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Repeatability and reproducibility of a home physical exercise manual

Repetibilidade e reprodutibilidade de um manual de exercícios físicos domiciliares

Repetibilidad y reproducibilidad de un manual de ejercicios físicos domiciliarios

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ABSTRACT | The reproducibility and repeatability of a manual of home physical exercises at different levels of schooling in elderly women with breast cancer was investigated. Methods: A cross-sectional study carried out between August and November, 2016 at the Instituto de Medicina Integral Prof. Fernando Figueira (IMIP), in the metropolitan area of Recife, Pernambuco. Twenty-two elderly women (aged 66.2±3.5 years) diagnosed with breast cancer using hormone therapy received an instructional manual composed of 12 exercises, to be performed independently and at home to improve physical fitness. The manual was delivered at the first consultation and after six weeks its reproducibility was checked by a physical education professional and a physiotherapist who assessed the "right" or "wrong" execution of the movements. Results: The results were analyzed by Cohen's kappa coefficient (k). There was an "almost perfect" inter-rater relationship (higher than 0.88) across all 12 exercises. As regards the "right" execution of movements, six exercises presented inter-rater agreement with variation between 68.2% and 90.9%; on the other hand, as regards the "wrong" execution, the variation was between 54.4% and 68.2%. In addition, two exercises resulted in 50% for "right" and "wrong". Regarding schooling, only exercise 6 had statistical significance (p-value=0.03). Conclusions: The manual of home physical exercises seems to be reproducible in elderly women with breast cancer at all levels of schooling, to improve physical fitness and promote functional self-care.

Keywords | Exercise Therapy; Neoplasms; Homebound Persons; Breast Neoplasms.

RESUMO | Verificou-se a reprodutibilidade e repetibilidade de um manual de exercícios físicos domiciliares em diferentes níveis de escolaridade em idosas com câncer de mama. Estudo seccional realizado entre agosto e novembro de 2016 no Instituto de Medicina Integral Professor Fernando Figueira (Imip), região metropolitana de Recife, Pernambuco. Vinte e duas idosas (idade 66.2±3.5 anos) diagnosticadas com câncer de mama em uso de hormonioterapia receberam um manual instrucional composto por 12 exercícios, a serem realizados de forma autônoma e independente em domicílio para melhoria das aptidões físicas. O manual foi entregue na primeira consulta e após seis semanas verificou-se sua reprodutibilidade por meio da avaliação de concordância em "certo" ou "errado" dos movimentos por um profissional de educação física e um fisioterapeuta. Os resultados foram analisados pelo coeficiente kappa de Cohen (k). Verificou-se uma relação interavaliadores de concordância "quase perfeita" (superior a 0,88) entre todos os 12 exercícios. Considerando a execução "certa" dos movimentos, verificou-se que seis exercícios apresentaram concordância interavaliadores com variação

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entre 68,2% e 90,9%; por outro lado, quando considerada a execução "errada", observou-se variação entre 54,4% e 68,2%. Além disso, dois exercícios resultaram em 50% para "certo" e "errado". Quanto ao nível de escolaridade, apenas o exercício 6 apresentou significância estatística (p-valor=0,03). O manual de exercícios físicos domiciliares parece ser reprodutível em idosas com câncer de mama em todos os níveis de escolaridade, para melhorar a aptidão física e promover o autocuidado funcional.
Descritores | Terapia por Exercício; Neoplasia; Pacientes Domiciliares; Neoplasias da Mama.

RESUMEN | Se verificó la reproducibilidad y repetibilidad de un manual de ejercicios físicos domiciliarios en diferentes niveles de escolaridad en ancianas con cáncer de mama. Métodos: Investigación seccional realizada entre agosto y noviembre de 2016 en el Instituto de Medicina Integral Prof. Fernando Figueira (IMIP), del área metropolitana de Recife, Pernambuco. Veinte y dos ancianas (66.2±3,5 años) diagnosticadas con cáncer de mama en uso de terapia hormonal recibieron un manual instructivo compuesto por 12 ejercicios para realizar de forma autónoma e independiente a domicilio, mejorando las aptitudes físicas. Se entregó el manual en la primera consulta y después de seis semanas se verificó su reproducibilidad a través de la evaluación de concordancia en «correcto» o «incorrecto» de los movimientos, por un profesional de educación física y un fisioterapeuta. Resultados: Los resultados fueron analizados por el coeficiente kappa de Cohen (k). Se verificó una relación interevaluadores de concordancia «casi perfecta» (superior a 0,88) entre los 12 ejercicios. Considerando la ejecución «correcta» de los movimientos, se verificó que seis ejercicios presentaron concordancia interevaluadores con variación entre el 68,2% al 90,9%; por otro lado cuando se considera la ejecución «incorrecta», se observó variación entre el 54,4% al 68,2%. Además, dos ejercicios resultaron en un 50% para «correcto» y «incorrecto». En cuanto al nivel de escolaridad, sólo el ejercicio 6 presentó significancia estadística (p-valor=0,03). Conclusiones: El manual de ejercicios físicos domiciliarios parece ser reproducible en ancianas con cáncer de mama en todos los niveles de escolaridad, para mejorar la aptitud física y promover el autocuidado funcional.
Palabras clave | Terapia por Ejercicio; Neoplasias; Personas Imposibilitadas; Neoplasias de la Mama.

INTRODUCTION

Cancer, defined as the uncontrolled growth of cells in the body[1], has its incidence increased with advancing age, becoming up to 16 times more lethal in individuals aged 65 years or more[2,3]. Among the various types, breast cancer is the most frequent and the one with the highest mortality among women in developed and developing countries[4-6].

Treatments for breast cancer include one or more therapeutic modalities[7,] which are associated with the presence of various side effects[8,9]. In hormone therapy[10], the agents used are associated with adverse effects, including loss of bone mineral density, arthralgia, and cardiovascular disease[11]. In addition, inadequate lifestyle habits, such as physical inactivity, may compromise the physical fitness and quality of life of women undergoing this type of treatment[12-16].

Physical activity is considered an important health-related factor before and after a diagnosis of cancer[17,18]. However, patients with breast cancer are generally less physically active and have longer sedentary time[12,19], which increases side effects and contributes to a reduction in the motivation for adopting physical activity[20-22]. However, clinical settings do not have the necessary support to accompany, stimulate and provide services that help change behavior for the functional self-care of these individuals[23].

One of the ways to achieve physical activity is through the development of booklets[24,25]. The implementation of educational resources contributes to lifestyle and health changes[23,26]. However, if such material is difficult to understand, especially as regards what is intended to be passed on and what is assimilated by the target public, it may instead pose health risks[27,28]. In this context, this study was designed to check the level of reproducibility and repeatability of a manual of physical exercises at different levels of schooling in elderly women with breast cancer.

METHODOLOGY

Design and ethical aspects of the study

This is a cross-sectional study conducted from August to November 2016, involving elderly women diagnosed with breast cancer using hormone therapy and followed at the Adult Oncology Outpatient Clinic of IMIP, located in Recife, Brazil. Twenty-two elderly

women were enrolled after a sample calculation that considered physical ability (Agility and Balance) for the "sitting, walking" test at an average of 6.0+1.0 seconds in the intervention group, accepting a significance level of 0.05 and a power of 0.99. For the aforementioned study, there was no sample attrition.

This project was previously approved by the Ethics Committee of IMIP (CAEE: 53633016.0.0000.5201).

Recruitment/Selection

The recruitment of elderly women to participate in the study was carried out through an analysis of medical records to check eligibility criteria. The inclusion criteria were: age between 60 and 74 years; diagnosis of breast cancer stage I or II, and being in use of hormone therapy for breast cancer. The exclusion criterion was the presence of some absolute contraindication to physical exercise[29].

Intervention protocol

The aims and benefits of this study were explained to all participants, who signed an ICF in accordance with resolution 466/2012. Sociodemographic and clinical epidemiological data were collected to characterize the sample.

Subsequently, the participants received a home physical exercise manual called "Gymnastics to do at home: A manual adapted for patients with breast cancer"[30], which was prepared from the exercises included in the first version of the Gymnastics to do at Home[31] manual, both designed for improving the physical abilities of the elderly, with orientations in general and the amount of daily and weekly repetitions of suggested exercises.

Participants were informed that after six weeks, the execution of the exercises contained in the manual would be analyzed. Exercises in the manual were performed for 45 days by the elderly women alone and with no contact with researchers, after which they returned to be evaluated by two health professionals, a physical education professional and a physiotherapist.

The analysis of the execution of the movements was performed by both raters simultaneously without previous contact between them, in a reserved place. The elderly were asked to perform each of the 12 exercises contained in the manual, in the order described. They were allowed to check the manual freely while doing the exercises. No command or assistance from the raters was provided.

Instrumentation

For the analysis of human movement, we used the qualitative method which, according to Hay & Reid[32], is a "subjectively based assessment, visual observation", where each rater analyzed the execution of each movement using a structured form with the dichotomous variable (right = 1; wrong=2).

Data analysis

Data were initially analyzed using descriptive statistics and chi-square/Fisher's exact tests to check differences in responses between categories. Subsequently, the agreement or reproducibility between the two raters was tested by obtaining the simple kappa coefficient (k), with its given interpretation[33].

For tie-breaking criteria and data formulation, evaluations carried out by the physical education professional were taken as a reference because these are professionals responsible for prescribing, supervising, analyzing and evaluating in the areas of physical activities, sports and the like, according to CONFEF[34].

RESULTS

Respecting sample calculation, a total of 22 elderly women (mean age 66.2±3.5 years) participated in the study. No statistical differences were observed across the elderly according to sociodemographic and clinical characteristics (Table 1).

Table 1. Descriptive statistics of clinical and epidemiological characteristics of elderly women with breast cancer

Variables	n	%
Marital status		
Single	3	13.6
Married	10	45.5
Separated	1	4.5
Widowed	8	36.4
Schooling		
Illiterate	6	27.3
Up to 4th grade	7	31.8
Elementary school	3	13.6
High school	3	13.6
College	3	13.6

(continue)

Table 1. Continuation

Variables	n	%
Co-morbidity		
Yes	18	81.8
No	4	18.2
Histological Type		
IDC	19	86.5
Tubular carcinoma	1	4.5
Mucinous Carcinoma	1	4.5
Micropapillary Carcinoma	1	4.5
Immunology		
RH(+) and HER-2(-)	18	81.8
RH(+) and HER-2(+)	4	18.2
TNM Staging		
1	9	40.9
2	13	59.1
Medication		
Tamoxifen	16	72.7
Anastrozole	3	13.6
Exemestane	2	9.1
Aromasin	1	4.5
Chemotherapy		
Yes	16	72.7
No	6	27.3
Radiotherapy		
Yes	19	86.4
No	3	13.6
Type of Surgery		
Quadrantectomy	12	54.5
Mastectomy	10	45.5
Axillary emptying		
Yes	17	77.3
No	5	22.7
Age	**Mean**	**Standard deviation**
	66.2	3.5

Table 2. Percentage of inter-rater agreement, Kappa coefficient and its interpretation obtained in the qualitative analysis of performance of the exercise

		n (%)	Kappa	Interpretation	p-value*
Exercise 1	Right	17 (77.3)	1	APA	0.01
	Wrong	5 (22.7)			
Exercise 2	Right	10 (45.5)	1	APA	0.01
	Wrong	12 (54.5)			
Exercise 3	Right	7 (31.8)	1	APA	0.01
	Wrong	15 (68.2)			
Exercise 4	Right	10 (45.5)	1	APA	0.01
	Wrong	12 (54.5)			
Exercise 5	Right	11 (50)	1	APA	0.01
	Wrong	11 (50)			
Exercise 6	Right	11 (50)	1	APA	0.01
	Wrong	11 (50)			
Exercise 7	Right	17 (77.3)	1	APA	0.01
	Wrong	5 (22.7)			
Exercise 8	Right	20 (90.9)	1	APA	0.01
	Wrong	2 (9.1)			
Exercise 9	Right	15 (68.2)	0.90	APA	0.01
	Wrong	7 (31.8)			
Exercise 10	Right	16 (72.7)	0.88	APA	0.01
	Wrong	6 (27.3)			
Exercise 11	Right	10 (45.5)	1	APA	0.01
	Wrong	12 (54.5)			
Exercise 12	Right	15 (68.2)	1	APA	0.01
	Wrong	7 (31.8)			

*Results of significance tests for kappa coefficients.
APA: Almost perfect agreement.

Table 2 presents p-values of inter-rater concordance by the Kappa coefficient and its interpretation according to the qualitative analysis of performance of exercises after six weeks using the manual. A "near-perfect" agreement between raters was observed in all exercises. All exercises presented a statistically significant p-value (p = 0.01), where 6 exercises were performed correctly, 4 incorrectly and 2 with equal shares (50%) for "correct" and "incorrect".

Table 3 shows the relationship between the level of education of the women of age and the amount of correct/incorrect execution of the movements described in the manual. In exercise 6 was observed a significant relation (p=0.03) between the execution of exercises for women of age with secondary education compared to those with higher education; in exercise 4 (p=0.06), only a tendency was observed.

Table 3. Distribution of results of physical exercises, according to schooling level

		Illiterate	Up to 4th grade	Elementary	High school	College	p-value*
Exercise 1	Right	3 (13.6)	6 (27.3)	3 (13.6)	3 (13.6)	2 (9.1)	0.31
	Wrong	3 (13.6)	1 (4.5)	0 (0.0)	0 (0.0)	1 (4.5)	
Exercise 2	Right	1 (4.5)	3 (13.6)	2 (9.1)	2 (9.1)	2 (9.1)	0.45
	Wrong	5 (22.7)	4 (18.2)	1 (4.5)	1 (4.5)	1 (4.5)	
Exercise 3	Right	0 (0.0)	3 (13.6)	1 (4.5)	2 (9.1)	1 (4.5)	0.3
	Wrong	6 (27.3)	4 (18.2)	2 (9.1)	1 (4.5)	2 (9.1)	
Exercise 4	Right	1 (4.5)	4 (18.2)	0 (0.0)	2 (9.1)	3 (13.6)	0.06
	Wrong	5 (22.7)	3 (13.6)	3 (13.6)	1 (4.5)	0 (0.0)	
Exercise 5	Right	3 (13.6)	4 (18.2)	2 (9.1)	2 (9.1)	0 (0.0)	0.43
	Wrong	3 (13.6)	3 (13.6)	1 (4.5)	1 (4.5)	3 (13.6)	
Exercise 6	Right	1 (4.5)	2 (9.1)	2 (9.1)	3 (13.6)	3 (13.6)	0.03
	Wrong	5 (22.7)	5 (22.7)	1 (4.5)	0 (0.0)	0 (0.0)	
Exercise 7	Right	3 (13.6)	5 (22.7)	3 (13.6)	3 (13.6)	3 (13.6)	0.25
	Wrong	3 (13.6)	2 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	
Exercise 8	Right	5 (22.7)	6 (27.3)	3 (13.6)	3 (13.6)	3 (13.6)	0.81
	Wrong	1 (4.5)	1 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)	
Exercise 9	Right	2 (9.1)	5 (22.7)	2 (9.1)	3 (13.6)	3 (13.6)	0.18
	Wrong	4 (18.2)	2 (9.1)	1 (4.5)	0 (0.0)	0 (0.0)	
Exercise 10	Right	3 (13.6)	5 (22.7)	2 (9.1)	3 (13.6)	3 (13.6)	0.42
	Wrong	3 (13.6)	2 (9.1)	1 (4.5)	0 (0.0)	0 (0.0)	
Exercise 11	Right	1 (4.5)	3 (13.6)	2 (9.1)	2 (9.1)	2 (9.1)	0.45
	Wrong	5 (22.7)	4 (18.2)	1 (4.5)	1 (4.5)	1 (4.5)	
Exercise 12	Right	4 (18.2)	4 (18.2)	2 (9.1)	2 (9.1)	3 (13.6)	0.77
	Wrong	2 (9.1)	3 (13.6)	1 (4.5)	1 (4.5)	0 (0.0)	

*Result of chi-square tests.

DISCUSSION

Some studies have investigated the relationship between the benefits of performing home rehabilitation and obtaining the same results as in a hospital setting in order to reduce expenditures[35-37]. However, the purpose of this study was to investigate the reproducibility and repeatability of a home physical exercise manual at different levels of schooling in elderly women with breast cancer, post-surgery and hormone therapy.

Our study found a high level of agreement between raters regarding the execution of exercises contained in the manual. The results show that the exercises were performed correctly by the elderly. However, for some exercises, incorrect execution of the movement was observed. Albrecht states that individuals in social isolation tend to struggle

more to understand exercise instructions[38], because patients see the people around them as a support for the proposed exercises[39].

Another limiting factor that can cause wrong execution of the movement is the fear of pain, which consequently leads the person to stop exercising[40].

Ceccato[41] in his study shows that individuals with higher levels of education have a better understanding of the treatment for type 2 diabetes mellitus. Souza[42] observed that the technique of applying eye drops by the elderly is significant connected to those with higher education.

A manual delivered to the population should be accessible to all individuals. In this sense, Oliveira[25] shows that health education materials should, in average, be understandable by individuals with six years of schooling, which is the case in the manual used here, where individuals with no education can understand and perform the exercises correctly.

The adversity of incorrect execution of the movement in exercise 6 among lower-educated women of age compared to those with higher education in our study may be related to the volume of images contained in the exercise. The exercise that presents incorrect assessment in the group of individuals with education lower than primary education is among the three exercises of a total of twelve contained in the manual that have three pictures in their description, compared to two images occurring in the cases of exercises where education levels showed no significant difference. The lower amount of images can be a way to improve the organization, appearance and understanding of the exercises, thus providing their correct execution, since images associated with writing make it easier to comprehend them[43].

The present study appears to be the first to investigate the level of reproducibility of a manual from the achievement of beneficiaries themselves. However, our study has some limitations, such as small sample size, which restricts the extrapolation of the results to the entire Brazilian elderly population with breast cancer, due to the low representativeness in the mentioned service; lack of adherence analysis, even if this is not the purpose of the study; short duration of the intervention protocol, characterized by the possibility of sample attrition and complications in the disease; and the absence of comparison of individual training without supervision in healthy and cancerous elderly women.

CONCLUSION

The evaluation protocol was sufficient to check the reproducibility and repeatability of the home physical exercise manual. This evaluation is extremely important because, in the majority of cases, evaluations made with instructional manuals take place in the functional effectiveness of these with its target audience, failing to emerge in the correct execution of the movement. Furtheremore, the manual managed to reach older women of all levels of schooling. Thus, the manual presents promising characteristics for its use in outpatient health services that promote functional self-care of their patients. With these results, together with the available literature, it is possible to ascertain the importance of physical exercise at home and the use of new technologies such as instructional manuals for exercises aimed at the rehabilitation and health improvement of women with breast cancer. This new technology can be considered as a low-cost and proven reproducibility practice for public health, assisting physiotherapists and physical rehabilitation professionals in general in offering guidelines with higher quality and safety to users in health services. However, it is important to carry out research addressing protocols with a greater number of individuals and studies that investigate the use of exercises in the form of DVDs in combination or in contrast with the printed manual.

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