



Does multimorbidity interfere with the functionality of the physically active elderly?

A multimorbidade interfere na funcionalidade de idosos fisicamente ativos?

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Abstract

Introduction: Multimorbidity is currently considered as a relevant clinical condition due to its severity and the high prevalence among the elderly. **Objective:** Assessing whether multimorbidity is an intervening factor in the functionality of the physically active elderly. **Method:** This is a cross-sectional study carried out with 70 older people of both sexes who practice exercises at the Fitness zones (FZ) in the municipality of Maringá, state of Paraná. A sociodemographic questionnaire, and the World Health Organization Disability Assessment Scale (WHO-DAS 2.0) were used as instruments. Data analysis was performed by using the

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Kolmogorov-Smirnov test, Kruskal-Wallis test, Mann-Whitney test and Spearman's rank correlation, in addition to the Path Analysis ($p < 0.05$). **Results:** the elderly who have more than two diseases showed worse functionality than the ones with none or from 1 to 2 diseases ($p < 0.05$). The number of diseases showed a significant association ($p < 0.05$) with a reduction in functional domain scores, which explains from 15% to 31% of the variable's variability. Specifically, the number of diseases was positively associated with the strong effect on the domains referred to as self-care ($\beta = 0.56$) and cognition ($\beta = 0.55$), besides a moderate effect on interpersonal relationships ($\beta = 0.39$) and social participation domains ($\beta = 0.39$). **Conclusion:** it was concluded that multimorbidity can be considered as an intervening factor in the functionality of elderly people who practice physical activity.

Keywords: Multimorbidity. Functionality. Aging. Diseases. Self-Care.

Resumo

Introdução: A multimorbidade é considerada atualmente uma condição clínica relevante devido à sua gravidade e alta prevalência entre os idosos. **Objetivo:** Avaliar se a multimorbidade é um fator interveniente na funcionalidade do idoso fisicamente ativo. **Métodos:** Estudo transversal realizado com 70 idosos de ambos os sexos que praticam exercícios nas academias da terceira idade do município de Maringá, estado do Paraná. Um questionário sociodemográfico e a Escala de Avaliação da Incapacidade da Organização Mundial da Saúde (WHODAS 2.0) foram utilizados como instrumentos. A análise dos dados foi realizada pelo teste de Kolmogorov-Smirnov, teste de Kruskal-Wallis, teste de Mann-Whitney e correlação de Spearman, além da Análise de caminhos ($p < 0,05$). **Resultados:** Os idosos com mais de duas doenças apresentaram pior funcionalidade do que os que não possuíam ou possuíam de uma a duas doenças ($p < 0,05$). O número maior de doenças mostrou associação significativa ($p < 0,05$), com redução nos escores dos domínios funcionais, o que explica de 15% a 31% da variabilidade das variáveis. Especificamente, o número de doenças foi positivamente associado ao forte efeito nos domínios referidos como autocuidado ($\beta = 0,56$) e cognição ($\beta = 0,55$), além de efeito moderado nos domínios de relações interpessoais ($\beta = 0,39$) e participação social ($\beta = 0,39$). **Conclusão:** concluiu-se que a multimorbidade pode ser considerada como um fator interveniente na funcionalidade de idosos que praticam atividade física.

Palavras-chave: Multimorbidade. Funcionalidade. Envelhecimento. Doenças. Cuidados Pessoais.

Introduction

The Brazilian population has been undergoing an accelerated aging process. In 2010 the Brazilian elderly population consisted of approximately 20.6 million people [1], however, in 2020 this number will exceed to 30 million, corresponding to 14% of the total population and making it the sixth largest population of the elderly in the planet [2].

In old age, the coexistence of chronic diseases is common due to chronic deregulation of multiple organ systems, which may cause adverse outcomes, such as poor quality of life, functional disability for daily activities, hospitalization and mortality [3]. Therefore, advanced age alone is an important risk factor for multimorbidity [4], which is characterized by a set of morbidities that simultaneously overtake a person, without a major disease under study [5].

Multimorbidity is currently considered as a relevant clinical condition due to its severity and the high prevalence among the elderly [5]. It is estimated that 60% of 65-year-old people worldwide are affected and considering the octogenarians this proportion reaches 80% [6]. Its prevalence varies in high-income countries, such as the United States (65%), Australia (83.2%) and the Netherlands (55%) [7-9], as well as in countries with low and moderate-income, such as India (57%) Vietnam (40%) [10-11] and, in Brazil, the Ministry of Health estimates that it is 83% [12].

Recently, studies have focused on the coexistence of multiple health problems, especially in the case of the elderly [4]. The effect of multimorbidity in reducing the survival of the elderly would be enhanced due to the

presence of functional losses, for example [13]. A multicenter longitudinal study [14] with European older people over 70 years of age revealed that the prevalence of functional disability was of 22%. Among Brazilians older individuals over 60 years of age, this prevalence was between 16% and 22% in the different regions of the country [15-16].

It is known that loss of functionality results in loss of autonomy, which refers to the self-administered life or freedom for making decisions; reduction of the quality of life; increased risk of hospitalization; institutionalization; falls and death [17], besides the factor that functional dependence on daily activities is a predictor of death in individuals aged 75 years and over [18]. It is worth remembering that, according to the World Health Organization (WHO), through the International Classification of Functioning (CIF), functionality is a term that involves all body functions, activities, and participation; similarly, disability is a term that includes disability, activity limitation, or restriction on participation in activities [19].

However, not much is known about the direct impact of multimorbidity on the functional losses of the elderly, thus, it is relevant to carry out such survey. Therefore, this study aimed at assessing whether multimorbidity is an intervening factor in the functionality of the physically active elderly.

Methods

Participants

The population of this study consisted of elderly individuals (60 years old or over) who practice exercise at the Fitness zone (FZ) in the city of Maringá, Paraná, Brazil. The sample, chosen intentionally and for convenience, embraced 70 older people of both sexes. The elderly with possible cognitive deficits (evaluated by the Mini Mental State Examination — MMSE) [20-21] and the ones with auditory deficits were excluded.

Instruments

In order to characterize the sociodemographic, healthy and physically activity profiles found at the FZ, a questionnaire structured by the authors was used, which had questions regarding age, sex, monthly income, education, use of medicines, self-perceived health, falls and near falls in the last semester, presence of chronic diseases

(heart disease, hypertension, stroke, diabetes, cancer, osteoarthritis, lung disease, depression, osteoporosis) and multimorbidity (two or more chronic diseases).

Functionality was assessed by using the World Health Organization Disability Assessment Scale (WHO-DAS 2.0). This instrument was designed to evaluate the functionality in six domains of activity: Cognition, Mobility, Self-Care, Interpersonal Relationships, Daily Activities and Participation, based on 12 questions. Each item in WHO-DAS 2.0 evaluated the amount of difficulty that the elderly people had to perform their activities in the last month. Each question has a Likert scale with points from 0 (no difficulty) to 4 (extreme difficulty). When adding the two questions of each domain, a final score is obtained that can vary from 0 to 8, and the greater it is, the greater the difficulty (inability) to perform the domain assessed [22].

Procedures

This is an analytical observational cross-sectional study, approved by the Research Ethics Committee of the Metropolitan University Center of Maringá (UNIFAMMA) under Opinion number 2.986.433/2018.

Firstly, contact was made with the Secretary of State for Sport and Recreation of Maringá city in order to obtain a list and address of all the FZ of the municipality. After that, four FZ were classified.

The researchers collected the data at their convenience, regarding time and days. When addressing the elderly at the FZ, the purposes and procedures of the research were explained. The elderly who agreed to participate, signed the Free Informed Consent Form (FICF). On average, each collection was performed in 10 minutes.

Data analysis

The data analysis was carried out by using the SPSS 22.0 Software with a descriptive and inferential statistics. Absolute frequency and percentage were used as descriptive measures for the categorical variables. Considering the numerical variables, the data normality was initially verified by using Kolmogorov-Smirnov test. Since the data did not show a normal distribution, Median (Md) and Quartiles (Q1; Q3) were used as measures for central tendency and dispersion. A comparison between functionality and the

number of diseases was performed by using Kruskal-Wallis test followed by Mann-Whitney U test for paired groups. The correlation between the number of diseases and the functionality of the elderly was assessed by using Spearman's coefficient. Within our analyses, correlations were judged as small (up to .39), medium (between .40 and .69), or large ($r > \pm .70$) based on Nunally and Bernstein criteria [23]. The significance of $p < 0.05$ was adopted.

In order to verify the magnitude of the association between the number of diseases and functionality, a Path Analysis model was conducted with the variables that obtained a significant correlation ($p < .05$). The existence of outliers was evaluated by applying Mahalanobis square distance (DM2), and the univariate normality of the variables through the univariate and multivariate coefficients of asymmetry (ISkI < 3) and kurtosis (IKuI < 10). Since the data did not show a normal distribution, the Bollen-Stine Bootstrap technique was used to correct the value of the coefficients estimated by the Maximum Likelihood Method [24] implemented in AMOS software version 22.0. In order to assess the sample suitability for the analysis proposed, the Bootstrapping technique was used. There were no DM2 values indicating the existence of outliers, nor sufficiently strong correlations among the variables that pointed out to multicollinearity (Variance Inflation Factors < 5.0). Based on the recommendations by Kline [25], the regression coefficients interpretation had as reference the following: little effect for coefficients $< .20$, medium effect for the coefficients up to .49, and a strong effect for coefficients > 0.50 .

Results

Out of the 70 participants, the majority of the elderly were female (64.3%), had a partner (61.4%), were 60-70 years old (77.1%), had a monthly income from one to two Brazilian minimum wages (62.1%) and were retired (72.9%). It was observed that 37.1% of the participants had completed high school/higher education. According to the results of Table 1, few percentage of the elderly patients reported heart disease (14.3%), hypertension (47.1%), stroke (4.3%), diabetes (17.1%), cancer (.0%), osteoarthritis (24.3%), lung disease (8.6%), depression (27.1%) or osteoporosis (24.3%). It is worth mentioning that 60.0% of the elderly reported having from one to two of the diseases mentioned above.

Table 1 - Diseases reported by the elderly users of the Fitness zone in the city of Maringá, Paraná, Brazil, 2018

VARIABLES	f	%
Heart disease		
Yes	10	14.3
No	60	85.7
Hypertension		
Yes	33	47.1
No	37	52.9
Stroke		
Yes	3	4.3
No	67	95.7
Diabetes		
Yes	12	17.1
No	58	82.9
Cancer		
Yes	0	0.0
No	70	100.0
Osteoarthritis		
Yes	17	24.3
No	53	75.7
Lung disease		
Yes	6	8.6
No	64	91.4
Depression		
Yes	19	27.1
No	51	72.9
Osteoporosis		
Yes	17	24.3
No	53	75.7
Number of diseases		
None	15	21.4
1 to 2	42	60.0
More than 2	13	18.6

When assessing the functionality of the elderly (Table 2), it was seen that the low scores in all the domains and overall functionality, with scores close to 0.0, indicated that the elderly had a good functionality.

Table 2 - Descriptive analysis of the functionality of elderly users of the Fitness zone in the city of Maringá, Paraná, Brazil, 2018

VARIABLES	Md (Q1; Q3)
Cognition	0.0 (0.0; 2.0)
Mobility	1.0 (0.0; 2.3)
Self-care	0.0 (0.0; 0.0)

(To be continued)

(Conclusion)

VARIABLES	Md (Q1; Q3)
Interpersonal relationships	0.0 (0.0; 0.0)
DLA	0.0 (0.0; 1.0)
Social participation	0.0 (0.0; 2.0)
Overall functionality	2.0 (0.0; 6.0)

Note: DLA = Daily life activities.

When comparing the functionality of the elderly according to the number of the self-reported diseases (Table 3), a significant difference was found only in the domains referred to as cognition ($p = .004$), self-care ($p = .001$) and interpersonal relationships ($p = .006$), which shows that the elderly with more than two diseases had a higher functional score than the elderly with none or from 1 to 2 diseases, that is, the elderly with less or no disease showed a better functionality.

Table 3 - Comparison of the functionality of the elderly users of the Fitness zone based on the number of the diseases associated. Maringá, Paraná, Brazil, 2018

Functional domains	Number of diseases			p-value
	None (n=15)	1 to 2 (n=42)	More than 2 (n=13)	
	Md (Q1-Q3)	Md (Q1-Q3)	Md (Q1-Q3)	
Cognition	0.0 (0.0; 1.0)	0.0 (0.0; 1.0)	3.0 (0.0; 4.0) ^a	.004*
Mobility	0.0 (0.0; 5.0)	0.0 (0.0; 2.0)	3.0 (0.0; 4.0)	.195
Self-care	0.0 (0.0; 0.0)	0.0 (0.0; 0.0)	2.0 (0.0; 2.0) ^b	.001*
Interpersonal relationships	0.0 (0.0; 0.0)	0.0 (0.0; 0.0)	0.5 (0.0; 2.0) ^c	.006*
DLA	0.0 (0.0; 1.0)	0.0 (0.0; 0.0)	0.0 (0.0; 1.0)	.305
Social participation	0.0 (0.0; 1.0)	0.5 (0.0; 2.0)	3.0 (0.0; 4.0)	.123
Overall functionality	1.0 (0.0; 9.0)	2.0 (0.0; 5.3)	15.0 (1.0; 17.0)	.080

Note: *Significant difference - $p < .05$ - Kruskal-Wallis test: a, b, c) difference from More than 2 with none and 1 to 2. DLA = Daily life activities.

It was seen (Table 4) that the number of diseases correlated significantly ($p < .05$) and positively with cognition

($r = .32$), self-care ($r = .50$), interpersonal relationships ($r = .41$), social participation ($r = .24$) and overall functionality ($r = .30$). These results show that there is a directly proportional relationship among the variables.

Table 4 - Correlation between the number of diseases and functionality of the elderly users of the Fitness zone in the city of Maringá, Paraná, Brazil, 2018

Functionality	Number of diseases
Cognition	.32*
Mobility	.17
Self-care	.50*
Interpersonal relationships	.41*
DLA	.19
Social participation	.24*
Overall functionality	.30*

Note: *Significant Correlation ($p < .05$) – Spearman's correlation. DLA = Daily life activities.

In order to assess the magnitude of the association between the number of diseases and functionality of the elderly (Figure 1), after the correlation analysis, a Path Analysis model was carried out for the variables that showed a significant correlation ($p < .05$). It was seen that the number of diseases reported by the elderly had a significant association ($p < .05$) with the functional domains, which explained from 15% to 31% of the variable's variability.

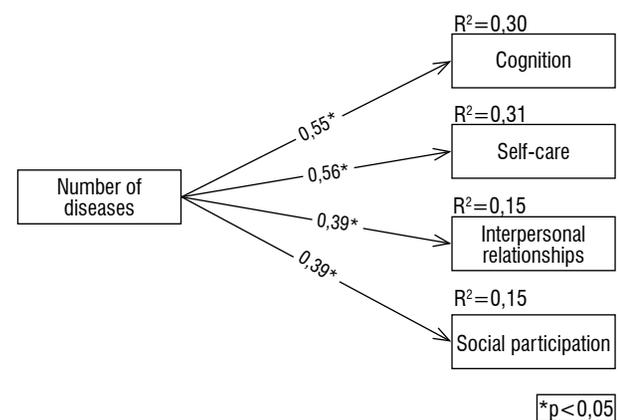


Figure 1 - Model of the association between the number of diseases and the functional domains of the elderly users of the Fitness zone in the city of Maringá, Paraná, Brazil, 2018. Note: moderate effect: values (β) between .20 and .49; strong effect: values (β) higher than .50.

Considering the individual trajectories of the Path Analysis model, it was seen that the number of diseases was positively associated with a strong effect on the self-care ($\beta = .56$) and cognition ($\beta = .55$) domains; a moderate effect on the interpersonal relationships ($\beta = .39$) and social participation ($\beta = .39$) domains, which indicated that the more the elderly reported a disease, the greater the functional score, that is, the worse the functionality.

Discussion

The present study aimed at assessing whether multimorbidity is an intervening factor in the functionality of the elderly who practice physical activity. The main findings revealed that the number of diseases is associated with the poorer functionality of older people (Figure 1).

The prevalence of the multimorbidity rate found in the older population was of 60%, a rate that meets the findings by Maregoni et al [26] and Violán et al [27], that is, 50% and 98%, respectively. The differences of these findings can be justified by the different ways of assessing the prevalence of multimorbidity among the studies, which makes the investigation difficult, mainly due to the lack of a standard in relation to the number of diseases to be considered. The most recent studies are based on the occurrence of two or more chronic diseases to be classified as multimorbidity [26-30].

Regarding the functionality of the elderly, it can be seen that the more the elderly showed multimorbidity, the worse their functionality was. This finding shows that older people with multimorbidity have poor functionality, a deficit in their health self-care, and a greater degree of dependence for daily life activity, with negative repercussions on their functional capacity [31-34]. As the number of diseases increases, the elderly have physical, social and mental complications, and this makes their self-perceived health worse [35].

When comparing elderly patients who have one or two diseases with others with no disease, it can be seen that the elderly with no disease showed more functionality. The study by Welmer et al [36] showed that the male and female elderly with multimorbidity had the worst physical performance. Therefore, physical exercise emerges as a non-pharmaceutical product for healthy aging [37-40], since its practice is associated with the improvement of physical, physiological [41-42] and psychological aspects [43-44]. Physical exercise is essential for healthy aging. Specifically, exercises involving large muscle groups of rhythmic and aerobic

nature such as swimming, walking, and water aerobics improve physical fitness, consequently, assist in maintaining functionality and improve the quality of life of the elderly [45].

Finally, a significant positive correlation was found between the number of diseases and functional cognition, self-care, interpersonal relationships, social participation, and overall functionality. Ricci and colleagues [44] also pointed out the relation between the number of comorbidities and the cognitive level; the authors found that the cognitive impairment associated with the presence of multiple diseases and aging reduced functionality.

The study by Chi et al [5], referring to decision-making capacity on health, self-care and social participation, showed that the older people with four or more diseases are less likely to make active decisions on such subjects. In agreement with this study, other authors have also highlighted the association of multimorbidity with functional loss and pointed out to such relationship as being determinant on survival and quality of life over time [26,46-48].

Although the findings of this study point to important information regarding the association between multimorbidity and functionality of the elderly who practice physical activity, some limitations should be highlighted. Firstly, only the elderly who practice physical activity at the ATIs were investigated, which does not allow the generalization of the results for the entire elderly population. Another important limitation refers to the transversal character of this study; this does not allow inferences on causality. Perhaps a longitudinal study could show the causal nature of the associations between multimorbidity and functionality. Therefore, further studies should investigate such associations through a longitudinal or prospective research design. Also, assessing the sedentary elderly who not practice physical exercise is suggested, as well as evaluating the use of multi-group analyzes, multilevel and latent mean differences, to understand the complex relationships among these variables in different groups.

Conclusion

It can be concluded that multimorbidity can be considered as an intervening factor in the functionality of the elderly who practice physical activity. It is emphasized that the greater the number of diseases that the elderly have, the greater their difficulty will be, mainly

in relation to cognition, self-care, interpersonal relationships and social participation. From a practical point of view, maintaining health during the aging process to avoid damages to functionality is important. Thus, promoting physical exercise programs is essential, since it is a tool to mitigate the consequences of the aging process and to provide the elderly with independence.

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Where it reads:

Does multimorbidity interfere with the functionality of the physically active elderly

It should read:

Does multimorbidity interfere with the functionality of the physically active elderly?

In the article “Does multimorbidity interfere with the functionality of the physically active elderly?”, DOI number <http://dx.doi.org/10.1590/1980-5918.033.A052>, published in *Revista Fisioterapia em Movimento*, v. 33, e003352, 2020, (http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-51502020000100249&lng=en&nrm=iso&tlng=en), on pages 2, 4, 6 and 8:

Where it reads:

Oliveira DV, Moreira CR, Freire GLM, Melo RS, Franco MF, Nascimento Júnior JRA.

It should read:

Oliveira DV, Moreira CR, Freire GLM, Melo RS, Franco MF, Nascimento Jr JRA.