ORIGINAL ARTICLE

ISSN 0103-5150
Fisioter. Mov., Curitiba, v. 33, e003359, 2020
DOI: http://dx.doi.org/10.1590/1980-5918.032.AO58

Evaluation of the influence of nutritional status, measures of frailty and level of physical activity on the quality of life of long-lived individuals

Avaliação da influência do estado nutricional, medidas de fragilidade e nível de atividade física com a qualidade de vida de idosos longevos

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Abstract

Introduction: Aging is a worldwide phenomenon that has favored an increase in people aged 80 years and older. Objective: To assess the influence of nutritional status (NS), measures of frailty, and physical activity level (PAL) on the quality of life (QoL) of long-lived people. **Method:** The study was carried out from Oct 2016 to Sept 2017 with 103 individuals aged 80 years or more. NS was classified according to the PAHO Health, Well-Being and Aging (SABE) survey; waist circumference (WC) and calf perimeter (CP) was based on the WHO classification; handgrip strength (HGS) and gait speed (GS) used the classification proposed by Lauretani; PAL was classified according to the IPAQ short form; the WHOQoL-bref and WHOQoL-old were applied to measure QOL. Variables were assessed using the Mann-Whitney U and t-tests. **Results:** 69.2% were women, with an average age of 82.75 (± 2.98) years, and only WC showed a significant association ($p < 0.001$). The older women without dynapenia exhibited better QoL in the physical domain ($p = 0.004$), social relationships ($p = 0.022$), self-reported QoL ($p = 0.017$) of the WHOQoL-bref and social participation facet ($p = 0.025$) of WHOQOL-old. Comparison of QoL with NS and PAL showed a significant difference in

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self-reported QoL (p = 0.027) for the former and past, present and future activities for the latter (p = 0.050). **Conclusion:** Obesity and the absence of dynapenia were positively associated with the QoL of long-lived individuals. PAL was associated with positive QoL in one facet of the WHOQoL-old.

Keywords: Aged, 80 and over. Nutritional Status. Physical Activity. Quality of Life.

Resumo

Introdução: *Envelhecimento é um fenômeno mundial que favoreceu o aumento de idosos com 80 anos ou mais.* ***Objetivo:*** *Avaliar a influência do estado nutricional (EN), medidas de fragilidade, nível de atividade física (NAF) com a qualidade de vida (QV) de idosos longevos.* ***Método:*** *Estudo realizado de out/2016 a set/2017 com 103 idosos ≥80 anos. O EN foi classificado segundo OPAS/SABE; circunferência abdominal (CA) e da panturrilha (CP) utilizou-se a classificação WHO; força de preensão palmar (FPP) e velocidade de marcha (VM) utilizou-se a classificação proposta por Lauretani; NAF foi classificado segundo IPAQ versão curta; para a mensuração da QV foram utilizados WHOQoL-bref e old. As variáveis foram avaliadas através do Test t e teste U de Mann-Whitney. Resultados: 69.2% eram mulheres, média de 82.75 (±2.98) anos, apenas a variável CA apresentou associação significativa (p<0.001). As idosas sem dinapenia apresentaram melhor QV no domínio físico (p=0.004), relação social (p=0.022) e autoavaliação da QV (p=0.017) do WHOQoL-bref e na faceta de participação social (p=0.025) do WHOQoL-old. Comparada a percepção de QV pelo EN, houve diferença significativa na autoavaliação da QV (p=0.027), pelo NAF observou-se diferença significativa na faceta atividades passadas, presentes e futuras (p=0.050).* ***Conclusão:*** *A obesidade e ausência de dinapenia associaram-se positivamente com a QV dos longevos. O NAF foi associado com a QV positiva em uma faceta do WHOQoL-old.*

Palavras-chave: *Idoso de 80 anos ou mais. Estado Nutricional. Atividade Física. Qualidade de Vida.*

Introduction

The aging population is a worldwide phenomenon with significant repercussions in Brazil. The increased life expectancy in the country has resulted in a rise in the proportion of individuals aged 80 years or older [1], called older adults, very old adults, advanced older adults or long-lived older adults [2,3].

The prevalence of long-lived adults has important implications for the healthcare area due to the presence of comorbidities and a higher incidence of functional decline [4]. During the aging process, natural senescent structural, physiological and functional changes occur [5]. These changes include reduced height, a greater relationship between fat and muscle mass, lower body water level, weight loss (after the age of 80) [6] and a decline in muscle tissue that interferes in the mobility of older people [7]. For some individuals, these changes may be more marked, increasing the risk of morbidity and mortality, while others remain robust even at advanced age. Within the heterogeneity resulting from the aging process, the concept of frailty has been increasingly discussed [5]. The physical characteristics of frailty involve fatigue, muscle weakness, physical inactivity, slow gait and weight loss [8]. Inadequate nutritional status (NS), combined with a sedentary lifestyle, is a risk factor for chronic noncommunicable diseases (NCDs) in the population and physical inactivity raises the risk of comorbidities related to their development. Thus, preventive measures such as engaging in physical activity and a healthy diet are essential to reduce the physiological effects of aging, increase well-being, enhance cardiovascular health and mitigate chronic inflammatory conditions [9].

Dias, Salvador and Cucato [10] reported that physical activity improves independence, disease control, physical aptitude (skills and capacities to perform activities), and the quality of life (QoL) of older adults, in addition to promoting socialization.

Thus, understanding the aging process is a necessary challenge to increase longevity and improve the QoL of this population. Nutrition, physical activity and frailty are aspects that should be studied, since they play an important role in the physical changes caused by the

aging process. The aim of this study was to assess the nutritional status, measures of frailty, physical activity level and their relation with the quality of life in older adults aged 80 years or more.

Method

This is quantitative cross-sectional study, using probability sampling with no intervention [11]. Data were collected between October 2016 and September 2017, from 103 long-lived older adults of both sexes from different communities in São Paulo state.

Participants were selected at five institutions that offer free activities in education, sports, leisure and culture, in addition to healthcare services for older people. These include the House for Older Adults in São José dos Campos (n=29), Laboratory for the Study of Movement (LEM) of Clínícas Hospital in São Paulo (n=25), Higher Physical Education School (ESEF) in Jundiaí (n=18), Integrated Center for Health and Education in Old Age (CISE) in São Caetano do Sul (n=17) and São Judas Tadeu University (USJT) in São Paulo (n=14). All the subjects met the following inclusion criteria: age greater than or equal to 80 years; able to complete the questionnaires and perform the proposed tests. No exclusion criteria were established, since all the older adults were volunteers. When subjects were unwilling to take part in a test, they were considered absent in the database.

The data were collected by a team of researchers (physical education teachers, pharmacists, nutritionists and psychologists) trained and standardized for the collection and assessment techniques. A *Plenna*® portable digital scale with a maximum load of 150 kg and accurate to 0.1kg was used to measure body weight. Height was measured by a *Welmy*® portable stadiometer, with 0.5cm graduations and maximum height of 2m. During measurements, the subjects were asked to remain standing, with their feet together and not wearing shoes, staring at a fixed point on a horizontal line. Waist circumference (WC) and calf perimeter (CP) were measured with a nonelastic tape measure, accurate to 1 mm. WC was determined with individuals standing, arms at their sides and feet together, with the tape wrapped around the largest abdominal circumference. For CP, the subject remained seated with legs bent at 90^0, and the tape was placed around the largest circumference of the right calf.

Instruments

Nutritional status was determined by body mass index (BMI) and analyzed according to the cutoff points recommended by the Pan American Health Organization (PAHO/SABE Survey) [12], with the older adults classified as low weight (< 23.0 kg/m^2), normal weight (23.0 – 28.0 kg/m^2), overweight (28.0 – 30.0 kg/m^2) and obesity (> 30.0 kg/m^2).

WC <94cm was classified as normal for men and < 80cm for women; high risk between 94 and 102 cm for men and between 80 and 88 cm for women; very high risk > 102 cm for men and > 88 cm for women [13]. Three measures of CP were taken and an average of CP >31cm was considered adequate [14].

Handgrip strength (HGS) is a measure of the muscle strength of middle-aged and older adults, in addition to allowing analysis of functional performance during the aging process [15]. This was checked three times with a Jamar® hydraulic dynamometer and the average of the three values calculated. The subjects were asked to use their dominant hand, with a 20-second interval between each attempt. The result was classified according to the recommendations for older adults, where ≥ 20kg/f is considered adequate for women and ≥ 30kg/f for men [16]. Older people with lower than recommended HGS were considered dynapenic, an indicator of frailty.

Gait speed (GS) is used to assess balance and physical mobility [17] and was evaluated using the 4-meter walk test. To that end, two chairs were used to demarcate the start and end of the walk. The test was repeated three times and the average was used as the final time. A Seiko® digital stopwatch measured the time to complete the test. The speed was obtained by dividing the 4 meters traveled by the time in seconds, with a value <.8 m/s considered compromised mobility [16]. The decrease in GS was deemed physical frailty in older adults.

In order to establish physical activity level (PAL), the data were collected in a battery of activities established in the metabolic equivalent (MET). The data obtained were transferred to the International Physical Activity Questionnaire (IPAQ) – short form [18]. The participants were classified as very active, active, irregularly active and sedentary. When the older person engaged in more than one activity, each one was considered for PAL classification.

The World Health Organization Quality of Life (WHOQOL) questionnaire was translated to Portuguese

by Fleck [19] and Fleck, Chachamovich, Trentini [20] in the short form (WHOQoL-bref) and the specific version for older adults (WHOQoL-old). In relation to the final score, high scores (maximum score = 100) mean a high QoL and low score (minimum score = 0) a low QoL.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS), version 21.0 was used for statistical analysis. The data were presented as descriptive statistics (mean and standard deviation), median, interquartile range, absolute and relative frequency. The chi-squared test was applied to determine the association between the variables studied and sex. When the assumption was not met, Fisher's exact test was used for situations in which each variable has only two response possibilities. The test was not applied for variables with more response possibilities and which did not meet the assumption.

The t-test was used to compare QoL with GHS. Cohen's d was adopted to determine the effect size in the test. When the domains or facets did not exhibit normal distribution, the Mann-Whitney U test was used.

Spearman's correlation was applied to assess the association between GS and QoL. This correlation varies between 1 and -1 to measure the degree of association between two variables. Zero *r* values show no association, and values near zero (negative or positive) indicate a very weak association between the variables. The closer the *r* values to 1 or -1, the stronger the association between the variables [21].

One-way ANOVA was used to compare QoL, nutritional status (NS) and PAL, followed by Tukey's test. The effect size was examined using partial eta squared, presented in percentage. A 5% significance level was adopted ($p<0.05$).

Ethical aspects

This study was approved by the Research Ethics Committee of São Judas Tadeu University (USJT) under protocol number 56493317.00000.0089. The participants gave written informed consent in accordance with the National Health Council's Resolution 466, of December 12, 2012).

Results

Most of the 103 older adults were women (69.2%), with an average age of 82.75 (±2.98) years, minimum age of 80 and maximum of 94 years, 87.7% white, 58.7% widowed, 51.7% with elementary education, 66.3% do not live alone and 51.9% earn between 1 and 2 minimum monthly wages (≈USD200-400).

Table 1 shows that when nutritional status variables, WC, CP, GHS, GS, and PAL are compared by sex, only WC shows a significant association ($p< 0.001$), and 81.7% of the women exhibited a very high risk for cardiovascular diseases.

Table 1 - Distribution of older adults according to anthropometric measures, handgrip strength, gait speed and physical activity level. São Paulo, 2016-2017

Variables	Men		Women		Total		Chi-squared	p
	n	%	n	%	n	%		
Nutritional Status								
Low weight	05	15.6	10	14.3	15	14.7		
Normal weight	19	59.4	37	52.9	56	54.9		
Overweight	04	12.5	09	12.9	13	12.7	0.899	0.826
Obesity	04	12.5	14	20.0	18	17.6		
Total	32	100.0	70	100.0	102	100.0		

(to be continued)

(conclusion)

Waist Circumference								
Normal	14	43.8	2	2.8	16	15.5		
Increased risk	10	31.3	11	15.5	21	20.4	37.542	< 0.001
Very increased risk	08	25.0	58	81.7	66	64.1		
Total	32	100.0	71	100.0	103	100.0		
Calf Perimeter								
Inadequate	02	6.3	06	8.6	08	7.8	0.164	0.686
Adequate	30	93.8	64	91.4	94	92.2		
Total	32	100.0	70	100.0	102	100.0		
Variables	**Men**		**Women**		**Total**		**Chi-squared**	**p**
	n	**%**	**n**	**%**	**n**	**%**		
Handgrip Strength								
Dynapenic	21	61.7	49	71.0	70	70.0	0.009	0.925
Non-dynapenic	10	32.3	20	29.0	30	30.0		
Total	31	100.0	69	100.0	100	100.0		
Gait speed								
Compromised mobility	01	3.8	01	1.5	02	2.1	--	0.479#
Non-compromised mobility	25	96.2	67	98.5	92	97.9		
Total	26	100.0	68	100.0	94	100.0		
Physical Activity Level								
Very active	02	6.5	03	4.2	05	4.9	--	--§
Active	04	12.9	10	14.1	14	13.7		
Irregularly active	06	19.4	25	35.2	31	30.4		
Sedentary	19	61,3	33	46.5	52	51.0		
Total	31	100.0	71	100.0	102	100.0		

Note: #Fisher's exact test. § the chi-squared test was not used because the assumption was not met.

The older people without dynapenia, assessed using HGS, showed better QoL in the physical domain (83.9, p=0.004), social relationships (83.3, p=0.022) and self-reported quality of life (75.0, p=0.017) of the WHOQoL-bref and the social participation facet (p=0.025) of the WHOQoL-old (Table 2).

Table 3 shows there was no significant correlation between gait speed (GS) and any QoL domain or facet assessed.

Comparison of perceived QoL (in its different domains and facets) according to nutritional status reveals a significant difference only in self-reported QoL (p=0.027) (Table 4). The obese older adults demonstrated significantly higher perceived QoL when compared to overweight individuals.

Table 5 shows a significant difference in QoL only in past, present and future activities (p=0.050) when compared by PAL; however, Tukey's test found no statistically significant difference.

Table 2 - Distribution of older people according to handgrip strength and quality of life, classified by sex. São Paulo, 2016-2017

Sex	Quality of life	With dynapenia	Without dynapenia	t	p	d
		(n) Average QoL ± SD	(n) Average QoL ± SD			
Men	WHOQoL-bref					
	Physical	(n=21) 65.65 ± 13.67	(n=10) 65.36 ± 14.39	0.54	0.957	0.02
	Psychology	(n=21) 68.65 ± 12.47	(n=10) 75.00 ± 10.39	-1.39	0.174	-0.55
	Social relationships	(n=21) 65.08 ± 16.38	(n=10) 64.17 ± 10.43	0.16	0.874	0.06
	Environment	(n=21) 65.33 ± 12.34	(n=10) 68.44 ± 14.16	-0.63	0.536	-0.23
	Self-reported quality of life	(n=21) 75.0 (75.0 / 100.0)	(n=10) 75.0 (62.5 / 87.5)	-0.64	0.520	--
	Self-reported satisfaction with health	(n=21) 75.0 (75.0 / 100.0)	(n=10) 75.0 (75.0 / 100.0)	-0.82	0.410	--
	WHOQoL-bref					
	Sensory abilities	(n=19) 68.8 (43.8 / 93.8)	(n=9) 87.5 (65,6 / 93.8)	-1.18	0.239	--
	Autonomy	(n=19) 60.20 ± 18.07	(n=9) 70.14 ± 19.96	-1.32	0.200	-0.52
	Past, present and future activities	(n=19) 69.74 ± 14.92	(n=9) 77.78 ± 14.01	-1.36	0.186	-0.55
	Social participation	(n=19) 75.0 (56.3 / 81.3)	(n=9) 81.3 (75,0 / 81.3)	-1.62	0.105	--
	Death and dying	(n=19) 87.5 (50.0 / 100.0)	(n=9) 56.3 (43,8 / 90.6)	-0.83	0.405	--
	Intimacy	(n=19) 65.13 ± 21.78	(n=9) 68.06 ± 23.48	-0.32	0.749	-0.13
Women	WHOQoL-bref					
	Physical	(n=44) 64.3 (53.6 / 78.6)	(n=15) 83.9 (79.5 / 92.9)	-2.87	0.004	--
	Psychological	(n=44) 70.8 (64.6 / 75.0)	(n=15) 79.2 (71.9 / 86.5)	-1.90	0.06	-0.56
	Social relationships	(n=44) 75.0 (66.7 / 75.0)	(n=15) 83.3 (68.7 / 91.6)	-2.30	0.022	--
	Environment	(n=44) 71.17 ± 12.22	(n=15) 75.0 (75.0 / 100.0)	-1.49	0.138	-0.45
	Self-reported quality of life	(n=44) 75.0 (75.0 / 75.0)	(n=15) 75.0 (75.0 / 100.0)	-2.39	0.017	--
	Self-reported satisfaction with health	(n=44) 75.0 (50.0 / 75.0)	(n=15) 75.0 (75.0 / 100.0)	-1.66	0.096	--
	WHOQoL-bref					
	Sensory abilities	(n=41) 75.0 (56.3 / 87.5)	(n=17) 87.5 (50.0 / 93.8)	-1.73	0.084	--
	Autonomy	(n=41) 66.46 ± 16.87	(n=17) 68.75 ± 20.49	-0.44	0.661	-0.12
	Past, present and future activities	(n=41) 75.0 (68.8 / 87.5)	(n=17) 78.1 (64,1 / 96.9)	-0.96	0.338	--
	Social participation	(n=41) 70.12 ± 16.27	(n=17) 80.88 ± 16.01	-2.30	0.025	-0.67
	Death and dying	(n=41) 67.53 ± 26.67	(n=17) 68.38 ± 21.25	-0.12	0.907	-0.03
	Intimacy	(n=41) 79.26 ± 14.69	(n=17) 77.94 ± 17.56	-0.30	0.769	0.08

Note: the data are presented as mean ± standard deviation, Student's t-test for independent samples; median (Q1/Q3) Mann-Whitney U test.

Table 3 - Distribution of older adults according to gait speed and quality of life. São Paulo, 2016-2017

Correlations	r_s	p
WHOQoL-bref		
Gait speed x physical domain	-0.136	0.211
Gait speed x psychological domain	-0.115	0.291
Gait speed x social relations domain	-0.073	0.506
Gait speed x environmental domain	-0.053	0.625
Gait speed x self-reported quality of life	-0.039	0.723
Gait speed x self-reported satisfaction with health	-0.158	0.147
WHOQoL-old		
Gait speed x sensory abilities facet	-0.205	0.068
Gait speed x autonomy facet	-0.214	0.056
Gait speed x past, present and future activities	-0.091	0.422
Gait speed x social participation facet	-0.134	0.235
Gait speed x death and dying facet	0.146	0.197
Gait speed x intimacy facet	-0.151	0.181

Note: Spearman's correlation.

Table 4 - Distribution of older adults according to nutritional status and quality of life. São Paulo, 2016-2017

Quality of life	Low Weight (n) average QoL ± SD	Eutrophy (n) average QoL ± SD	Overweight (n) average QoL ± SD	Obesity (n) average QoL ± SD	P	p	η2 parcial
WHOQoL-bref							
Physical	(n=13) 67.30 ± 16.55	(n=52) 70.19 ± 15.48	(n=12) 69.35 ± 14.48	(n=16) 69.42 ± 16.65	0.12	0.949	0.4
Psychology	(n=13) 73.40 ± 14.08	(n=52) 72.76 ± 10.35	(n=12) 65.97 ± 13.74	(n=16) 74.45 ± 12.35	1.42	0.244	4.6
Social relationships	(n=13) 69.23 ± 20.52	(n=52) 69.39 ± 14.27	(n=12) 70.14 ± 13.97	(n=16) 78.13 ± 13.90	1.44	0.236	4.6
Environment	(n=13) 71.40 ± 15.35	(n=52) 70.19 ± 12.70	(n=12) 68.75 ± 13.06	(n=16) 72.27 ± 12.28	0.20	0.897	0.7
Self-reported quality of life	(n=13) 75.00 ± 14.43[ab]	(n=52) 78.84 ± 15.95 [ab]	(n=12) 72.92 ± 16.71 [a]	(n=16) 89.06 ± 12.81 [b]	3.20	0.027	9.7
Self-reported satisfaction with health	(n=13) 75.00 ± 17.68	(n=52) 72.59 ± 25.85	(n=12) 70.83 ± 14.43	(n=16) 89.06 ± 12.81	0.07	0.976	0.2
WHOQoL-bref							
Sensory abilities	(n=12) 71.35 ± 21.73	(n=50) 70.63 ± 22.53	(n=12) 79.17 ± 19.46	(n=13) 79.81 ± 22.12	0.94	0.424	3.3
Autonomy	(n=12) 70.83 ± 17.94	(n=50) 63.38 ± 16.89	(n=12) 76.04 ± 18.43	(n=13) 62.98 ± 17.76	2.16	0.099	7.2
Past, present and future activities	(n=12) 78.13 ± 13.98	(n=50) 73.13 ± 17.78	(n=12) 76.56 ± 18.49	(n=13) 77.40 ± 12.64	0.47	0.703	1.7
Social participation	(n=12) 76.04 ± 16.82	(n=50) 70.63 ± 15.68	(n=12) 78.65 ± 18.36	(n=13) 76.44 ± 11.74	1.24	0.301	4.3
Death and dying	(n=12) 76.56 ± 21.00	(n=50) 68.12 ± 27.53	(n=12) 63.54 ± 26.36	(n=13) 66.35 ± 28.24	0.53	0.661	1.9
Intimacy	(n=12) 76.56 ± 17.09	(n=50) 72.00 ± 18.39	(n=12) 76.56 ± 25.86	(n=13) 79.33 ± 16.41	0.65	0.584	2.3

Note: In the comparison between self-reported quality of life and nutritional status, means followed by the same letter[ab] do not differ and those followed by distinct letters[a;b] differ according to Tukey's test. QoL: quality of life. SD: standard deviation. P: power. *p*: significance level ($p<0.05$). partial η2: partial eta squared.

Table 5 - Distribution of older adults according to physical activity level and quality of life. São Paulo, 2016-2017

Quality of life	Very active (n) average QoL ± SD	Active (n) average QoL ± SD	Irregularly active (n) average QoL ± SD	Sedentary (n) average QoL ± SD	P	p	partial η2
WHOQoL-bref							
Physical	(n=5) 74.29 ± 18.63	(n=13) 75.28 ± 17.65	(n=28) 71.94 ± 13.87	(n=46) 64.82 ± 14.79	2.46	0.068	7.5
Psychology	(n=5) 80.00 ± 16.77	(n=13) 72.11 ± 14.87	(n=28) 74.55 ± 7.47	(n=46) 69.75 ± 12.31	1.78	0.156	5.7
Social relationships	(n=5) 68.33 ± 19.00	(n=13) 71.80 ± 17.52	(n=28) 72.02 ± 13.84	(n=46) 71.20 ± 15.29	0.09	0.967	0.3
Environment	(n=5) 78.13 ± 16.68	(n=13) 71.40 ± 14.08	(n=28) 72.21 ± 11.64	(n=46) 68.69 ± 12.90	1.07	0.367	3.5
Self-reported quality of life	(n=5) 80.00 ± 11.18	(n=13) 80.77 ± 20.28	(n=28) 77.68 ± 12.43	(n=46) 79.89 ± 17.17	0.15	0.928	0.5
Self-reported satisfaction with health	(n=5) 85.00 ± 13.69	(n=13) 80.77 ± 23.17	(n=28) 68.75 ± 26.02	(n=46) 69.57 ± 23.52	1.40	0.248	4.6
WHOQoL-bref							
Sensory abilities	(n=5) 86.25 ± 12.02	(n=12) 80,21 ± 20.96	(n=25) 77.50 ± 19.60	(n=46) 66.85 ± 23.49	2.66	0.054	8.7
Autonomy	(n=5) 72.50 ± 21.47	(n=12) 73,44 ± 21.83	(n=25) 66.00 ± 16.45	(n=46) 63.04 ± 17.17	1.33	0.270	4.5
Past, present and future activities	(n=5) 88.75 ± 8.15	(n=12) 78,64 ± 14.21	(n=25) 77.75 ± 16.15	(n=46) 70.79 ± 17.03	2.71	0.050	8.8
Social participation	(n=5) 76.25 ± 19.47	(n=12) 78,13 ± 14.96	(n=25) 77.00 ± 14.40	(n=46) 69.70 ± 15.97	1.73	0.168	5.8
Death and dying	(n=5) 91.25 ± 12.18	(n=12) 62,50 ± 20.81	(n=25) 64.50 ± 28.17	(n=46) 68.89 ± 26.70	1.69	0.175	5.7
Intimacy	(n=5) 91.25 ± 10.46	(n=12) 79,69 ± 16.02	(n=25) 73.25 ± 22.86	(n=46) 72.28 ± 16.39	2.00	0.121	6.7

Note: QoL: quality of life. SD: standard deviation. P: power. *p*: significance level ($p<0.05$). partial η2: partial eta squared.

Discussion

This study discusses themes relevant to the nutritional status, frailty, physical activity and quality of life of adults older than 80 years. With respect to frailty, individuals without dynapenia showed better perceived quality of life. Self-reported QoL was also higher in obese older adults.

In the present study, 30.3% of the subjects exhibited excess weight (overweight and obesity). In the review by Lira, Goulart and Alonso [22], the authors report that the youngest older adults with excess weight displayed more satisfaction with life and better perception of the aspects that influence QoL. However, this population has greater risk for NCDs, particularly cardiovascular diseases and diabetes mellitus. Low weight was found in 14.7% of the individuals. In a study performed with community-dwelling older adults, the highest prevalence of frailty was observed in malnourished older people. According to the authors, malnutrition increases the risk of frailty nearly five-fold [23].

Visceral abdominal fat assessed by WC showed a much greater risk for cardiovascular disease in the older individuals studied. A similar result was found by Nascimento et al [24], where long-lived adults obtained an average value of 89.0±9.84, with a risk for metabolic complications.

Assessment of adiposity should be more effective, since overweight, obesity, hypertension, type 2 diabetes and abdominal obesity increase the risk of morbidities and mortality [24,25]. WC reflects visceral fat and has proved to be strongly associated with cardiovascular disease and mortality when compared to BMI [25].

In the present study, 51.0% of the older adults were considered sedentary according to the IPAQ classification. A similar finding was reported by Queiroz et al. [26] in a group aged 80 years or older, where 72.8% of the individuals were considered physically inactive, according to the IPAQ long form. The authors found an increasing trend in the proportion of sedentary older people, concomitant to the decline in active and very

active older adults, age being the factor for the reduction in PAL.

A sedentary lifestyle was an indicator for frailty. A decrease in physical activity may cause a drop in handgrip strength and gait speed [23].

Regular physical activity is important in maintaining the health of older people, which should be increasingly encouraged in long-lived adults. Oliveira et al [27] found a significant association between PAL and perceived health ($p = 0.037$), number of drugs used ($p = 0.008$) and the history of near falls among older individuals in the last semester ($p = 0.038$), demonstrating that physical activity was important in reducing actions associated with health-related variables.

Perceived QoL in the presence or absence of dynapenia, showed that the older adults without dynapenia obtained a higher QoL score in the physical and social relationships domains and social participation facet. This result indicates that this population may feel less confident in performing activities of daily living such as taking medication, eating, personal hygiene, and selecting and putting on clothes, which may reflect in their being more willing and comfortable in environments that promote social interaction when compared to dynapenia.

Despite older men exhibiting naturally greater HGS than their female counterparts, the former displayed no significant values, suggesting that these individuals may or may not have dynapenia, since it does not interfere in their perceived QoL.

A number of authors refer to HGS as grip strength [28,29,30], but few studies assess this variable in individuals older than 80 years. With increasing age, HGS declines and dynapenia is associated with greater risk of disease, falls, disability, cardiovascular mortality and morbidity [28,29].

A Swedish study investigated HGS in one hundred and two functionally independent individuals aged 80 years or older. The authors assessed HGS at two different moments and found that it declined over a four-year period in older men but not in women, albeit with no significant different. Despite this decline, the older men exhibited higher HGS than that of women [30].

Mihara et al. [29] investigated the association between HGS and oral functions (occlusal strength, masticatory performance, saliva flow, repetitive saliva swallowing performance, tongue pressure and mouth-opening distance) in octogenarians from a Japanese community. Dynapenia was found in 50.4% of older men and 68.9% in women. HGS was significantly correlated with all the oral functions assessed. The authors reported that since it was a cross-sectional study, a causal relation between HGS and oral functions cannot be confirmed, which opens the possibility for further studies with long-lived individuals.

In the present study, the obese older men had higher self-reported QoL. A similar result was observed by Tavares et al. [31], where overweight older people considered their QoL to be good and obtained higher scores in the social relationships domain; however, they exhibited a lower score in the physical domain of the WHOQoL-bref. The authors reported that this association was related to the high number of morbidities found in the older adults, since excess weight can cause unfavorable health conditions.

When physical activity was observed, only past, present and future activities showed a significant difference ($p=0.050$) in relation to the positive perceived QoL of older individuals, but no significant difference was found between older women and men or at different PALs.

Guedes et al. [32] found a significant difference in the average scores of autonomy ($p < 0.001$) and past, present and future activities ($p = 0.002$) in favor of the men. When the authors assessed older men and women, sensory abilities and social participation exhibited better self-reported QoL. The authors also observed that physically active older adults obtained higher self-reported QoL in sensory abilities (76.39 for women; 83.26 for men), autonomy (62.13 for women; 71.72 for men) and intimacy (53.84 for women; 63.07 for men), in addition to the overall QoL score (62.27 for women; 70.45 for men).

A study with 850 individuals aged 60 years and older from the rural zone of Uberlândia, Minas Gerais (MG) state showed that active older adults obtained higher average QoL scores in the physical ($p<0.001$); psychological ($p=0.001$) and environmental ($p<0.001$) domains of the WHOQoL-bref. The authors concluded that older people active in leisure activities display better physical and functional conditions when compared to their inactive counterparts [33].

A study with older adults in the Older People in Movement Program in Curitiba, Paraná state also assessed the relation between PAL and QoL. Older subjects that take slow walks obtained good QoL scores, but the moderate to vigorous physical activity group exhibited higher QoL scores in both instruments (WHOQoL-bref and WHOQoL-old) [34]. The authors suggest that regular physical activity may improve the QoL of older

people, in addition to providing benefits for functional capacity and overall health status, thereby contributing to healthier aging. Physical activity should be encouraged in order to provide physiological benefits to the cardiovascular and muscle systems of older adults.

However, in both studies [33,34] the sample was composed of young-old people not only those aged 80 years and older, making it necessary to determine the relation between the physical activity and quality of life in this specific population. It is known that active older adults perform better in the activities of daily living, primarily those that provide an independent life. Thus, studies on these issues, mainly with long-lived individuals, are needed to enhance their healthcare, given that there is a trend for life expectancy to increase worldwide.

Since this is a cross-sectional study, a cause and effect relation cannot be established between the factors associated with the QoL of older people. A limitation of the study is the higher proportion of women, which may have compromised the investigation of the association with the QoL domain assessed. However, this does not invalidate the results obtained, since this proportion is in line with the distribution of older women in Brazil. Sample size may have influenced the absence of some associations.

Conclusion

Obesity and the absence of dynapenia showed a positive association with the quality of life of long-lived adults. Physical activity was associated with positive quality of life only in the past, present and future activities facet of the WHOQoL-old; however, no significant difference was found between the different physical activity levels. For the older people of the present study, being sedentary, irregularly active, active or very active did not influence the perceived quality of life of this population. There is a need for longitudinal studies with a larger number of long-lived individuals in order to deepen the discussion and investigate the cause-effect relation between physical activity level and quality of life, since cross-sectional studies preclude this analysis.

However, this study revealed relevant factors that may influence the quality of life of long-lived adults. Understanding the multifactorial factors of quality of life in these individuals allow health professionals to make better decisions in relation to actions and strategies that mitigate frailty in older adults.

Acknowledgements

We thank the Coordination for the Improvement of Higher Education Personnel (CAPES), the research team and the study participants.

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Received: 06/22/2019
Recebido: 22/06/2019

Approved: 07/06/2020
Aprovado: 06/07/2020