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A cross-sectional study on physical and sedentary activity and health-related quality of life in institutionalized vs. non-institutionalized elderly

Um estudo transversal sobre atividade física e qualidade de vida relacionada à saúde em idosos institucionalizados e não institucionalizados

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ABSTRACT

Aims: To compare the physical activity, sedentary activity and health-related quality of life (HRQoL) in institutionalized vs. non-institutionalized elderly, and to establish a pattern of relationship and prediction of physical and sedentary activity with physical and mental components of HRQoL. **Methods:** The sample consisted of 383 elderly with ≥ 75 years old (n=187 institutionalized and n=196 non-institutionalized). Were administered the International Physical Activity Questionnaire (IPAQ) and Short Form 36 Health Survey (SF-36) for evaluated the physical and sedentary activity and HRQoL. Also was used the Mini Mental State Examination (MMSE) as exclusion criteria for cognitive problems in the elderly. **Results:** Differences between institutionalized and non-institutionalized elderly were found in moderate-intensity activities and walking, a favour of non-institutionalized. The institutionalized elderly remain more minutes in sedentary activity. Also, were observed differences between both groups in physical component of HRQoL, a favour of non-institutionalized elderly. The mental component remained unchanged. The multivariate regression analyses showed that physical activity predicted the physical (8 to 12%) and mental (5 to 8%) components of HRQoL for institutionalized and non-institutionalized elderly. **Conclusions:** Non-institutionalized elderly were more physically active, spent less time in sedentary activity and showed better perception physical component of HRQoL that institutionalized elderly. An important and encouraging result of this study was that physical activity is a predictor of improved physical and mental component of HRQoL for institutionalized and non-institutionalized elderly.

KEYWORDS: Motor activity. Sedentary lifestyle. Quality of life. Health of institutionalized elderly.

RESUMO

Objetivos: Comparar atividade física, sedentarismo e qualidade de vida relacionada a saúde (QVRS) em idosos institucionalizados e não institucionalizado e estabelecer um padrão de associação e predição da atividade física e do sedentarismo com os componentes físicos e mentais da QVRS. **Métodos:** A amostra foi composta por 383 idosos com idade ≥ 75 anos (187 institucionalizados e 196 não institucionalizados). Foram aplicados o questionário internacional de atividade física (IPAQ) e a versão reduzida do inventário de saúde (SF-36) para avaliar a atividade física e o QVRS. Também foi utilizado o Mini Exame do Estado Mental (MEEM) para exclusão de problemas cognitivos. **Resultados:** Foram encontradas diferenças entre idosos institucionalizados e não institucionalizados nas atividades de intensidade moderada e na caminhada, a favor dos idosos não institucionalizados. Os idosos institucionalizados apresentaram mais minutos em atividade sedentária. Além disso, foram observadas diferenças entre os dois grupos no componente físico da QVRS, a favor dos idosos não institucionalizados. O componente mental permaneceu inalterado. A análise de regressão multivariada mostrou que a atividade física é um preditor de melhor componente físico (8-12%) e mental (5-8%) da QVRS em idosos institucionalizados e não institucionalizados. **Conclusões:** Idosos não institucionalizados foram mais ativos fisicamente, gastaram menos tempo em atividades sedentárias e apresentou melhor percepção do componente físico da QVRS que idosos institucionalizados. Um resultado importante e encorajador deste estudo foi que a atividade física é um preditor de melhor componente físico e mental da QVRS em idosos institucionalizados e não institucionalizados.

DESCRITORES: Atividade motora. Estilo de vida sedentária. Qualidade de vida. Sáude em idosos institucionalizados.

INTRODUCTION

The aging population is a reality that has come to increase.[1] In Portugal, the elderly population over 65 years is 17.9% of the total population, slightly above the European average, and where the population ≥75 years, accounts for 46.8% of older people.[2] In recent years the number of older people living in institutional long-term care has been gradually increasing, ranging from 1-4% of elderly ≥65 years.[3] This condition is influenced by the increased life expectancy, disability and increased dependence of the elderly.[4] Increasing age is a strong predictor of institutionalization,[5] but other factors such as functional, cognitive or health problems, increase the need for attention and therefore the risk of institutionalization of community-dwelling older adults.[6] However, when older adults maintain their health and independence, aging at home is usually regarded as the most suitable place for caretaking.[7]

Regular physical activity is associated with increased independence and reduced risk of mortality in general elderly population.[8,9] Several studies associate the benefits of physical activity with improved HRQoL on both institutionalized and non-institutionalized elders. Thus, it is known that the practice of regular physical activity is associated with better HRQoL, regardless of age, level of education, obesity or other chronic diseases present in institutionalized elderly.[10] Similar findings were described in community-dwelling elders, supporting the fact that having a good fitness level by increasing physical activity and reducing sedentary lifestyle is associated with better physical and mental component of HRQoL in elderly non-institutionalized.[11,12] Other studies included both non-institutionalized and institutionalized older adults in order to compare the perception of quality of life,[13] physical activity and fitness,[14] the relationship between functional capacity and HRQoL,[15] or the influence of physical activity in the physical and mental components of HRQoL.[16] However, more research is needed to include all these variables, which so far have been studied isolated, in order to create prediction patterns of how physical and sedentary activity influences the HRQoL of institutionalized and non-institutionalized elderly.

Thus, the purpose of the present study was to: 1) determine whether there are differences in physical activity, sedentary activity and physical and mental components of HRQoL of institutionalized and non-institutionalized older adults and between sexes, and 2) establish a relationship and prediction pattern of physical and sedentary activity, with physical and mental components of HRQoL of institutionalized and non-institutionalized older adults.

METHODS

Study Sample

The population of this cross-sectional and exploratory study was composed for elderly people pertaining to the town council of Évora (Portugal). The following inclusion criteria were considered: women and men with ≥75 years old resident in town council of Évora, without cognitive problems and without locomotors problems. The exclusion criteria were: use walker or wheelchair and severe neurologic disorders such as Parkinsonism. The minimum sample size to be representative of the total population of elderly with ≥75 years old (n=5028) was calculated based on the formula recommended for sample estimation in cross-sectional studies of finite populations utilizing the software or epidemiologic statistic OpenEpi.[17] The following parameters were considered: 95% significance level ($Z_a=1.96$); 5% sampling error; size of population: 5028 elderly registered in the system; hypothesized % frequency of outcome factor in the population (p); 50%. Based on these parameters, the minimum sample size to be representative of the total population was of 357 elderly. All nursing homes and associaions of retired persons from Évora were contacted and after that it was scheduled a meeting with the boards of each to request the participation of its members with ≥75 years of age. To select the non-institutionalized elderly it was sent a letter to all members of the retired persons associations from Évora with ≥75 years of age while to select institutionalized elderly a meeting was held in their own nursing homes with all ≥75 years residents. In both cases it was explained the purpose and details of research and collaboration to participate was asked. Three hundred eighty-seven elderly signed the informed consent to participate in this study. Mini-mental evaluation detected four elderly people with score values <22, and with <11 schooling years, that were excluded concerning de exclusion criteria of cognitive impairment. The final sample was constituted of 383 elders: n=187 institutionalized (n=126 elderly female and n=61 elderly male) y n=196 non-institutionalized (n=85 elderly female and n=111 elderly male). This study was approved by the Committee on Biomedical Ethics (University of Évora) and followed the updates of the Declaration of Helsinki, amended by the 64th World Medical Association General Assembly (Fortaleza, Brazil, 2013).

Socio-demographic and anthropometric variables and cognitive problems

All participants were asked about the age, civil status and education level. Immediately, were measured the weight and height in a fasting state barefoot in light clothing to calculate the body mass index (kg/m²).

The Portugal version of the Mini Mental State Examination (MMSE)[18] was used as exclusion criteria for cognitive problems in the elderly. The MMSE scale is one of the most used global cognitive screening measures because it is quick and easy to administer. The MMSE includes questions related to attention, orientation, memory, calculation, and language. Scores range from 0 to 30 points. A score ≤15 for illiterate persons, or ≤22 with 1 to 11 schooling years, or ≤27 with >11 schooling years, indicates cognitive impairment.

Physical and sedentary activity

The International Physical Activity Questionnaire (IPAQ)[19] was applied to assess physical and sedentary activity. The IPAQ asks about three specific types of activity: walking, moderate-intensity activities and vigorous-intensity activities undertaken in the four domains (leisure time, domestic, work and transport of objects). The computation of the total score requires summation of the duration (in minutes) and frequency (days) of walking, moderate-intensity and vigorous-intensity activities. It was included in the analysis final the minutes per week of walking, moderate-intensity and vigorous-intensity activities calculated as: duration of the activity (minutes) x frequency (days per week on which all physical activity was undertaken).

The IPAQ sitting question is an additional indicator variable of time spent in sedentary activity and is not included as part of any summary score of physical activity. Was included in the analysis final the summation of minutes sitting per week, considering an estimate of minutes sitting on a typical weekday and weekend day.

Physical and mental component of health-related quality of life

The Portuguese version of the Short Form 36 Health Survey (SF-36)[20] was used to evaluate the physical and mental component of health-related quality of life (HRQoL). The SF-36 has 36 items that assesses eight dimensions integrated in two summary scales:[21] physical component score (PCS) integrated for physical function, role physical problems, body pain and general health perception; and mental component score (MCS) integrated for vitality, social function, role emotional problems and mental health. The scale of each component runs from 0='very poor' to 100='very good'.

Statistical analysis

Normality of data was initially tested using the Kolmogorov-Smirnov test. Institutionalized and non-institutionalized differences between groups for total, female and male elderly were tested using Kruskal-Wallis test for continuous variables, and Chi-square test for categorical variables. The relationships between the selected variables were assessed by the Spearman product moment correlation coefficient. Physical activity variables entered into univariated regression model predicting physical and mental components of HRQoL. The assumptions of linear regression analysis (e.g. linearity, normal distribution and scattering of residuals and multicollinearity) were tested and they were found to be reasonably valid. For all tests the significance level was set at $p<0.05$. These analyses were performed in SPSS 20.0 software.

RESULTS

The socio-demographical status of institutionalized and non-institutionalized elderly people was shown in Table 1. Were observed significant differences in all the variables analysed for total elderly and, for female and male for separate.

Physical and sedentary activity and, physical and mental components of health related-quality of life

Significant differences were found between institutionalized and non-institutionalized elderly people in total minutes per week of moderate-intensity activities and walking with higher values in the no-institutionalized group; sedentary activity (institutionalized elderly remain more minutes sitting); and physical component of quality of life once again with greater results on non-institutionalized group (+6.1%). Also, were observed significant differences between female institutionalized and non-institutionalized in walking and sedentary activity. Non-institutionalized elderly females walk more minutes per week and remain less minutes sitting. No differences were found between elderly female institutionalized and non-institutionalized in health related-quality of life. Moreover, in elderly male only were showed significant differences in the physical component a favour of non-institutionalized (+11.3%) (Table 2).

Table 1. Socio-demographic characteristics and anthropometric variables of institutionalized (n=187) and non-institutionalized (n=196) elderly with ≥ 75 years old.

Variables	Institutionalized			Non-institutionalized			Pφ	P†	Pγ
	Total	Female	Male	Total	Female	Male			
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD			
Age (years) [a]	83.9 ± 5.1	83.9 ± 5.1	83.7 ± 5.4	80.1 ± 4.4	80.0 ± 4.5	80.1 ± 4.3	<.001	<.001	<.001
Body mass index (kg/m²) [a]	28.9 ± 4.5	29.1 ± 4.6	28.4 ± 4.2	25.7 ± 3.9	25.4 ± 4.2	25.9 ± 3.6	<.001	<.001	<.001
Age [b]							<.001	<.001	<.001
75-79 years	75 (38.3)	48 (64)	27 (36)	97 (48.5)	42 (43.3)	55 (56.7)			
80-84 years	60 (30.6)	42 (70)	18 (30)	47 (23.5)	21 (44.7)	26 (55.3)			
85-89 years	44 (22.4)	31 (70.5)	13 (29.5)	45 (22.5)	21 (46.7)	24 (53.3)			
> 90 years	17 (8.7)	12 (70.6)	5 (29.4)	11 (5.5)	3 (27.3)	8 (72.7)			
Civil status [b]							<.001	<.001	<.001
Unmarried	25 (12.8)	17 (68)	8 (32)	9 (4.5)	5 (55.6)	4 (44.4)			
Married	47 (24)	25 (53.2)	22 (46.8)	133 (66.5)	42 (31.6)	91 (68.4)			
Divorced	2 (1)	0 (0)	2 (100)	0 (0)	0 (0)	0 (0)			
Widowed	122 (62.2)	91 (74.6)	31 (25.4)	58 (29)	40 (69)	18 (31)			
Education level [b]							<.001	<.001	<.001
Unfinished studies	139 (70.9)	95 (68.4)	44 (31.6)	68 (34)	32 (47)	36 (53)			
Primary school	50 (25.5)	32 (64)	18 (36)	129 (64.5)	55 (42.6)	74 (57.4)			
Secondary school	2 (1)	2 (100)	0 (0)	3 (1.5)	0 (0)	3 (100)			
University degree	5 (2.6)	4 (80)	1 (20)	0 (0)	0 (0)	0 (0)			

[a] Values expressed as Mean ± Standard Deviation; p-value of Kruskal-Wallis test.
[b] Values expressed as N (%); p-value of analysis of Chi-square.
φ Differences between groups for total elderly; † differences between groups only for female; γ differences between groups only for male.

Table 2. Physical and sedentary activity and, physical and mental component of health-related quality of life of institutionalized (n=187) and non-institutionalized (n=196) elderly with ≥ 75 years old.

Activity	Institutionalized			Non-institutionalized			Pφ	P†	Pγ
	Total	Female	Male	Total	Female	Male			
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD			
Physical activity									
Vigorous-intensity activities (min/week)	1.1±1.0	0.7±0.6	1.3±1.1	1.7±1.4	1.5±1.2	1.9±1.5	.139	.198	.231
Moderate-intensity activities (min/week)	83.0±73.6	88.2±73.4	69.7±63.1	141.9±125.2	130.3±113.7	150.9±140.8	.039	.154	.169
Walking (min/week)	107.2±94.9	75.0±69.9	175.1±126.7	166.5±130.3	128.6±108.5	195.7±150.3	.001	.004	.539
Sedentary activity									
Sedentary activity (min sitting/week)	2841.5±1043.5	3032.8±1113.4	2437.6±735.3	2644.6±867.0	2730.2±886.0	2579.5±850.3	.042	.035	.268
Health-related quality of life SF-36 (scale 0-100)									
Physical component score	52.0±19.5	50.5±19.7	55.3±18.8	58.1±22.6	51.8±21.9	66.6±15.7	.005	.629	.021
Mental component score	61.6±16.9	59.3±17.0	62.8±22.0	62.8±18.3	56.5±16.8	67.8±17.9	.495	.236	.653

Values expressed as Mean ± Standard Deviation.
φ p-value of Kruskal-Wallis test to compare differences between groups for total elderly; † p-value of Kruskal-Wallis test to compare differences between groups only for female;
γ p-value of Kruskal-Wallis test to compare differences between groups only for male.
SF-36: Short Form 36 Health Survey.

Influence of physical and sedentary activity on physical and mental component of health related-quality of life

Correlation analyses showed that vigorous-intensity activities have a negative influence on mental component (3.1%) only in institutionalized elderly. Moreover, the moderate-intensity activities performed for institutionalized elderly has a positive influence on physical and mental components (2.4% and 2.7%; respectively). Also, was observed a positive influence between walking and physical component

Table 3. Correlation between physical and sedentary activity and, physical and mental component of health-related quality of life of institutionalized (n=187) and non-institutionalized (n=196) elderly with ≥ 75 years old.

	Vigorous-intensity activities		Moderate-intensity activities		Walking		Sedentary activity	
	r	p	r	p	r	p	r	p
Institutionalized								
Physical component score	-.059	.417	.157	.043	.185	.010	-.198	.006
Mental component score	-.175	.015	.165	.033	.136	.058	-.115	.112
Non-institutionalized								
Physical component score	.030	.678	.085	.232	.196	.006	-.322	.001
Mental component score	.070	.326	.047	.508	.112	.114	-.181	.010

Values expressed as coefficient of correlation of Spearman.
p-value of Spearman correlation test.

for institutionalized and non-institutionalized elderly (3.4% and 3.8%; respectively). With respect to sedentary activity, were found negatives correlations between physical and mental component for non-institutionalized elderly (10.4% and 3.3%; respectively) and on physical component for institutionalized elderly (3.9%) (Table 3). On the other hand, multivariate regression analyses showed that physical activity, including in the regression model vigorous-intensity activities, moderate-intensity activities and walking, predicted the physical component for institutionalized and non-institutionalized elderly (R^2=0.083, p=0.007; R^2=0.122, p=0.001; respectively). Equality, the regression model predicted the mental component for institutionalized and non-institutionalized elderly (R^2=0.080, p=0.009; R^2=0.050, p=0.040; respectively).

DISCUSSION

The present study showed that there were differences in socio-demographic and anthropometric characteristics among institutionalized and non-institutionalized elderly. Moreover, the non-institutionalized elderly exercised more and spent less time sitting than institutionalized elderly. Similarly, non-institutionalized older adults had better perception of quality of life, relative to the physical component than institutionalized older adults. In addition, physical activity predicted improvements in physical and mental component of HRQoL, both on institutionalized and non-institutionalized elderly.

Increasing age is a strong and consistent predictor of institutionalization,[6] but it is not the only one. Other factors such as health, education, civil status, smoking and alcohol use are associated with the probability of being in an institution.[22] In this way, the age of the

elderly in this study is in line with the literature, once the age of the non-institutionalized elderly is lower than that observed in institutionalized older adults,[23] and there is a greater concentration of people institutionalized with 80 years or more.[13] Moreover, the predominance of women among older adults is an international reality.[24,25] Thus, our results showed that women are predominant in institutions in all age ranges analysed, as was reported in preview literature.[23] However, unlike other studies,[13,23] when we analysed the non-institutionalized elderly we observed a similar proportion of men and women. In this way, our results showed that more than double of non-institutionalized elderly still married, relatively to the predominantly institutionalized widowed. These results may partly explain that in our study the men and women present a ratio close to 50% in all age ranges, except for the elderly over 90 years. Thus, our results suggest that civil status may be a factor to consider on institutionalization as shown by previous studies.[22] Another factor of institutionalization is the level of education,[22] and in this way our study highlights differences between the institutionalized and non-institutionalized groups, showing that 71% of institutionalized elderly finished their studies vs. 34% of non-institutionalized elderly. These results are similar to other studies that suggest as a possible cause the difficulty of access to education in rural areas.[13] Further, the elders of our study with a BMI >25 kg/m² in both groups, suggesting overweight, higher values were observed in institutionalized older adults. Our results differ from a previous study in Korea, where 31.2% and 41.6 % of elderly patients institutionalized and non-institutionalized respectively had a BMI >25 (kg/m²).[23] These differences could be explained by differences on dietary habits and physical activity between eastern and western countries. In this regard, a recent study in Portugal[26] showed that the

prevalence of overweight in older adults was 53.6% and 52.9% for men and women respectively, while 16.8% of men and 21.8% of women were obese. These authors also noted that the prevalence of overweight was higher in older ages, which could explain our results, since the entire study sample has more than 75 years, with averages over 80 years in both groups.

Regular physical activity can provide significant health benefits for older adults, increasing years of active and independent life.[9] Some studies reported that a gradually increase of physical activity until 100 min/day decreases mortality by 4%.[27] In our present work the non-institutionalized elderly group performed more physical activity than the institutionalized group (310.1 vs. 191.3 min/week, respectively). Previous studies[11,12] showed a physical activity levels ranging from 238.3 to 265.8 min/week in non-institutionalized elderly, slightly lower than the values observed in our study concerning non-institutionalized elderly, however higher than that values concerning our institutionalized elderly group. Moreover, physical activity levels of men and women were different. In this way, was reported that men perform up to 21.4% more physical activity than women.[28] Our results showed that in both groups men had similar physical activity, with higher scores than women. Furthermore, the present study showed differences in physical activity among non-institutionalized women vs. institutionalized (260.4 vs. 163.9 min/week, respectively). Our results suggest that institutionalized women are nearly to insufficient levels of physical activity, with values near 150 min/week of physical activity, considered the minimum for health benefits.[28]

It is known that physical activity decreases with age and is associated with a decrease in physical fitness of the elderly.[29] It was described that, in the elderly, physical activity decreases 3% for each additional year of age.[30] Recent studies showed that ≈50% of older adults have a poor level of physical activity, increasing to ≈61% in elderly subjects over 80 years,[31] according to international recommendations of minimum physical activity.[28] It was also reported that older adults between 70 and 85 years is the group that spends more time in sedentary activity ≈9 hours/day.[32] Our study showed fewer hours of sedentary activity, highlighting differences among non-institutionalized and institutionalized groups. While in the present study, men in both groups had similarly sedentary activity, institutionalized women were more sedentary activity than non-institutionalized. Our findings also showed that women who spend more time sitting are less physically active, and vice versa. Some authors suggest that much of the physical activity of women

is due to the domestic tasks.[33] This could explain the differences between the two elderly women groups since in institutions household tasks are undertaken by carers.

On the other hand, our results showed differences between the institutionalized vs. non-institutionalized elderly in the physical component of HRQoL for both sexes combined, on men but not on women, always in favour of the non-institutionalized group. However, no differences were found in the mental component. Previous studies demonstrated that older adults with more leisure and social activities have higher HRQoL in the physical component,[23] like our results. Nonetheless, other studies report differences between institutionalized and non-institutionalized in both components,[16] or only in the psychological domain.[13] We should consider that there may be differences arising from the use of different questionnaires to assess quality of life. On scientific literature, the SF-36 has shown that people who live an active lifestyle have a higher score on the physical component.[23,34] Our results support the same conclusions. It was previously reported that women have a poorer HRQoL than men,[35] in this way we do not intend to analyse the differences between men and women, but looking carefully at the results of the present study they seem to point in the same direction.

It was previously reported that the reduction of sitting time could be an effective strategy for improving the quality of life of older adults.[12] Thus, our results showed an inverse association between sedentary activity and physical component of HRQoL on both groups. In addition, non-institutionalized older adults have more minutes of physical activity than the institutionalized ones, hence the negative association between time spent sitting and physical component of HRQoL of older adults is stronger in those more physically active, possibly due to the more autonomous performance of daily activities than institutionalized older adults. In addition, there is a growing consensus that sedentary behaviour has a harmful effect on health regardless of the total volume of physical activity.[36] Consequently, more physical activity and less sitting time improves physical and mental components of HRQoL in non-institutionalized[37] and institutiona-lized elderly.[38] Some studies suggest that replacing 30 minutes/day of sedentary activity with light physical activity is associated with a better physical health on older adults.[12] This way, the present study showed that physical activity positively predicts overall physical and mental component of HRQoL in both non-institutionalized and institutionalized older adults, where walking activity had the greatest influence on

this predictive model. Previous studies also highlight the importance of walking as a regular practice among older adults, in order to improve functional capacity and health.[39]

This study has some limitations that need to be discussed. First, due to the application of the MMSE, as an exclusion criterion for cognitive problems, the sample consisted of people ≥75 years, which compromises the generalization of our conclusions to all older adults. However these conclusions may be considered for elderly with ≥75 years, without cognitive problems. Second, some results have to be taken with caution as being a cross-sectional study, there is no causal link between the different predictors. Thus, it would be necessary to confirm these predictions with longitudinal studies. Third, the data of physical and sedentary activity, and HRQoL were collected through interviews, not self-reports. Although the interviewers were trained so that there were no differences in the application, differences may exist. It would have been appropriate to conduct a test-retest to confirm this.

In conclusion, the institutionalized elderly were older, predominantly female, with more overweight, without life partner and without completed studies, compared with non-institutionalized. The non-institutionalized elderly were more physically active, spending less time in sedentary activity and showed better perception of HRQoL that institutionalized. However, an important and encouraging result of this study was that physical activity is a predictor of improved physical and mental component of HRQoL, both on institutionalized and non-institutionalized older adults.

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