative Network for Translational Research for Healthy Aging in Mexico City (RECITES). Also, the Research and Postgraduate Direction and Health Department of Ibero-American University in Mexico City provided support in the study development and publication of this article.

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