

IMPACTO DE UM TREINO PROPRIOCETIVO NA CAPACIDADE FUNCIONAL DOS IDOSOS

IMPACTO DE UN ENTRENAMIENTO PROPIOCEPTIVO EN LA CAPACIDAD FUNCIONAL DE LOS ANCIANOS

IMPACT OF A PROPRIOCEPTIVE TRAINING ON THE FUNCTIONAL CAPACITY OF THE ELDERLY PEOPLE

DOI 10.33194/rper.2019.v2.n1.12.4560 | Submitted 03.03.2019 | Approved 27.06.2019

Sérgio Garcia^{1,2}; Marisa Cunha^{2,3};  Eugénia Mendes⁴;  Leonel Preto⁴;  André Novo^{4,5}

1 - ACES Tâmega II - Vale do Sousa Sul - UCC Paredes Rebordosa; 2 - Reabilita.Lar; 3 - ACES Tâmega II - Vale do Sousa Sul - UCC Cuidar Penafiel; 4 - Escola Superior de Saúde do Instituto Politécnico de Bragança; 5 - NurseID - CINTESIS

RESUMO**Introdução:** O envelhecimento humano acarreta uma diminuição da capacidade funcional dos idosos, sendo o exercício físico fundamental para a melhorar.**Objetivo:** Avaliar os efeitos de um programa de Enfermagem de Reabilitação de treino proprioceptivo na capacidade funcional num grupo de idosos.**Método:** Estudo quasi-experimental com avaliação antes e após intervenção. A amostra é constituída por 24 idosos distribuídos pelo grupo de intervenção (n=12) e grupo de controlo (12). O programa de intervenção incluiu 24 sessões ao longo de 12 semanas de implementação. Foram utilizados como instrumentos de medida o teste de equilíbrio unipodal, o Índice de Tinetti para equilíbrio e marcha e aptidão física pela bateria de testes de Rikli & Jones.**Resultados:** No grupo de intervenção houve evolução positiva relativamente a todas as variáveis avaliadas, com diferenças estatisticamente significativas nos dois momentos de avaliação. No grupo de controlo não se verificaram alterações com significado estatístico.**Conclusão:** Este programa de treino proprioceptivo demonstrou ganhos na capacidade funcional dos idosos.**Palavras chave:** enfermagem de reabilitação; proprioceção; envelhecimento; capacidade funcional**RESUMEN****Introducción:** El envejecimiento humano acarrea una disminución de la capacidad funcional de los ancianos, siendo el ejercicio físico fundamental para mejorarla.**Objetivo:** Evaluar los efectos de un programa de Enfermería de Rehabilitación de entrenamiento propio en la capacidad funcional en un grupo de ancianos.**Método:** Estudio cuasi-experimental con evaluación antes y después de intervención. La muestra está constituida por 24 ancianos distribuidos por el grupo de intervención (n=12) y el grupo de control (12). El programa de intervención incluyó 24 sesiones a lo largo de 12 semanas de aplicación. Se utilizaron como instrumentos de medida la prueba de equilibrio unipodal, el Índice de Tinetti para equilibrio y marcha, y aptitud física por la batería de pruebas de Rikli & Jones.**Resultados:** En el grupo de intervención hubo una evolución positiva en todas las variables evaluadas, con diferencias estadísticamente significativas en los dos momentos de evaluación. En el grupo de control, no hubo cambios significativos en el significado estadístico.**Conclusión:** Este programa de entrenamiento propuesto ha demostrado ser determinante en la mejora de la capacidad funcional de los ancianos.**Palabras clave:** enfermería de rehabilitación; propiocepción; envejecimiento; capacidad funcional**ABSTRACT****Introduction:** Human aging implies a reduction in the functional capacity of the elderly population, and physical exercise is fundamental to improve it.**Objective:** To evaluate the effects of a Rehabilitation Nursing program of self-training on functional capacity in a group of elderly people.**Method:** It is a quasi-experimental study with evaluation before and after intervention. The sample consisted of 24 elderly people distributed by the intervention group (n=12) and the control group (n=12). The intervention program included 24 sessions over 12 weeks of implementation. The unipodal balance test, the Tinetti index for balance and gait, and physical fitness by the Rikli & Jones test battery were used as measuring instruments.

Results: In the intervention group there was a positive evolution in relation to all variables evaluated, with statistically significant differences in the two moments of evaluation. In the control group, there were no statistically significant changes.

Conclusion: This program of proprioceptive training demonstrated gains in the functional capacity of the elderly.

Keywords: rehabilitation nursing; proprioception; aging; functional capacity

INTRODUCTION

With increasing age, the human body goes through a period of changes that lead to a decline in physical abilities, such as decreased flexibility, agility, coordination, joint mobility and, especially, balance⁽¹⁾.

There is a progressive decrease in functional capacity that accompanies the aging process, but which should not be a factor of social exclusion, dependence or other limitations that lead to situations of loneliness or institutionalization⁽²⁾.

Aging compromises the ability of the central nervous system to process vestibular, visual and proprioceptive signals responsible for maintaining body balance⁽³⁾.

Elderly people have proprioceptive losses that reduce their ability to detect movement and make it difficult to accurately reproduce joint movements, difficulting proprioception⁽⁴⁾.

The term proprioception derives from the Latin (re)ceptus (to receive) and proprios (ourselves).

Proprioception can be defined as the neural input from nerve endings called mechanoreceptors (sensory receptors for proprioception) located in the skin, tendons, muscles, joint capsules, and ligaments, which are responsible for sending information about movement, position or deformation that occurs in these structures to the Central Nervous System (CNS). This processes, organizes and commands the body in an adequate way to maintain the control and correct posture of the body^(5,6).

Rossato et al., in 2013, state that through proprioception, stimuli occur in the receptors of the joint capsules, muscles and ligaments, which, in addition to ensuring good integrity of proprioceptive sensations, improve muscle strength, balance and gait⁽⁷⁾.

The aging process is accompanied by changes in the nervous, locomotor and sensory system that can cause changes in posture, balance and gait⁽⁸⁾. Bulksman and Vilela, in 2004, reported that in elderly people, motor responses to proprioceptive, visual and auditory stimuli are slower, which may interfere with the quality of gait and in the performance of activities of daily living (ADL)⁽⁹⁾.

Functional capacity can be represented by an individual's ability to perform ADL without difficulties⁽¹⁰⁾, in addition to being associated with clinical changes caused by aging. Changes in ADL can be useful to indicate future complications related to the health of the elderly, such as physical disability, frailty, institutionalization and mortality⁽¹¹⁾.

The functional capacity variables that were considered pertinent to evaluate in this study were balance and physical fitness, which are fundamental for the functional capacity of the elderly and which have become an important focus of health professionals due to their high impact on the elderly lives.

This study aimed to evaluate the impact of a Rehabilitation Nursing program of proprioceptive training on the functional capacity of the elderly. The following research question was formulated: What is the impact of a Rehabilitation Nursing program of proprioceptive training on the functional capacity of the elderly?

METHOD

A quasi-experimental study was carried out, with an intervention group and a control group.

Population and sample

General Practitioners were asked to collaborate in the referral of participants. The convenience sample consists of 24 elderly people, out of them 12 were in the intervention group (elderly people enrolled in the USF in Lordelo) and 12 in the control group (elderly enrolled in the USF in Rebordosa).

The following inclusion criteria were defined: age equal to or greater than 65 years-old, clinically stable, with musculoskeletal skills to perform the exercises included in the intervention program and in the two evaluation moments, with the ability to understand and comply simple orders. As an exclusion criterion, the contraindication for the practice of physical exercise by the family doctor was defined. All study participants missed 4 or fewer training sessions.

Instruments of assessment

To assess the impact resulting from the implementation of the Rehabilitation Nursing program of proprioceptive training on the functional capacity of the elderly, the Tinetti Index (balance and gait assessment), the unipodal balance test (static balance assessment) and the Rikli-Jones test battery (assessment of physical fitness).

All tests were performed in the two groups of elderly participants, with a 12-week interval between the two evaluation moments. In the intervention group, evaluations were carried out before the beginning of the program and at the end of it.

The assessments were carried out in both groups at the same time and in the same week, and all participants were asked to wear comfortable sports clothing.

Functional capacity variables were evaluated, namely static and dynamic balance, unipodal balance and physical fitness.

Protocol of intervention

The program was carried out for 12 weeks, with 2 sessions per week of 60 minutes each. All exercises were performed by the participants without shoes, in order to enhance the proprioceptive effect of the exercises on the participants, with the exception of some exercises in which the elderly people did not feel

so comfortable without shoes. The sessions consisted of 3 parts such as Brower, 2003 and Eyigor et al., 2007 described^(12,13):

- Warming up/stretching (10 min);
- Proprioceptive exercises (40 min);
- Stretch/relax (10 min).

In Figure 1, the Proprioceptive Exercise Program can be seen schematically.



Figure 1 – Proprioceptive exercise program

Stages of the proprioceptive exercise program

Over the 12 weeks, 54 different exercises were performed, created and adapted for the elderly people, which increased in intensity, complexity, speed and some with visual restriction, taking into account whether the participants were able to perform them without complaints or discomfort. Circuits were formed with several stations with different exercises in the various sessions, lasting 2 to 3 minutes in each exercise⁽¹⁴⁾. The exercises were performed in phases, divided into 3 stages of evolution of the elderly people (18 exercises each), considering the adaptation to the exercises, resistance, muscle strength and balance presented. In summary, the first 4 weeks represented the 1st stage, from the 5th to the 8th week we considered the 2nd stage and from the 9th to the 12th week the 3rd stage.

Analysis and treatment of data

The statistical treatment of the data was carried out using the computer program Statistical Package for the Social Sciences Statistics (SPSS IBM), version 20, presenting descriptive statistics using the mean ± standard deviation and minimum and maximum values. The number of individuals determined by the evaluations is indicated by the sample n.

To study the comparison between the two moments of assessment of each group, the Wilcoxon non-parametric test of mean differences between subjects was applied. The significance level for this study was set at p≤0.05.

Ethical considerations

All participants signed an informed consent in a free and express way, with the objectives of the study and the nature of their participation being explained in detail, as well as authorization for the use of image and video. The study was authorized by ACeS Tâmega II -

Vale de Sousa Sul and received a favorable opinion from the Ethics Committee for Health of ARS Norte (Opinion No. 51/2013).

RESULTS

The female gender predominated both in the intervention group (66.7%) and in the control group (75%), thus having a similar gender distribution in both groups.

Regarding the average age, there was a homogeneity of the two groups, with the intervention group having an average of 67.25 ± 2.01 years and the control group 68.08 ± 1.73 years, with a minimum of age is 65 years and the maximum is 71 years (in both groups).

Table 1 shows the results of the evaluations (intra-subjects) before and after the implementation of the intervention program, in the intervention and control groups (Wilcoxon Test, Z).

			Intervention group		Control group		
			N	Average	p	Average	p
PHYSICAL APTITUDE	Getting up and sitting on the chair (repetitions)	Before	12	9.08 ± 2.10	<u>0.002</u>	10.42 ± 3.37	0.357
		After	12	17.17 ± 5.02		10.08 ± 3.55	
	Elbow flexion (repetitions)	Before	12	11.33 ± 3.91	<u>0.002</u>	15.58 ± 6.14	0.196
		After	12	21.33 ± 6.91		15.08 ± 5.79	
	Sitting and reaching (cm)	Before	12	11.92 ± 12.06	<u>0.002</u>	7.92 ± 7.79	0.621
		After	12	0.33 ± 8.13		8.25 ± 8.04	
	Reaching behind their back (cm)	Before	12	26 ± 5.87	<u>0.002</u>	32.25 ± 9.72	0.072
		After	12	18.33 ± 6.27		33.5 ± 10.20	
	Getting up, walking 2.44m and sitting down again (seconds)	Before	12	11.5 ± 2.46	<u>0.002</u>	11 ± 3.46	0.272
		After	12	6.08 ± 1.50		11.7 ± 4.68	
BALANCE	One-leg balancing Test (seconds)	Before	12	12.75 ± 12.37	<u>0.002</u>	4.92 ± 6.59	<u>0.034</u>
		After	12	29.75 ± 21.75		3.75 ± 3.86	
	Tinetti index – Balance	Before	12	14.08 ± 2.02	<u>0.011</u>	14.67 ± 2.38	<u>0.046</u>
		After	12	15.67 ± 1.15		14.33 ± 2.27	
	Tinetti index – Gait	Before	12	9.75 ± 1.13	<u>0.003</u>	10.83 ± 0.93	0.564
		After	12	11.83 ± 0.57		10.75 ± 1.13	

Table 1 – Results of evaluations before and after the intervention program (intra-subjects), in the intervention and control groups (Wilcoxon Test, Z).

DISCUSSION

Regarding the Rikli & Jones battery tests for physical fitness, there was a statistically significant improvement in all parameters evaluated. In the elbow flexion test there was an improvement from 11.33 to 21.33 repetitions, on average. In the test stand up and sit down from a chair, from 9.08 to 17.17 repetitions, in the sit test and reach -11.92 to -0.33cm, in the test behind the back from -26cm to -18.33cm and in the test standing up, walking for 2.44m and sitting again there was an improvement from 11.5 to 6.08 seconds.

Avelar, in 2013, in a study whose objective was to evaluate a 12-week program of sensory circuits, found an improvement in the physical fitness of the elderly participants. In the study, Kim et al., in 2010, concluded that the implementation of a balance program resulted in an increase in muscle strength in the lower and upper limbs^(14,15).

The improvement in the performance of “standing up, walking for 2.44m and sitting down again” is consistent with the results of studies that applied exercises similar to those in this study and with the same number of sessions^(4,13,14,16,17).

No proprioceptive training studies were found that directly assessed flexibility, but we can argue that the statistically significant differences in the present program are due to the diversity of proprioceptive component exercises based on another type of exercise, which implies stretching and increased flexibility in elderly people.

Sousa, in 2012, in a study that took place for 20 weeks with the elderly population, with the objective of evaluating a multicomponent physical activity program, found a significant improvement in the flexibility of the upper and lower limbs⁽¹⁸⁾.

In the present study, there was also a significant improvement in unipodal balance, static and dynamic/gait balance, according to the Tinetti Index.

In the one-leg balance test, in the intervention group, on average, the time in balance went from 12.75 seconds before the intervention to 29.75 seconds after the program. In the control group there was a slight decrease between the two assessments. The results agree with the consulted literature. Lustosa et al., in 2010, in a study that took place over 8 weeks with the participation of 7 elderly women, with the objective of

testing a functional training, verified a significant improvement in the one-leg balance⁽¹⁹⁾.

Regarding static balance, in the intervention group, there was a statistically significant improvement in the mean score between assessments, from 14.08 to 15.67. As for the dynamic balance /gait, in the group of elderly people who performed this program, there was a statistically significant improvement in the score between the assessments, from 9.75 to 11.83. The results obtained are supported by several studies in the literature.

Nascimento et al., in 2012, in a study of 4 weeks of proprioceptive training in 9 elderly people, found a significant improvement in the postural balance of the elderly people⁽²⁰⁾. Silva et al., in 2018, found an improvement in the balance of elderly women after a proprioceptive program⁽²¹⁾, as did Costa et al., in 2009, who studied the effect of a multisensory exercise circuit in 26 elderly people during 10 sessions, with results with significant improvement⁽²²⁾.

CONCLUSION

So-called civilized societies must be aware that investing in independent and healthy elderly people for as many years of life as possible is not only a bet for quality in health, but also for economic sustainability.

Rehabilitation Nurses can and should have an intervening and sustained role in their body of knowledge and specific skills and implement exercise programs aimed at improving the functional capacity of the elderly, providing them with skills that make them more independent in carrying out their daily activities. This study is part of this context, and proprioceptive training is our priority focus of attention, as it is specific exercise training and still little used in the elderly population, but with great potential for use, as demonstrated in this study.

We can now state that the Rehabilitation Nursing program of proprioceptive training implemented had a determining effect on improving the functional capacity of the elderly people, which allows us to fully respond to the outlined objective.

There was a statistically significant improvement in all parameters evaluated in the intervention group, while in the control group there was no significant improvement in any parameter evaluated, and there was still a statistically significant decrease in the unipedal balance parameter in the latter group.

The implementation of physical exercise programs is currently an area of expertise for Rehabilitation Nurses and it is in the interest of increasing our body of specific skills that will allow us to intervene in a more insightful, rigorous and scientific way in the elderly in our communities. The implementation of proprioceptive exercise programs by rehabilitation nurses, targeting the most vulnerable population, which includes the elderly, must be a systematic and systematized - professionalized - practice promoting gains in health and, at the same time, contributing to our position as

fundamental elements in the health, social and economic system.

As limitations of this study, we point out the short period of time in which the training program took place, the small sample size and the shortage of scientific articles on the subject under study. As future suggestions, we point to the need to replicate this program with a greater number of elderly people and to implement it in different health programs of the General Directorate of Health, within the scope of increasing levels of physical activity and improving balance

REFERENCES

- Manna L, Mota CB, Lopes LFD, Rossi AG, Teixeira CS, Kleinpaul JF. Investigação do equilíbrio corporal em idosos. *Rev Bras Geriatr Gerontol* [Internet]. 2008;11(2):155-65. Available from: <http://www.redalyc.org/pdf/4038/403838778003.pdf>
- Cabral MV, Ferreira PM. Envelhecimento activo em Portugal: trabalho, reforma, lazer e redes sociais [Internet]. Fundação Francisco Manuel dos Santos; 2014 [cited 2019 Feb 24]. 141 p. Available from: <http://repositorio.ul.pt/handle/10451/23416>
- Zanardini FH, Zeigelboim BS, Jurkiewicz AL, Marques JM, Bassetto JM. Reabilitação vestibular em idosos com tontura. *Pro-Fono Rev Atualização Cient.* 2007;19(2):1-7.
- Marcon Alfieri, Fábio; Leite de Moraes MC. Envelhecimento e o controle postural. *Saúde Colet* [Internet]. 2008 [cited 2019 Feb 24];4(19):30-3. Available from: <https://www.redalyc.org/html/842/84201907/>
- Silvestre MV, Lima WC de. Importância do treinamento proprioceptivo na reabilitação de entorse de tornozelo. *Fisioter Mov.* 2003;16(2):27-34.
- Sayuri Tookuni K, Bolliger Neto R, Martins Pereira CA, Rúbio de Souza D, Greve JMD, Ayala AD. Análise comparativa do controle postural de indivíduos com e sem lesão do ligamento cruzado anterior do joelho. *Acta Ortop Bras.* 2005;13(3).
- Rossato CE, Lemos LFC, Teixeira CS, Pranke GI, Mota CB. Propriocepção no esporte: uma revisão sobre a prevenção e recuperação de lesões desportivas. *Saúde (Santa Maria).* 2013;39(2):57-70.
- Sanglard RCF, Pereira JS. A influência do isostretching nas alterações dos parâmetros da marcha em idosos. *Fisioter Bras.* 2005;6(4):255-60.
- Buksman S, Vilela AL. Instabilidade postural e quedas. In: *Saúde do idoso: a arte de cuidar.* 2ª ed. Rio de Janeiro (RJ): Interciência; 2004:208-18.
- Arena R, Myers J, Williams MA, Gulati M, Kligfield P, Balady GJ, et al. Assessment of functional capacity in clinical and research settings: a scientific statement from the American Heart Association Committee on Exercise, Rehabilitation, and Prevention of the Council on Clinical Cardiology and the Council on Cardiovascular N. *Circulation.* 2007;116(3):329-43.
- Coelho C de F, Burini RC. Atividade física para prevenção e tratamento das doenças crônicas não transmissíveis e da incapacidade funcional. *Rev Nutr.* 2009;937-46.
- Brouwer BJ, Walker C, Rydahl SJ, Culham EG. Reducing fear of falling in seniors through education and activity programs: a randomized trial. *J Am Geriatr Soc.* 2003;51(6):829-34.
- Eyigor S, Karapolat H, Durmaz B. Effects of a group-based exercise program on the physical performance, muscle strength and quality of life in older women. *Arch Gerontol Geriatr.* 2007;45(3):259-71.
- Avelar BP. Efeitos de um circuito de exercícios sensoriais na força muscular, equilíbrio e desempenho funcional de mulheres idosas. *Dissertação (Mestrado em Educação Física)—Universidade de Brasília, Brasília;* 2013.
- Kim K, Piao Y-J, Kim N-G, Kwon T-K. Characteristic analysis of the isokinetic strength in lower limbs of the elderly on training for postural control. *Int J Precis Eng Manuf.* 2010;11(6):955-67.
- Donat H, Özcan A. Comparison of the effectiveness of two

- programmes on older adults at risk of falling: unsupervised home exercise and supervised group exercise. *Clin Rehabil.* 2007;21(3):273-83.
17. Fu S, Low Choy N, Nitz J. Controlling balance decline across the menopause using a balance-strategy training program: a randomized, controlled trial. *Climacteric.* 2009;12(2):165-76.
 18. Sousa FLG de. *Academia Sénior: um contributo para a aptidão funcional dos idosos Tese Mestrado Gerontologia Social.* Centro de Tecnologias de Saúde. Funcha; 2014.
 19. Lustosa LP, de Oliveira LA, da Silva Santos L, de Cássia Guedes R, Parentoni AN, Pereira LSM. Efeito de um programa de treinamento funcional no equilíbrio postural de idosas da comunidade. *Fisioter e Pesqui.* 2010;17(2):153-6.
 20. Nascimento LCG do, Patrizzi LJ, Oliveira C. Efeito de quatro semanas de treinamento proprioceptivo no equilíbrio postural de idosos. *Fisioter mov.* 2012;25(2):325-31.
 21. Silva C, Silva B, Pimentel T, Souza J, Januário P, Cruz A. Análise do equilíbrio em idosas após a realização dos exercícios de Frenkel. *Rev Saúde e Desenvol.* 2018;12(10):210-23.
 22. Costa JNA, Gonçalves CD, Rodrigues GBA, Paula AP, Pereira MM, Safons MP. Exercícios multissensoriais no equilíbrio e na prevenção de quedas em idosos. *EFDeportes com.* 2009;