



Revista Portuguesa de Enfermagem de Reabilitação

Volume 2 | Number 1 | June 2019



Fotografia: Elisabete Branco e Teresa Ferreira

1º Prémio – Imagens da Enfermagem de Reabilitação 2017

TECHNICAL FILE

ISSN: 2184-3023

INTELLECTUAL OWNERSHIP

Associação Portuguesa dos Enfermeiros de Reabilitação
Rua Cassiano Branco 74, 4º Esq Tras 4250 - 084 Porto - www.aper.pt

E-mail: revista@aper.pt | Telephone: 931756382

Editor-in-Chief

Maria Manuela Ferreira Pereira da Silva Martins 
PhD - Escola Superior de Enfermagem do Porto, Portugal

Senior Editor


Fernando Manuel Dias Henriques 
Escola Superior de Enfermagem de Coimbra, Portugal

Editorial Board







André Filipe Morais Pinto Novo 
PhD - Escola Superior de Saúde do Instituto Politécnico de Bragança, Portugal







Luís Manuel Mota Sousa 
PhD - Escola Superior de Enfermagem S. João de Deus, Universidade de Évora, Portugal

Graphical Editing

















Rui Pedro Marques da Silva 













Technical committee

Ana Cristina Nunes Mesquita 
Ana da Conceição Alves Faria
Bruno Miguel Delgado 
Clara Monteiro
Cristina Maria Medeiros Guedes F. Moura
Dulce Sofia Antunes Ferreira
Eunice Salomé Alves Sobral Sousa
Glória Maria Andrade do Couto
Helena Castelão Figueira Carlos Pestana 
Ivo Cláudio Mendes Lopes 
Jacinta Pires Martins
João Pedro Pinto Coelho Oliveira
Joaquim Augusto Gonçalves Simões
José Alberto Teixeira Pires Pereira
José Alexandre Pinto Soares 
Júlia da Conceição Marques dos Santos
Liliana Celeste Faria da Silva Ribeiro
Luís Jorge Rodrigues Gaspar 
Luís Miguel Ferreira Agostinho

Manuel Barnabé Moura Pinto de Melo
Maria do Carmo Oliveira Cordeiro
Maria de Fátima Sequeira Loureiro
Maria Eugénia Rodrigues Mendes 
Maria Helena Ferreira de Almeida
Maria José Bule 
Marisa da Glória Teixeira da Cunha
Patrícia Maria Rodrigues Pereira Pires
Raquel Maria dos Reis Marques
Ricardo Jorge Almeida Braga
Rui Pedro Marques da Silva 
Rute Salomé Silva Pereira 
Sandy Silva Pedro Severino 
Sérgio Alberto Pires Garcia
Sérgio Filipe Alves Vaz
Sónia Alexandra Claro Casado
Teresa Silveira 
Víctor Jorge Reis Pereira
Virgínia Lucinda de Sousa Cruz Pereira

Scientific Committee

Ana Filipa dos Reis Cardoso 
André Filipe Morais Pinto Novo 
Arménio Guardado Cruz 
Bárbara Pereira Gomes 
Bruna Raquel Figueira Ornelas de Gouveia 
Carla Sílvia Fernandes 
César João Vicente da Fonseca 
Clara de Assis Coelho de Araújo 
Cristina Lavareda Baixinho 
Cristina Marques-Vieira 
Élvio Henriques de Jesus 
Fabiana Faleiros Santana Castro 
Fernando Alberto Soares Petronilho 
José Miguel Santos Castro Padilha 
Leonel São Romão Preto 
Luís Manuel Mota Sousa 

Maria de La Salette Rodrigues Soares 
Maria Gorete Mendonça dos Reis 
Maria José Almendra Gomes 
Maria José Lopes Fonseca 
Maria José Lumini Landeiro 
Maria Manuela Martins 
Maria Salomé Martins Ferreira 
Nelson Emidio Henrique Guerra 
Olga Maria Pimenta Lopes Ribeiro 
Pedro Migue Santos Dinis Parreira 
Rosa Maria Lopes Martins 
Soraia Dornelles Schoeller 
Vanda Lopes da Costa Marques Pinto
William C. A. Machado 

CONTENT INDEX

| | |
|---|-----|
| EDITORIAL..... | 4 |
| PHYSICAL ACTIVITY AND PHYSICAL EXERCISE: FUNDAMENTALS AND APPLICATIONS IN REHABILITATION NURSING | 4 |
| EFFECT OF PULMONARY REHABILITATION ASSESSED BY CAT AND ITS RELATION TO ACTIVITY TOLERANCE | 6 |
| <i>id Luis Gaspar; Paula Martins; Fátima Gomes</i> | |
| NURSING REHABILITATION IN THE PREVENTION OF FALLS IN THE ELDERLY PEOPLE AT HOME..... | 11 |
| <i>Jéssica Gomes; Carlos Miguel Soares; id Maria José Bule</i> | |
| PHYSICAL EXERCISE IN PEOPLE WITH DIABETES: SYSTEMATIC REVIEW OF LITERATURE | 18 |
| <i>id Lénia Alexandra Ramos Loureiro; id Maria Isabel Vaz Afonso; id Patrícia da Silva Ribeiro; id Ana Cristina Nunes Mesquita; id Helena Castelão Figueira Carlos Pestana; id Luís Manuel Mota de Sousa</i> | |
| PHYSICAL EXERCISE IN A PERSON WITH DEMENTIA: SYSTEMATIC REVIEW OF LITERATURE | 27 |
| <i>id Diana Vanessa Ferreira Maia; id Rui Miguel de Andrade Gaspar; id António Manuel Gradíssimo Costa; id Filipe Manuel Gonçalves Dias; id Helena Castelão Figueira Carlos Pestana; id Luís Manuel Mota de Sousa</i> | |
| PHYSICAL EXERCISE IN THE PERSON WITH DEPRESSIVE DISORDER: A SYSTEMATIC LITERATURE REVIEW | 35 |
| <i>id Inês de Jesus Rocha; id Carla Alexandra Fundevila de Barros; id Ana Maria Pinto Mateus; id Rosa Cristina Rodrigues Correia; id Helena Castelão Figueira Carlos Pestana; id Luís Manuel Mota de Sousa</i> | |
| FUNCTIONALITY OF PEOPLE SUBMITTED TO TOTAL SHOULDER ARTHROPLASTY BY PROXIMAL HUMERUS FRACTURES: RETROSPECTIVE STUDY | 43 |
| <i>Carolina Tiago Afonso; Miguel Pinto Freitas; Nuno Gonçalo Pais; Daniel Ramos Pires; id André Novo; Afonso Salgado Ruano</i> | |
| EARLY MOBILIZATION IN PEOPLE SUBMITTED TO INVASIVE MECHANICAL VENTILATION: INTEGRATIVE LITERATURE REVIEW..... | 49 |
| <i>id Pedro Cerol; id Jorge Martins; id Luís Manuel Mota de Sousa; id Isabel Oliveira; id Teresa Silveira</i> | |
| EXERCISE TRAINING IN PEOPLE WITH A STABILIZED CHRONIC RESPIRATORY DISEASE: A SCOPING REVIEW | 59 |
| <i>id Luis Gaspar; Dulce Ferreira; Francisco Vieira; Paulo Machado; id Miguel Padilha</i> | |
| THE PROPRIOCEPTIVE AND POSTURAL BALANCE TRAINING IN THE ELDERLY PEOPLE FOR THE PREVENTION OF FALLS: SCOPING REVIEW | 66 |
| <i>Catarina Correia; Liliana Barbosa; Luís Rebelo; Marco Alves; Nuno Pinho; Bruno Magalhães</i> | |
| PREVENTION OF THE IMOBILITY CONSEQUENCES IN CRITICALLY ILL PATIENTS | 78 |
| <i>Ana Vanessa Barroso Cerqueira; id Eugénia Nunes Grilo</i> | |
| INTERVENTION OF THE SPECIALIST NURSE IN REHABILITATION ON THE MOBILITY OF THE INSTITUTIONALIZED ELDERLY PERSON - TEIA PROGRAM | 90 |
| <i>Rita Pires; id Maria Manuela Martins; id Bárbara Gomes; Clara Monteiro; id Olga Ribeiro</i> | |
| IMPACT OF A PROPRIOCEPTIVE TRAINING ON THE FUNCTIONAL CAPACITY OF THE ELDERLY PEOPLE..... | 102 |
| <i>Sérgio Garcia; Marisa Cunha; id Eugénia Mendes; id Leonel Preto; id André Novo</i> | |

EDITORIAL

When presenting a new issue of the journal, we are faced with the need to contextualize the theme, so we invited one of the members of the editorial committee to do so in order to explain the approach of the theme "physical activity" to the theoretical and practical knowledge of nursing.

We selected articles that covered the topic of physical activity with specificities related to human development, but also with particularities of health and programs. We also bring for reading various research methodologies and deepening knowledge on the subject.

We believe that it is one of the areas of nursing care that, although part of daily practices in various contexts, has not emerged in publications that represent the workload developed by Rehabilitation Nurses.

The interventions of Rehabilitation Nurses, around physical activity, are covered with particularities of knowledge from related areas, but incorporate specific nursing knowledge, so we consider that rehabilitation nurses have specific skills to intervene in this area in order to add value to people's health, throughout the life cycle and in disease processes.

To better justify the importance of physical activity in the work of Rehabilitation Nurses, Professor Luís Sousa developed an introductory summary to the subject.

DOCTOR PROF. MARIA MANUELA MARTINS

Coordinating Professor at the School of Nursing. Member of the Research Group - NursID: Innovation and Development in Nursing - CINTESIS - Center for Health Technology and Services Research - FMUP. Professor at the Master's Degree in Rehabilitation Nursing, Coordinator of the Master's Degree in Management and Head of Nursing Services. Member of the Scientific Committee of the Doctorate in Nursing Sciences at UP.

PHYSICAL ACTIVITY AND PHYSICAL EXERCISE: FUNDAMENTALS AND APPLICATIONS IN REHABILITATION NURSING

Roper, Logan and Tierney (1995), and Orem (2001) have based the nursing models in which physical activity and physical exercise are framed as nursing focuses and interventions. Physical activity and physical exercise are currently regulated in two competences, defined by the board of the Nursing College of Rehabilitation of the Ordem dos Enfermeiros, specifically, J2.1.2 – Performing specific DLA training, namely using support products (technical aids and devices compensation), as well as training inherent to physical activity and exercise and J3.1.3 - Teaching, instructing and training on techniques and technologies (including activity and exercise) to be used to maximize performance at the motor, cardiac and respiratory levels, taking into account the individual's individual goals and their health project.

Physical exercise is defined in the International Classification for Nursing Practice (ICNP) version 2011 as the performance of physical and voluntary work of the musculoskeletal and respiratory systems to improve physical fitness, mobility and strength. And activity intolerance as a compromised status: lack of ability or energy to tolerate or complete activities.

In this context, the ICNP version 2015 presents the following diagnoses/results: Adherence to the exercise regimen; Compromised exercise pattern; Attitude towards the difficult exercise regimen; Ability to manage compromised exercise regimen; Knowledge about exercise; Knowledge about physical therapy; Knowledge about exercise regimen; Activity intolerance; Risk of activity intolerance; Effective activity tolerance.

As interventions ICNP version 2015 presents: Assessing the evolution of the psychosocial response to exercise instruction; Assessing knowledge about physical therapy; Assessing exercise pattern; Assessing activity tolerance; Monitoring activity tolerance; Teaching how to increase activity tolerance; Increasing tolerance to activity; Promoting adherence to the exercise regimen; Promoting exercise; Promoting physical mobility; Reinforcing physical therapy regimen and Reinforcing muscle or joint exercise technique. And finally, the following resources are planned: Muscle or joint exercise technique and Activity therapy.

Therapeutic exercise, according to Kisner Colby and Borstad (2017), is characterized by the systematic and planned performance of physical movements, postures or activities designed to provide the patient/client with the means to: mitigate or prevent deficiencies in body functions and structures; restore or enhance activity and participation; prevent or reduce health-related risk factors; optimize overall health and sense of well-being.

The recommendations in the prescription of physical exercise are based on the following criteria: Mode/type of exercise, intensity, volume, exercise order, duration, frequency and progression.

According to Kisner Colby and Borstad (2017), when planning physical exercise, the various dimensions of physical function must be taken into account, namely, muscle performance, cardiovascular endurance, mobility/flexibility, neuromuscular control/coordination, stability and body balance.

Piercy and collaborators in 2018 refer to the benefits of physical activity and exercise in children and adolescents as: improved bone health (between 3 and 17 years-old); weight improvement (ages from 3 to 17 years-old); improvement in cardiorespiratory and muscular fitness (ages from 6 to 17 years-old); improvement in cardiometabolic health (between 6 and 17 years-old); Cognition improvement (ages 6 to 13); reduced risk of depression (between 6 and 13 years-old).

The scientific literature (Novo e Paz in 2012; Meneses-Echávez and collaborators in 2015; Piercy and collaborators in 2018) reports that in adults and elderly people, the benefits are: lower risk of mortality from all causes; lower risk of mortality from cardiovascular disease; lower risk of cardiovascular disease; lower risk of hypertension; lower risk of type 1 and 2 diabetes, with improved insulin sensitivity; lower risk of adverse blood lipid profile; lower risk of cancer of the bladder, breast, colon, endometrium, esophagus, kidney, lung and stomach; reduced fatigue related to breast cancer, improved quality of life and physical function after cancer; improved cognition; reduced risk of dementia (including Alzheimer's disease); better quality of life; anxiety reduction; reduced risk of depression; sleep improvement; weight reduction when combined with reduced caloric intake; improving bone health; improved physical function, lower risk of falls (elderly); lower risk of fall-related injuries (elderly people).

The most appropriate strategies to increase physical activity as well as physical exercise (type, frequency, intensity, duration) should be used; in addition, these strategies will have to be adapted according to people's abilities, needs and desires.

In summary, rehabilitation nurses have skills and hold scientific knowledge that allows them to prescribe physical exercise in special populations, thus contributing to the improvement of their health outcomes, in the context of physical activity and physical exercise.

DOCTOR PROF. LUIS SOUSA

Associate Professor of Escola Superior de Enfermagem S. João de Deus, Universidade de Évora, Portugal

EFEITO DA REABILITAÇÃO RESPIRATÓRIA NOS SINTOMAS AVALIADO PELO CAT E A SUA RELAÇÃO COM A TOLERÂNCIA À ATIVIDADE

EFFECTO DE LA REHABILITACIÓN PULMONAR EVALUADOS POR EL CAT Y SU RELACIÓN CON ACTIVIDAD

EFFECT OF PULMONARY REHABILITATION ASSESSED BY CAT AND ITS RELATION TO ACTIVITY TOLERANCE

DOI 10.33194/rper.2019.v2.n1.01.4566 | Submitted 12.03.2019 | Approved 27.06.2019

 **Luis Gaspar¹; Paula Martins¹; Fátima Gomes¹**

1 - Centro Hospitalar e Universitário São João

RESUMO

A Doença Pulmonar Obstrutiva Crónica (DPOC) caracteriza-se por limitação crónica, progressiva e não totalmente reversível do fluxo aéreo, limitando por vezes o autocuidado.

Anteriormente caracterizada pela dispneia, reconhece-se atualmente a necessidade de uma avaliação sintomática mais abrangente recomendando-se entre outros instrumentos o COPD Assessment Test (CAT).

Sendo a Reabilitação Respiratória (RR) o tratamento não farmacológico recomendado neste contexto é objetivo deste estudo perceber qual o seu efeito no CAT e sua relação com a capacidade funcional (CF).

Estudo Quasi-Experimental com programa de Reabilitação Respiratória (PRR) de duração mediana de 13 semanas sendo o efeito no CAT e na CF avaliados no início e no final.

Incluídas 45 pessoas: 80% homens; idade média 65,82 anos e FEV1% médio 40%.

Verificou-se melhoria estatística e clinicamente significativas no CAT e na CF existindo entre as duas uma correlação negativa moderada.

Concluimos que este PRR reduziu a sintomatologia e aumentou a capacidade funcional em pessoas com DPOC.

Descritores: Enfermagem de Reabilitação, Reabilitação Respiratória; CAT; Tolerância à atividade; DPOC

RESUMEN

La Enfermedad Pulmonar Obstrutiva Crónica (EPOC) se caracteriza por una limitación crónica, progresiva y no totalmente reversible del flujo aéreo, provocando limitaciones funcionales importantes repercutidas en el autocuidado.

Anteriormente caracterizada únicamente por la disnea se reconoce actualmente la necesidad de una evaluación más amplia de los síntomas y se recomienda entre otros el uso del COPD Assessment Test (CAT).

La Rehabilitación Respiratoria (RR) es el tratamiento no farmacológico recomendado en este contexto, la meta de este estudio es saber cuál es su efecto en el CAT y su relación con la CF.

Estudio Quasi-Experimental con programa de Rehabilitación Respiratoria (PRR) de duración mediana de 13 semanas, 3X semana siendo su efecto en el CAT y en la CF evaluados al inicio y al final.

Se incluyeron a 45 personas: 80% hombres; edad media 65,82 años y FEV1% medio de 40%.

Se observó una mejora estadística ($p < 0,001$) y clínicamente significativas en el CAT y en la CF existiendo una correlación negativa moderada.

Concluimos que este programa de RR redujo la sintomatología y aumentó la capacidad funcional en personas con EPOC.

Palabras clave: Enfermería de Rehabilitación; Rehabilitación Pulmonar; CAT; Tolerancia a la actividad; EPOC

ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a common disease characterized by progressive airflow limitation, causing important functional impairment with repercussions on self-care. Previously characterized only by dyspnea, it is now recognized that a more comprehensive symptomatic assessment is needed, leading GOLD to recommend the COPD Assessment Test (CAT), among others.

Pulmonary Rehabilitation (PR) is the non-pharmacological treatment recommended in this context, and for that reason the goal of this investigation is to understand its effect on CAT as well as its relation with functional capacity (FC).

Quasi-Experimental Study with a Respiratory Rehabilitation Program (RRP) with a median duration of 13 weeks, with the effect on CAT and FC evaluated at the beginning and at the end.

Forty five patients were included: 80% men, mean age 65.82 years and mean forced expiratory volume in the first second (FEV1) of 40%.

Statistical and clinically significant improvements were found in both CAT and FC, with a moderate negative correlation between the two.

We conclude that this RRP reduced symptoms and increased FC in people with COPD.

Key words: Rehabilitation Nursing; Pulmonary Rehabilitation; CAT; Exercise tolerance; COPD

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is characterized by persistent airflow limitation.

In recent years there has been an increase in mortality and morbidity and it is estimated that it will be the third cause of death in 2020. ^{(1) (2)}

In Portugal, comparing the patient's records between 2011 and 2017, there was an increase from 54,000 to 136,958 cases, being the currently estimated prevalence of 14.2% for those over 40 years old, which should be around 800,000 people. ⁽²⁾

The degree of obstruction is associated with many symptoms of the disease; however it is poorly predictive of dyspnea and quality of life. ^{(1) (2) (3)}

In fact, respiratory function does not explain all the symptoms of the disease, resulting activity intolerance not solely from the loss of pulmonary function, but associated with impaired gas exchange and peripheral muscle dysfunction causing muscle fatigue (especially of the lower limbs) and dyspnea with important impact in self-care and quality of life. ⁽³⁾

This fact led Global Initiative for Chronic Obstructive Lung Disease (GOLD) to propose, since 2011, a new stratification of the disease, combining the risk of exacerbation, spirometry and symptomatic assessment ⁽¹⁾.

Symptoms resulting from the disease, especially dyspnea, activity intolerance and loss of lung function lead to the recognition of Respiratory Rehabilitation (especially due to the exercise training component) as a non-pharmacological treatment indicated for people with COPD. ^{(2) (3) (4) (5)} Provided that intervention of Rehabilitation Nurses must meet the individual needs of the person, increasing tolerance to the activity fundamentally through exercise training and the educational component, promoting functional independence and the adoption of healthy behaviors. ^{(4) (5)}

In this context, the initial assessment of respiratory rehabilitation programs is essential to determine the impact of the disease on the person, as well as understand the individual response and the health care sensitive gains of the respiratory rehabilitation program. ^{(3) (4) (6)}

In this sense, data on dyspnea, activity tolerance and quality of life should be evaluated, which can be easily collected using the COPD Assessment Test (CAT). ^{(4) (5) (6)}

This questionnaire contains eight questions centered on respiratory function data: cough, sputum, dyspnea and

limited chest expansion and also on non-respiratory data such as activity intolerance, sleep disturbances, and inability to perform activities of daily living. ^{(3) (4) (7)}

The CAT is a short assessment tool that simply quantifies the various impacts of disease symptoms and was developed to assess the health status and also to simplify communication between the sick person and the healthcare team.

It consists in 8 items answered along a 5-point Likert scale, with a maximum disease score of 40 points.

It is a self-administered questionnaire where scores range from 0 to 10 (mild), 11 to 20 (moderate), 21 to 30 (severe) and 31 to 40 (very severe). ^{(3) (4) (6) (7)}

The recent 2019 GOLD report recommends that people with a CAT greater than 10 points be stratified as highly symptomatic. ⁽²⁾

A decrease of 2 points in the CAT questionnaire is considered a relevant gain in health, making this value the least clinically significant difference, which is a very important indicator since it translates gains in health. ⁽⁸⁾

This study aimed to evaluate the effect of a respiratory rehabilitation program on the symptoms perceived by people with COPD assessed by the CAT and to understand its relationship with activity tolerance

In this sense, there were two questions that guided this investigation:

- What is the impact of a Respiratory Rehabilitation Program on symptoms, quality of life and exercise tolerance in people with COPD?
- What is the relationship between the changes assessed in the CAT and exercise tolerance in people with COPD undergoing a Respiratory Rehabilitation Program?

METHODS

Type of study

It is a quasi-Experimental Study with a respiratory rehabilitation program with an average duration of 13 weeks, 3 sessions per week.

Each session lasted an average of 1 hour and included exercise training. The educational session was held in the classroom and lasted 60 minutes. ⁽⁹⁾ (Table 1)

Sample

The sampling technique used was non-probabilistic for convenience and consisted of people with COPD who completed the respiratory rehabilitation program in the Kinesitherapy and Respiratory Rehabilitation Sector of Centro Hospitalar e Universitário de São João.

Inclusion criteria follow the GOLD recommendations published in 2019. ⁽¹⁾

Exclusion criteria used were failure to fully comply with the respiratory rehabilitation program, disability and/or formal contraindication for physical exercise, psychiatric illness or severe cognitive impairment, and exertion induced hypoxia refractory to oxygen.

Data Collection Instruments

The impact of the respiratory rehabilitation program on symptoms was assessed through the self-completion of CAT before and after the rehabilitation program.

The intensity of exercise training was assessed by the Cardio-Respiratory Exertion Test and the 1RM test according to the ERS/ATS guidelines. ^{(4) (5) (9) (11)}

Functional capacity was assessed at the beginning and at the end of the respiratory rehabilitation program using a six-minute walk test (variations after clinical intervention equal to or greater than 25 meters translate to clinical improvement). ^{(4) (8)}

Statistic analysis

In the analysis and statistical treatment of data, descriptive and inferential statistics were used.

Statistical treatment was performed using a nonparametric test for 2 related samples (Wilcoxon signed-rank test) for the variables under study

The statistical treatment was performed using the IBM® SPSS® Statistics version 23.0 program.

All data were expressed with mean values and standard deviation (SD) with a statistical significance level of 0.05 for all statistical tests.

| RESPIRATORY REHABILITATION PROGRAM | |
|--|--|
| PHYSICAL COMPONENT | |
| Muscle Strength Training (30 minutes) | Endurance Training (30 minutes) |
| <ul style="list-style-type: none"> • Upper limbs <ul style="list-style-type: none"> • Biceps • Triceps • Deltoid • Lower limbs <ul style="list-style-type: none"> • Quadriceps • Hamstring • Gastrocnemius • Pectoralis major • Latissimus dorsi | <ul style="list-style-type: none"> • Cycle ergometer <ul style="list-style-type: none"> • Lower limbs • Upper limbs • Rug |
| EDUCATIONAL COMPONENT | |

Educational sessions (60 minutes)

- Changes in the respiratory process
- Benefits of exercise and maintenance of regular physical activity
- Management of therapeutic regimen
- Energy management techniques
- Controlled ventilation techniques
- Prevention and early treatment of exacerbations

Table 1 - Respiratory Rehabilitation Program

This study was conducted in accordance with the required ethical imperatives, having guaranteed all deontological assumptions inherent to research ethics.

RESULTS

The study included 45 people (71.9% men) with a mean age of 65.82 years old with a mean FEV1% of 40%. (Table 2)

| | |
|--|---|
| N | 45 |
| Male | 36 |
| Female | 9 |
| Age | 65,82 years-old (Max:83, min:49) Standard deviation:11.01 |
| FEV1% | 40% (Max:70.6; min: 11.2) Standard deviation:17.57 |
| Initial six-minute walking test | 357.4 meters (Max:504; min: 0) Standard deviation: 97.5 |

Table 2 - Sample characterization

The CAT results show a statistically improvement ($p < 0.001$) in the overall test result with a mean variation of -7.67 (Table 3).

| | COPD Assessment Test | | | |
|------|----------------------|-------|---------|-----------|
| | Start | End | P Value | Variation |
| Mean | 23,62 | 15,96 | 0,001* | -7,67** |
| min | 10 | 10 | | |
| Max | 38 | 35 | | |
| DP | 6,66 | 4,88 | | |

* Statistically significant for $p < 0,005$

** Clinically significant for variation > 2 pontos

Table 3 - CAT Results

Functional capacity had a statistical ($p = 0.001$) and clinically significant variation with a mean variation of 32.4 meters in the six-minute walk test (Table 4).

| | 6-minute walk test | | | |
|------|--------------------|-------|---------|-----------|
| | Start | End | P Value | Variation |
| Mean | 357,4 | 389,9 | 0,001* | 32.4** |
| min | 0 | 120 | | |
| Max | 504 | 550 | | |
| DP | 97,5 | 87,91 | | |

* Statistically significant for $p < 0,005$

** Clinically significant for variation $>$ to 25 meters

Table 4 - Results 6 minutes walk test (6MWT)

Finally, it was found that there is a negative correlation between the two variables studied, more accentuated in the values after the respiratory rehabilitation program. (Table 5)

| | Pearson correlation | | |
|------------|---------------------|----------|--------------------|
| | Initial | Final | Δ Walk Test |
| CATInitial | -0,618* | | |
| CATFinal | | -0,744** | |
| II CAT | | | -0,507* |

* Moderate correlation p between -0.7 and -0.5

** Strong correlation p between -0.9 and -0.7

Table 5 - Correlation between CAT and Walk Test

DISCUSSION

This investigation aimed to assess the impact of a respiratory rehabilitation program on symptoms and to understand its relationship with activity tolerance in people with COPD.

Our investigation obtained results that overlap with those results found in the most recent published scientific evidence; they obtained clinically significant gains both in the symptoms variable (assessed by CAT) and in the functional capacity variable (assessed by 6MWT).

We also verified that there is a negative correlation between the two variables, more exacerbated in the results after the rehabilitation program, which can be explained by the fact that exercise training improves cardiovascular capacity and reduces oxygen consumption, leading to a consequent improvement in dyspnea and tolerance the activity.

Another important finding in our investigation supports the importance of individualizing rehabilitation programs, since the impact on daily life activities and social interaction achieved clinically significant gains, despite the variability found.

As mentioned above, respiratory rehabilitation is the non-pharmacological treatment indicated for the treatment of people with COPD, being a combination of complex interventions based on individualized assessment of the person that include, but are not limited to, education and exercise training. ^{(4) (5) (9) (12)}

Its success is due to its effect on reducing dyspnea and muscle fatigue present in approximately 68% of people with COPD in an outpatient setting, improving their physical and psychological condition and promoting the acquisition of self-management tools for the disease. ^{(5) (9)}

In this context, the initial assessment is of particular importance in order to better design and implement the exercise training program.

Likewise, it is essential to evaluate the result of our clinical practice in order to identify interventions with greater clinical benefit, as well as to provide more robustness to rehabilitation nursing care, improving not only clinical practice but also validating the knowledge guided by nursing theory.

In this context, the CAT emerges as an excellent assessment tool due to its simplicity and to translating the symptoms that usually reflect the person's problems.

Liu et al (2015) in an experimental study with a control group in a sample of 80 people concluded that despite the respiratory function being more compromised in the intervention group, the values of the walking test after respiratory rehabilitation were higher than those in the control group. This fact clearly shows that CAT is a valid instrument to assess respiratory function and activity tolerance. ⁽¹¹⁾

Candemir et al (2015), in a sample of 40 people with COPD undergoing an 8-week respiratory rehabilitation program, related the results obtained by CAT with dyspnea (assessed by the MRC), quality of life (assessed by the Saint George Respiratory Questionnaire), daily life activities (assessed by the London Chest of daily living) and exercise tolerance (assessed by the Incremental Shuttle Walking test and the Endurance Shuttle Walking Test) having concluded that CAT is positively correlated with Quality of life, a dyspnea and life activities and negatively with effort tolerance. It also suggests that CAT is a robust instrument to assess the results of respiratory rehabilitation programs since it analyzes all the variables normally used as an indicator of results in respiratory rehabilitation programs. ⁽¹²⁾

Dood et al (2015) carried out a larger multicenter quasi-experimental study with a sample of 261 people with COPD, assessing anxiety, depression, quality of life, activity tolerance and quality of life in addition to CAT, having concluded that CAT is a simple, practical, viable and easy-to-complete instrument, which should be an integral part of both initial and final assessments of respiratory rehabilitation programs. ⁽³⁾

The same result was reached by Houben-Wilke S. et al (2018), who carried out a quasi-experimental study with 497 people with COPD and which revealed a significant improvement in the CAT and 6MWT values after the respiratory rehabilitation program. ⁽⁶⁾

CONCLUSION

The current scientific evidence is unanimous in accepting exercise training and education as

fundamental pillars in the rehabilitation of people with COPD, reducing the main symptoms of the disease (dyspnea and muscle fatigue).

CAT is sensitive to these results, expressing the gains sensitive to Rehabilitation Nursing care, and should be adopted in the evaluation of respiratory rehabilitation programs.

BIBLIOGRAPHIC REFERENCES

1. GLOBAL STRATEGY FOR THE DIAGNOSIS, MANAGEMENT, AND PREVENTION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (2019 REPORT). GLOBAL INITIATIVE FOR CHRONIC OBSTRUCTIVE LUNG DISEASE; 2019.
2. PANORAMA DAS DOENÇAS RESPIRATÓRIAS EM PORTUGAL Retrato da saúde 2018 O estado da Saúde em Portugal. OBSERVATÓRIO NACIONAL DAS DOENÇAS RESPIRATÓRIAS; 2018.
3. Ferreira D, Gaspar L, Teodoro A, et al. Guia Orientador de Boa Prática - Reabilitação Respiratória. Ordem dos Enfermeiros ed. Lisboa; 2018.
4. Dood JW, Hogg L, Nolan J, Jefford H, et al. The COPD assessment test (CAT): Response to pulmonary rehabilitation. A multicentre prospective study. *Thorax*. 2011 Março; 66: p. 425-429.
5. Spruit MA, Singh SJ, Garvey C, et al. An Official American Thoracic Society/European Respiratory Society Statement: Key Concepts and Advances in Pulmonary Rehabilitation. *American Thoracic Society Documents*. 2013; 188: p. 13-63.
6. Houben-Wilke S, Janssen SJA, Franssen FM, et al. Contribution of individual COPD assessment test (CAT) items to CAT total score and effects of pulmonary rehabilitation on CAT scores. *Health and Quality of life outcomes*. 2018.
7. Kim S, Oh J, Kim YI, et al. Differences in classification of COPD group using COPD assessment test (CAT) or modified Medical Research Council (mMRC) dyspnea scores: a cross-sectional analyses. *BMC Pulmonary Medicine*. 2013;; p. 13-35.
8. Kon S, Canavan JL, Jones SE, et al. Minimum clinically important difference for the COPD Assessment Test: A prospective analysis. *Lancet Respiratory Medicine*. 2014;; p. 195-203.
9. Garvey C, Bayles MP, Hamm LF, et al. Pulmonary Rehabilitation Exercise Prescription in Chronic Obstructive Pulmonary Disease: Review of selected guidelines. *Journal of Cardiopulmonary Rehabilitation and Prevention*. 2016; 36: p. 75-83.
10. M S, F P, al MEe. Pulmonary Rehabilitation and Physical Activity in Patients with Chronic Obstructive Pulmonary Disease. *American Journal of Respiratory and Critical Care Medicine*. 2015; 192.
11. Gloeckl R, Pitta F, Marinov B. Pratical recommendations for exercise training in patients with COPD. *European Respiratory Review*. 2013 Junho;; p. 178-186.
12. Gaspar L. Treino aeróbico e de fortalecimento muscular no doente com patologia respiratória. *Enfermeiro: Anuário 2017*. 2017 Maio;;(Reabilitação Respiratória).
13. Liu J, Meng G, Ma Y, Zhang X, Dingmei C, Chen M. Influence of COPD Assessment text (CAT) evaluation and rehabilitation education guidance on thr respiratory and motor functions of COPD patients. *Open Medicine*. 2015; 19: p. 394-398.
14. Candemir I, Kaymaz D, Ergun P, Demir N, et al. Assessment of pulmonary rehabilitation efficacy in chronic obstructive pulmonary disease patients using the chronic obstructive pulmonary disease assessment test. *Expert Review of Respiratory Medicine*. 2015;; p. 487-492.

ENFERMAGEM DE REABILITAÇÃO NA PREVENÇÃO DE QUEDAS EM IDOSOS NO DOMICÍLIO

ENFERMERÍA DE REHABILITACIÓN EN LA PREVENCIÓN DE CAÍDAS EN ANCIANOS EN EL DOMICILIO

NURSING REHABILITATION IN THE PREVENTION OF FALLS IN THE ELDERLY PEOPLE AT HOME

DOI 10.33194/rper.2019.v2.n1.02.4571 | Submitted 24.04.2019 | Approved 27.06.2019

Jéssica Gomes¹; Carlos Miguel Soares²;  Maria José Bule³

1 - ULSLA - Hospital do Litoral Alentejano, Serviço de Ortopedia;
2 - ULSLA - Centro de Saúde de Sines, UCC1; 3 - Universidade de Évora

RESUMO

Objetivo: Identificar fatores intrínsecos e extrínsecos associados ao risco de queda em idosos no domicílio; Analisar o resultado de cuidados de Enfermagem de Reabilitação na diminuição do risco de queda em idosos no domicílio.

Métodos: Estudo de caso descritivo com três participantes que são utentes integrados na Equipa de Cuidados Continuados Integrados de uma Unidade de Cuidados na Comunidade, com alterações do foro neurológico e com alteração do equilíbrio, alvos de cuidados de enfermagem de reabilitação, e com potencial de recuperação.

Resultados: Durante oito semanas de implementação do programa de cuidados de enfermagem de reabilitação verificou-se a diminuição de fatores de risco intrínsecos para queda, relacionados com o equilíbrio, com as transferências e com a mobilidade. Ao avaliar os resultados obtidos é possível observar que todos os participantes obtiveram ganhos. De uma forma geral, em todos os casos houve ganhos na capacidade dos participantes executarem as AVD's (IB) em 45 pontos e um aumento do Equilíbrio (EEB) de 42 pontos. A evolução no grau de dependência ocorreu apenas em um caso, sendo que nos restantes dois manteve-se a dependência grave.

Conclusão: Os cuidados de enfermagem de reabilitação indiciam produzir ganhos no equilíbrio e na capacidade de execução dos autocuidados, o que consequentemente diminui o risco de queda em idosos no domicílio. A enfermagem de reabilitação no domicílio nas fases subagudas da doença neurológica pode potencializar estes resultados.

Descritores: Reabilitação, Idoso, Acidentes por Quedas

RESUMEN

Objetivo: Identificar factores intrínsecos y extrínsecos asociados a riesgos de caídas en ancianos en el hogar; Analizar el resultado de cuidados de enfermería de rehabilitación en la disminución de los riesgos de caídas de los ancianos en el hogar.

Métodos: Estudio de caso descriptivo con tres participantes que son pacientes que están integrados en el equipo de Cuidados Continuados Integrados de la Unidad de Cuidados de la Comunidad, con alteraciones de origen neurológicos y con alteración del equilibrio, objetivo de cuidados de la enfermería de rehabilitación con potencial de recuperación.

Resultados: Durante ocho semanas de implementación del programa de cuidados de enfermería de rehabilitación se verificó la disminución de factores de riesgos intrínsecos para la caída, relacionados con el equilibrio, las transferencias y la movilidad. Al evaluar los resultados obtenidos es posible observar que todos los participantes obtuvieron ganancias. En general, en todos los casos hubo ganancias en la capacidad de los participantes para ejecutar sus actividades de vida diarias en 45 puntos y un aumento del Equilibrio de 42 puntos. La evolución en el grado de dependencia ocurrió sólo en un caso, siendo que en los restantes dos se mantuvo la dependencia grave.

Conclusión: Los cuidados de enfermería de rehabilitación producen ganancias en el equilibrio y en la disminución de la dependencia, lo que disminuye el riesgo de caída en ancianos en el domicilio. La enfermería de rehabilitación en el domicilio en las fases subagudas de la enfermedad neurológica puede potenciar estos resultados.

Palabras clave: Enfermería de rehabilitación, Anciano, Caídas

ABSTRACT

Objective: To identify intrinsic and extrinsic factors associated with the risk of fall in the elderly people at home; To analyse the result of rehabilitation nursing care on decreasing the risk of fall in the elderly people at home.

Methodology: Descriptive case study with three participants who are patients that are integrated into long-term care team unit integrated in the community care, with neurological and balance changes, targets of rehabilitation nursing care with potential for recovery.

Results: During eight weeks of implementation of the rehabilitation nursing care program, there was a decrease in intrinsic risk factors for falls, related to balance, transfers and mobility. When evaluating the results obtained it is possible to observe that all the participants obtained gains. In all cases there were gains in the ability of the participants to perform your daily living activities the in 45 points and an increase in the Equilibrium of 42 points. The evolution in the degree of dependence occurred only in one case, and in the other two cases, severe dependence was maintained.

Conclusion: The rehabilitation nursing care produce gains in balance and decreased dependency which consequently reduces the risk of fall in the elderly at home. The rehabilitation nursing at home in subacute phases of neurological disease can enhance these results.

Keywords: Rehabilitation nursing, Elderly people, Falls.

INTRODUCTION

The Rehabilitation Nurse (RN) is the professional with scientific, technical and human competence to provide general and specialized care based on people's real and potential problems, as well as perform therapeutic interventions at the level of neurological, respiratory, cardiac functions, orthopedic and other situations that potentiate disability ⁽¹⁾. In this way, the RN seeks to enable the elderly to reach their maximum potential so that they can perform their daily activities, previously limited by the incapacity resulting from the disease ⁽²⁾.

The aging of the population is a phenomenon that has been worsening annually, which is shown by the aging index since 1961 with a growth from 27.5 to 153.2% in 2017, which means that in the year of 2017 there were 153.2 elderly people for every 100 young people (people under 15 years-old) ⁽³⁾.

The aging process entails anatomical and physiological changes that contribute to an increased risk of falls in the elderly. Changes in the visual and vestibular systems; central nervous system; cardiovascular system and musculoskeletal system are the ones that most contribute to this increase. These physiological changes are manifested in, for example, deficit in maintaining body balance and postural control, muscle atrophy and weakness and changes in cognitive functions such as memory, learning and awareness, which contribute either to the increased risk of falling or to the decreased ability to perform activities of daily living (ADL)⁽⁴⁾. The elderly functionality study carried out in Alentejo (903 participants) concluded that the decline in functionality increases with age, with some functions being preserved until 75 years of age. The data revealed that about 25% of the elderly people had memory disorders that required therapeutic intervention, 15% needed care aimed at hearing deficits, 58% had mostly low back and lower limb pain, 11% needed help in carrying out daily routines and 32.2% needed help to move. Also in the same study, the need for help in self-care varied between 2.8% and 7.5% in activities of elimination and clothing, respectively ⁽⁵⁾.

In Europe, falls represent one of the main causes of injury in the elderly, with one in every three elderly people suffering a domestic accident each year and one in every two elderly people having a fall at least once a year. Approximately one in five of these falls requires medical care and one in twenty falls results in fracture⁽⁶⁾. Falls entail consequences responsible for

autonomy loss, or even significantly disability which affect elderly people and their caregivers' quality of life ⁽⁷⁾.

The General Directorate of Health and the MAPFRE Foundation⁽⁸⁾ classify the risk factors for falls into two: intrinsic and extrinsic risk factors. Intrinsic factors are related to the person and the physiological aging process and reflect their inability to maintain or recover balance when there is a change in the center of gravity. The extrinsic factors are, in turn, associated with home and leisure environment in which the person is found. At home, the presence of poor lighting, loose carpets, inexistence of handrails in bathrooms or stairs, and slippery pavement enhance the occurrence of accidents.

In this sense, it is essential that there is a set of preventive actions that promote a rehabilitation program with the elderly population with preventive measures for falls, suitable for each user and the respective physiological changes identified. A physical exercise program improves physical performance and reduces the risk of falls by 23% in an active elderly population⁽⁹⁾. This fact is also corroborated by the authors Daly et al ⁽¹⁰⁾, who demonstrate a reduction in falls through muscle strengthening and balance programs, hence why they suggest their implementation at the community level.

The application of this rehabilitation nursing program then emerged from the needs of the target population and the project objectives were: to identify intrinsic and extrinsic factors associated with the risk of falling in the elderly people at home; to analyze the result of rehabilitation nursing care in reducing the risk of falling in the elderly people at home.

METHOD

It is a multiple, descriptive case study ⁽¹¹⁾. It was carried out in the final stage of the Master's Degree in Nursing, specialization area of Rehabilitation Nursing from September to November 2018 in a Community Care Unit (CCU), belonging to the Local Health Unit of the Alentejo Coast (*Unidade Local de Saúde do Litoral Alentejano* - ULSLA). The participants were selected according to the following criteria: being 70 years old

or older, being the target of care by the RN of the CCU, presenting neurological disorders and altered balance.

The data collection was carried out between September 24 and November 16, 2018 and data on the sociodemographic characterization and the health condition/neurological changes of the users were collected in a grid prepared for this purpose by consulting the data from the clinical processes, observation and interview with the user and his/her caregiver.

In order to assess the intrinsic factors for falls, the following instruments were used: the Barthel Index (BI)⁽¹²⁾, which allowed us to assess the degree of dependence on ADL; the Berg Balance Scale (BBS)⁽¹³⁾ to assess the dynamic and static functional balance and to predict the risk of falling; and an observation grid drawn from the literature review that allowed for the assessment of existing changes in hearing, vision and elimination, and collection of data on regular medication and diagnosed pathologies that influenced the risk of falling.

The extrinsic risk factors for falls were identified by the Environmental Fall Risk Scale⁽¹⁴⁾. This scale allowed an assessment of home safety based on the following parameters: indoor and outdoor lighting and the presence of obstacles in the bedroom, bathroom, kitchen and stairs.

Based on the diagnostic evaluation, therapeutic intervention was planned⁽¹⁵⁾. The rehabilitation nursing intervention program was implemented for 8 weeks in the patients' homes in sessions of 30minutes-1hour twice a week, all of whom entered the program at the same time. The plan consisted of interventions aimed at increasing muscle strengthening and balance and optimizing the physical space of the patients' homes, as explained below.

The evaluation of results was carried out using the instruments used for diagnosis.

The intervention project was approved by the sub-region Ethics Committee where the CCU is located⁽¹⁶⁾. The users were asked to consent for participation, in accordance with the principles of the Declaration of Helsinki and the DGS rule^(15;16).

Three case studies were carried out below designated as A1, A2 and A3. The data were analyzed using descriptive techniques.

RESULTS

The participants are female aged 79, 86 and 90 years-old. Two of the women are married, live with their husband and receive support from informal caregivers. The case A3, widow, lives alone, receives support from her daughter and also from an informal caregiver. Low education is common to all participants. The two least elderly participants are those who have a history of falls and in both the accident occurred at home (Table 1).

| | A1 | A2 | A3 |
|------------------------|--|---|---|
| Age | 79 | 86 | 90 |
| Gender | Female | Female | Female |
| Nationality | Portuguese | Portuguese | Portuguese |
| Marital status | Married | Married | Widow |
| Family members | Lives with husband and has the support of an informal caregiver | Lives with husband and has the support of an informal caregiver | Lives alone with the support of her daughter and informal caregiver |
| Education level | 4th grade | 4th grade | No formal education |
| Profission | Retired | Retired | Retired |
| Fall history | 1 When transferring from bed to chair because it was not locked | 1 in the bathroom caused by imbalance | No fall history |

Table 1 - Sociodemographic Description of Participants

Study of A1Case

On October 20, 2017, the patient was admitted to the Emergency Department due to loss of strength in the right hemibody and aphasia when waking up. CT-brain (Brain Computed Axial Tomography) was performed, which revealed ischemic stroke of the left Middle Cerebral Artery. During hospitalization, she remained awake, apparently oriented, with right hemiplegia and aphasia monitored by Physical Medicine and Rehabilitation. On November 8th, she was discharged home where she waited until January 22nd, when she had a vacancy and joined the Medium Duration Continuing Care and Rehabilitation Unit, where she joined. Upon discharge home, the patient was dysarthric, without dysphagia and dependent on ADLs.

At home, the user is motivated for her rehabilitation process. She had right hemiparesis, with a severe decrease in strength in the right upper limb (1/5 Oxford Scale) and a slight decrease in the right lower limb (4/5 Oxford Scale). As intrinsic risk factors for falls, she had decreased hearing. She was undergoing sleep-inducing therapy and had a fall in the room because the wheelchair was not locked at the time of transfer.

Study of A2 Case

On December 6, 2017, the patient was admitted to the Emergency Department due to loss of strength in the right hemibody, dysarthria and deviation of the labial commissure. CT-brain was performed, which revealed left frontotemporoinsular ischemic stroke. During hospitalization, the patient remained alert, oriented, dysarthric and with right upper limb plegia and grade 1/5 (Oxford scale) right lower limb paresis. Patient was

monitored by Physical Medicine and Rehabilitation. On January 16, 2018, she was discharged to a Medium Term Continuing Care and Rehabilitation Unit. At discharge, the patient was dysarthric, without dysphagia, dependent on ADLs, with a slight decrease in functionality.

At home, the patient was motivated for rehabilitation process. She had right hemiparesis, with a severe decrease in strength in the right upper limb (2/5 Oxford Scale) and a moderate decrease in the right lower limb (3/5 Oxford Scale).

As intrinsic risk factors for falls, the patient had decreased hearing. She was undergoing sleep-inducing, diuretic and anti-hypertensive therapy and had a fall in the bathroom due to imbalance at the time of transfer, when trying to do it without help.

Study of A3 Case

On July 18, 2018, the patient was admitted to the Emergency Department with loss of strength in the left hemibody and aphasia. CT-brain revealed thalamic hemorrhagic stroke in the right hemisphere. During hospitalization she remained awake, oriented, dysarthric and with grade 3/5 left upper and lower limb paresis (Oxford Scale). On admission, she was followed up in the Physical Medicine and Rehabilitation specialty. On July 26, 2018, she was discharged home.

At home, the patient was motivated for rehabilitation process. She had left upper limb paresis, with a slight decrease in strength in the left upper limb (4/5 Oxford Scale) and normal strength in the left lower limb (5/5 Oxford Scale).

As intrinsic risk factors for falls, she had uncompensated hearing and vision impairment and was taking antihypertensive therapy.

Rehabilitation Nursing Intervention

The analysis of the initial assessment data led to the formulation of the RN diagnoses present in each user (Table 2):

| Users | Identified diagnoses |
|-------|--|
| A1 | Highly dependent on walking; Moderately dependent on Transferring; Compromised Body Balance; Decreased Muscle Movement; Present Falls Risk, in Moderate Degree |
| A2 | Highly dependent on walking; Moderately dependent on Transferring; Compromised Body Balance; Decreased Muscle Movement; Present Falls Risk, in High Degree |

| | |
|----|--|
| A3 | Highly dependent on walking; Highly dependent on Transferring; Compromised Body Balance; Decreased Muscle Movement; Present Falls Risk, in High Degree |
|----|--|

Table 2 – Rehabilitation Nursing Diagnoses
(Source: adapted from the Order of Nurses (17))

Regarding walking, all users had difficulty. In all cases, the use of a walking aid was encouraged and trained, namely the walking stick in cases A1 and A2 and walking frame in case A3. In addition to this, maneuvers such as turning, sitting and standing and overcoming obstacles present in their homes were also trained.

For the transfers, several techniques were trained, such as rolling and sitting in bed, static and dynamic seated balance, moving to an upright position, turning 180° and sitting with controlled descent in a wheelchair.

The participants had compromised body balance, and techniques were trained to recover static and dynamic balance, both in the sitting and upright positions. The training started in a sitting position with feet supported and trunk free for 1 min, followed by 10 repetitions with elevation of the upper limbs to the right and to the left, forward and upwards and 10 repetitions of trunk balance back and forth. Subsequently, static balance was trained in the upright position: without support for 20 seconds with eyes open, and then with eyes closed; with feet together for 30 seconds and with one foot in front of the other for another 30 seconds. In dynamic balance in the upright position, the following techniques were trained: from a sitting position to a standing position and vice versa; sit with your back unsupported, with your feet flat on the floor and lean forward with your upper limb extended. In all trained techniques, postural correction was always encouraged and the exercise time was gradually increased.

Regarding muscle movement, it was reduced in all cases due to pathologies and associated limitations. Muscle and joint exercise techniques were trained, namely: assisted and resisted active mobilizations, sitting and standing up without leaning more than 6 times; flexion of the thigh-femoral joint 6 to 8 times; with feet supported, swing for more than 30 seconds; bending the trunk with hands on the waist to the right and left more than 20 times and therapeutic exercises in bed such as the bridge, rolling to the healthy side and to the affected side and controlled rotation of the hip. In all trained techniques, the exercise time was increased according to the users' capacity ⁽¹⁸⁾.

All techniques were trained in the presence of caregivers, so that they could perform and train with users safely and effectively.

The evaluations of the users' homes were included and the respective teachings were carried out to family members and caregivers so that they could understand the importance of organizing the space and maintaining free access to increase safety and reduce the risk of falls at home.

In A1 user's home, the main external factor for falls identified was the building's stairs, as it did not have a bilateral handrail or non-slip coating. The husband carried out adaptation works in the bathroom and optimized the rest of the physical space in the house.

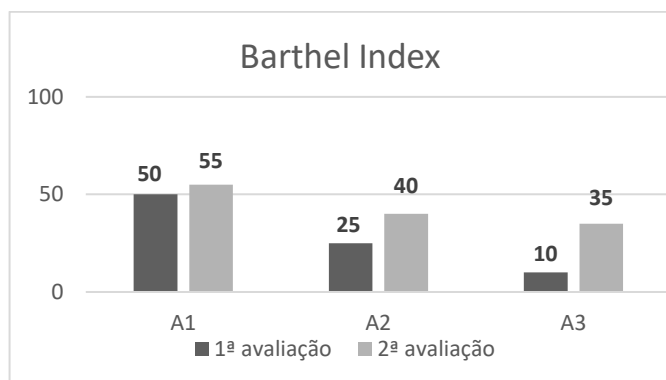
Regarding the extrinsic factors present in the A2 user's home, the main problem was in the walking areas as it were not free from obstructions. The caregiver was encouraged to clear them, facilitating circulation in the house areas. Although the bathroom has undergone works, these were not carried out properly, since the handrail was placed on the opposite side and the shower cabin was raised relative to the ground, which prevented the user from transferring easily.

In the A3 user's home, the main problem was the bathroom, as it did not have support bars that facilitated its transfer and because it had a bathtub that prevented the user from being transferred easily. The family optimized the remaining physical space in the house, leaving the circulation areas unobstructed.

DISCUSSION

Following the case study methodology of Yin, Robert⁽¹¹⁾, the phase of gathering the results obtained through the evaluation of users follows.

When evaluating the results obtained, it is possible that in all cases there were gains in the participants' ability to perform the ADL's (BI) in 45 points. The evolution between the first and second assessments is illustrated in Graphic 1.



Graphic 1 - Dependence on participants' ADLs before and after rehabilitation nursing intervention

User A1 continued to have a serious dependence on self-care, despite having obtained gains in transfers. User A2 also maintained the level of dependency as serious, despite having obtained gains essentially in transfers and mobility. In the case of user A3, it is possible to notice a positive evolution from total dependence to severe dependence, with the greatest evolution in mobility. Regarding walking self-care, all users were able to walk around the house with a walking aid, with supervision and occasional help. In case A2, the results were less evident due to the presence of joint knee instability of the affected hemibody, which made

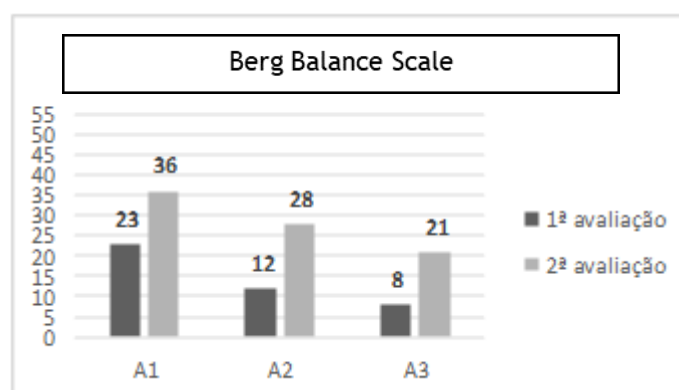
walking difficult. The results obtained in self-care transfer were independence in sitting with controlled descent and moving to a standing position in cases A1 and A2. Case A3 maintained the need for support to assume the standing position.

The results obtained in independence (BI) are corroborated by Hager et al⁽¹⁹⁾, who also concluded in their study that physical exercise programs at home to prevent falls are effective in reducing risk factors. Furthermore, they improve the balance, strength and functional capacity of the elderly.

Martinez-Velilla et al⁽²⁰⁾ also demonstrated through their study with 370 elderly people that the implementation of a physical activity program prevents the functional decline of users, with an improvement of about 6.9 points in the BI in the intervention group (exercise program twice a day) when compared to the control group.

In another study carried out by Kato et al⁽²¹⁾, a physical exercise program was applied for 12 weeks, whose interventions were: sitting down and getting up from a chair and walking in the same place. At the end of the intervention, it was possible to obtain a gain of about 11.6% in the BI, when compared to the intervention group to the control group.

After the application of the program, there was a decrease in intrinsic risk factors for falls, related to balance, as shown in Graphic 2.



Graphic 2 - Balance of participants before and after rehabilitation nursing intervention

As for the results obtained from the BBS, the diagnostic evaluation classified two participants as being at high risk and one at medium risk of falling. Two participants went from high to medium risk, and only in one of the cases there was no reduction in risk. In users A1 and A2, the biggest gains were essentially at the level of moving from a sitting position to a standing position, going from minimal help to being able to stand independently with the help of the hands. Regarding the change from standing to sitting, users were able to sit with the use of their hands to control the descent, and at the end of the assessment they were able to do it with minimal use of their hands. Regarding the A3 user, the main gains obtained were in static balance, both in the sitting and standing position. Sitting without trunk support, the user increased the execution time from 10 seconds to 2

minutes with supervision. In the unsupported standing position with eyes closed, the user needed help to avoid falling and was able to do it autonomously for 3 seconds.

Also in the study by Hess and Woollacott, M⁽²²⁾ applied to the elderly people for 10 weeks through high-intensity exercise, it was possible to observe an evolution in the BBS score from 48.8 at the beginning of the program to 51.2 points in the end of period.

The results obtained through the evaluation by the BI and the BBS demonstrate the need for users with neurological disorders to have interventions aimed at promoting autonomy in self-care, in order to reduce the risk of falling associated during its execution, namely in walking and transferring. From these results emerges the reflection that the best response was found in the A3 user who had a stroke not so long ago.

CONCLUSION

The specific competences of the Rehabilitation nurses are to take care of people with special needs throughout the life cycle, in all contexts of care practice, to train the person with a disability, activity limitation and/or participation restriction for the reintegration and exercise of citizenship and maximize functionality by developing the person's capabilities.

Based on the identified needs, specialized and individualized intervention plans were designed in order to maximize their capabilities and reduce their limitations, thus allowing for better motor performance. The intervention plans included muscle strengthening and balance training programs in order to promote adaptation to the limitations resulting from the pathology, reduce the risk of falling and maximize autonomy, thus predicting repercussions on their social reintegration and quality of life at home. These training programs were designed according to the users' objectives and taking into account the pathology and individual needs of each one, in order to promote their rehabilitation.

The implementation of the intervention program by the RN indicates that it has benefits in obtaining gains in balance and in the ability to carry out self-care, which consequently reduces the risk of falls in the elderly at home.

As limitations of the work, the reduced number of study participants can be pointed out, with a larger number having a greater representation of the population. In the future, more research studies in this area are suggested that can corroborate the data presented and that can value the work and the impact that RNs interventions have on the users' quality of life.

BIBLIOGRAPHIC REFERENCES

- Ordem dos Enfermeiros. Regulamento das Competências Específicas do Enfermeiro Especialista em Enfermagem de Reabilitação. [Online] 2010. <https://www.ordemenfermeiros.pt/arquivo/-de-p%C3%A1ginas-antigas/regulamento-das-compet%C3%Aancias-comuns-do-enfermeiroespecialista-e-regulamentos-das-compet%C3%Aancias-espec%C3%ADficas-das-especialidades-em-enfermagem/>.
- Marques-Vieira, C, Amaral, T e Pontifice-Sousa, P. Contributos para um Envelhecimento Ativo. [autor do livro] C Marques-Vieira e L Sousa. *Cuidados de Enfermagem de Reabilitação à Pessoa ao longo da Vida*. Loures : Lusodidacta, 2017: 525-34.
- Instituto Nacional de Estatística. *Indicadores de envelhecimento*. [Online] 2018. <https://www.pordata.pt/Portugal/Indicadores+de+envelhecimento-526>.
- Esquenazi, D; Silva, S e Guimarães, M. Aspectos fisiopatológicos do envelhecimento humano e quedas em idosos. *Revista HUPE*. 2014; 13 (2): 11-20.
- Lopes, M. A avaliação da funcionalidade dos idosos: uma forma de diagnosticar o estado de saúde e avaliar a eficácia dos cuidados. Conferência Internacional sobre Enfermagem Geriátrica. Livro de Atas. Lisboa. 2012
- Petridou, ET; Dikalioti, SK; Dessypris, N; Skalkidis, I; Basbone, F; Fitzpatrick, P et al. The evolution of unintentional injury mortality among elderly in Europe. s.l. : *J Aging Health*. 2008; 20: 159-82.
- Verbrugge, IM e Jette, AM. The disablement process. s.l. : *Soc. Sci. Med.* 1994; 38 (1): 1-14.
- Direção-Geral da Saúde e Fundação MAPFRE. Programa Nacional de Prevenção de Acidentes. Projeto: Com Mais Cuidado - Prevenção de acidentes domésticos com pessoas idosas. Manual de Apoio e Formulário. Lisboa : s.n., 2012.
- Freiberger, E; Menz, H; Abu-Omar, K; Rütten, A. Preventing Falls in Physically Active. *Gerontology*. 2007; 53: 298-305.
- Daly, R; Duckham, R; Tait, J; Rantalainen, T; Nowson, C; Taaffe, D et al. Effectiveness of dual-task functional power training for preventing falls in older people: study protocol for a cluster randomised controlled trial. *Daly et al. Trials*. 2015; 16:120.
- Yin, Robert K. *Estudo de Caso: Planejamento e Métodos*. 4ªed. Porto Alegre : Bookman. 2010.
- Araujo, F; Ribeiro, J; Oliveira, A; Pinto, C. Validação do Índice de Barthel numa amostra de Idosos não Institucionalizados. *Qualidade de Vida*. 2007; 25 (2): 59-66.
- Ordem dos Enfermeiros. Instrumentos de colheita de dados para a documentação dos Cuidados Especializados em Enfermagem de Reabilitação. [Online] 2016. https://www.ordemenfermeiros.pt/arquivo/colegios/Documentos/2017/InstRecolhaDadosDocumentacaoCuidEnfReabilitacao_Fin al_2017.pdf.
- Victorian Quality Council. Minimising the Risk of Fall & Fall - related injuries. Sub-acute and Residential Care. [Online] 2004. <http://www.networkofcare.org/library/Guidelines%20for%20Fall%20Prevention%20in%20Acute,%20Subacute%20and%20Residential%20Care%20Settings.pdf>.
- Lopes, M. A relação entre enfermeiro-doente como intervenção terapêutica: proposta de uma teria de médio alcance. Coimbra : Formasau. 2006.
- Norma 015/2013. Consentimento Informado, Esclarecido e Livre Dado por Escrito. DGS. 2013.
- Assembleia Geral da WMA. Declaração de Helsinque da Associação Médica Mundial. Princípio éticos para pesquisa médica envolvendo seres humanos. outubro de 2013.
- Ordem dos Enfermeiros. Padrão Documental dos Cuidados de Enfermagem da Especialidade de Enfermagem de Reabilitação. [Online] 2015. https://www.ordemenfermeiros.pt/arquivo/colegios/Documentos/2015/MCEER_Assembleia/PadraoDocumental_EER.pdf.
- Hager, A; Mathieu, N; Lenoble-Hoskovec, C; Swanenburg, J; Bie, R; Hilfiker, R. Effects of three home-based exercise programmes regarding falls, quality of life and exercise adherence in older adults at risk of falling: protocol for a randomized controlled trial. *BMC Geriatrics*. 2019; 19(13): 1-11.
- Martinez-Velilla, N; Casas-Herrero, A; Zambom-Ferraresi, F; Lopez, M; Lucia, A; Galbete, A, et al. Effect of Exercise Intervention on Functional Decline in Very Elderly Patients During Acute Hospitalization: A Randomized Clinical Trial. *JAMA Intern Med*. 2018.
- Kato, Y; Islam, M; Koizumi, D; Rogers, M; Takeshima, N. Effects

of a 12-week marching in place and chair rise daily exercise intervention on ADL and functional mobility in frail older adults. *J. Phys. Ther. Sci.* 2018; 30(4): 549-554.


22. Hess, J e Woollacott, M. Effect og high-intensity strenght-training on functional measures of ballance ability in balance-impaired older adults. *J Manipulative Psysiol Ther.* 2005; 28(8): 582-90.

EXERCÍCIO FÍSICO EM PESSOAS COM DIABETES: REVISÃO SISTEMÁTICA DE LITERATURA

EJERCICIO FÍSICO EN PERSONAS CON DIABETES: REVISIÓN SISTEMÁTICA DE LITERATURA

PHYSICAL EXERCISE IN PEOPLE WITH DIABETES: SYSTEMATIC REVIEW OF LITERATURE

DOI 10.33194/rper.2019.v2.n1.03.4564 | Submitted 05.03.2019 | Approved 27.06.2019

 Lénia Alexandra Ramos Loureiro¹;  Maria Isabel Vaz Afonso²;  Patrícia da Silva Ribeiro³;  Ana Cristina Nunes Mesquita⁴;  Helena Castelhão Figueira Carlos Pestana⁴;  Luís Manuel Mota de Sousa⁵

1 - Unidade de Cuidados Continuados na ASFE Saúde, Portugal; 2- Centro hospitalar Lisboa Ocidental, Hospital Egas Moniz, Portugal; 3 - Centro Hospitalar Lisboa Norte, Hospital Santa Maria, Lisboa, Portugal; 4- . Escola Superior de saúde Atlântica, Barcarena, Portugal; 5 - Universidade de Évora, Escola Superior de Enfermagem S. João de Deus, Évora, Portugal

RESUMO

Introdução: A Diabetes mellitus é caracterizada como um conjunto de alterações metabólicas, manifestada por hiperglicemia crónica. A atividade física surge neste contexto como uma estratégia positiva no processo terapêutico da diabetes.

Objetivo: Avaliar os efeitos do exercício físico em pessoas com diabetes.

Método: Revisão Sistemática da Literatura através do método PICO com a seguinte questão de pesquisa: Quais os benefícios do exercício físico na pessoa com diabetes? A pesquisa foi realizada com recurso a plataformas de bases de dados eletrónicas EBSCOhost, Medline e BVS tendo identificado, selecionado e avaliado a qualidade metodológica, incluindo artigos em acordo com as recomendações do PRISMA.

Resultados: Foram incluídos 9 estudos que cumpriam os critérios de elegibilidade e qualidade metodológica definidos para esta revisão. O exercício físico traz benefícios para a pessoa com diabetes nomeadamente a nível da redução da glicose plasmática em jejum e dos valores da hemoglobina glicada, assim como, melhoria da qualidade de vida.

Conclusões: A prescrição de exercícios físico em pessoas com diabetes pode ser um adjuvante no tratamento desta condição com benefícios no controlo metabólico e qualidade de vida.

Descritores: Diabetes; Exercício Físico; Glicémia; Enfermagem em Reabilitação.

RESUMEN

Introducción: La diabetes mellitus es caracterizada como un conjunto de alteraciones metabólicas, manifestada por hiperglucemia crónica. La actividad física surge en este contexto como una estrategia positiva en el proceso terapéutico de la diabetes.

Objetivo: Evaluar los efectos del ejercicio físico en las personas con diabetes.

Método: Revisión Sistemática de la Literatura. Se utilizó el método PICO con la siguiente pregunta de investigación: ¿Cuáles son los beneficios del ejercicio físico en la persona con diabetes? La pesquisa se realizó utilizando plataformas de bases de datos electrónicas EBSCOhost, Medline y BVS, identificando, seleccionando y evaluando la calidad metodológica, incluyendo artículos de acuerdo con las recomendaciones del PRISMA.

Resultados: Se incluyeron 9 estudios que cumplían los criterios de elegibilidad y calidad metodológica definidos para esta revisión. El ejercicio físico trae beneficios para la persona con diabetes, especialmente en la reducción de la glucosa plasmática en ayuno y de los valores de la hemoglobina glucosa, así como la mejora de la calidad de vida.

Conclusiones: La prescripción de ejercicios físicos en personas con diabetes puede ser un adyuvante en el tratamiento de esta condición con beneficios en el control metabólico y calidad de vida.

Descriptores: Diabetes; Ejercicio físico; Glucemia; Enfermería en Rehabilitación.

ABSTRACT

Background: Diabetes mellitus is characterized as group of metabolic alterations manifested by chronic hyperglycemia. Physical exercise has been shown as a positive strategy in the diabetes therapeutic process.

Objective: To access physical exercise effects on people with diabetes.

Methods: Systematic Review of Literature through the PICO method with the following research question: What are the benefits of physical exercise in a diabetic person? The research was carried out by using the electronic database platforms: EBSCOhost, Medline and BVS. The methodological quality was identified, selected, evaluated and we included the scientific papers that were according to PRISMA recommendations.

Results: 9 studies were included; they fulfilled the eligibility and methodological quality criteria.

Conclusion: The physical exercise prescription in people with diabetes can be an adjuvant in the treatment of this condition with metabolic control benefits, and improve quality of life.

Keywords: Diabetes; Physical Exercise; Glycemia; Rehabilitation Nursing.

INTRODUCTION

Diabetes mellitus is defined as a set of metabolic changes characterized by chronic hyperglycemia, which occur due to the destruction of beta cells in the pancreas, resistance to the action and/or insulin secretion disorders⁽¹⁾.

Diabetes mellitus can be classified into the following categories: type 1 diabetes, type 2 diabetes, gestational diabetes mellitus and diabetes originating from other specific causes⁽²⁻³⁾. However, the study will focus on type 1 and type 2 diabetes mellitus.

Type 1 diabetes mellitus arises when beta cells are destroyed, leading to deficient production of insulin in the body. The cause for this type of diabetes is not known yet. The symptoms include: excessive thirst, frequent urination, hunger, weight loss, changes in vision and fatigue⁽²⁻³⁾.

Type 2 diabetes mellitus occurs due to an alteration in insulin secretion leading to body insulin resistance. This type of diabetes is one of the most frequent and the symptoms are very similar to type 1 diabetes mellitus, but generally less evident or even absent⁽²⁻³⁾.

Diabetes mellitus has become one of the most important public health challenges of the 21st century. Until the last decade, it was underestimated, and currently it is seen as a threat to global public health⁽⁴⁾.

In 2014, worldwide, it was estimated that 422 million adults had diabetes, an increase compared to 1980, which had a prevalence of 108 million people. The overall (age-standardized) prevalence of diabetes has nearly doubled since 1980, rising from 4.7% to 8.5% in adults. This increase is associated with risk factors such as overweight or obesity⁽³⁾.

In Portugal, there is a statistically significant difference in the prevalence of Diabetes between men (15.9%) and women (10.9%), as well as the existence of a strong increase in the prevalence of diabetes with age (more than one quarter of people aged 60-79 years have diabetes)⁽⁵⁾.

Among the various types of diabetes, type 2 diabetes mellitus is the most common, representing about 90-95% of cases⁽⁶⁾. Some risk factors for this type of diabetes are: genetics, ethnicity, age (non-modifiable factors), overweight or obesity, unhealthy diet, insufficient physical activity and smoking (factors modifiable through behavioral and environmental changes)⁽³⁾.

Regular physical activity is important for everyone, but it is especially relevant for people with diabetes, being considered as an adjuvant in prevention and treatment⁽⁷⁾.

Physical activity includes all movements that result in energy expenditure above the resting level. Physical exercise, on the other hand, is a type of activity that consists of programmed, structured and systematically repetitive body movements that aim to improve physical preparation⁽⁶⁾.

Physical exercise, in addition to healthy eating habits, is one of the first strategies recommended for people newly diagnosed with type 2 diabetes mellitus, bringing benefits in terms of reducing the risk of diabetes and increasing blood glucose⁽³⁾ being essential for cardiovascular risk reduction, weight loss or control and general well-being. Physical exercise, whether aerobic, resistance or a combination, facilitates glucose regulation. High-intensity interval exercise is effective and has the advantage of being very efficient in terms of time⁽⁷⁾.

Regular physical exercise also brings considerable benefits to the health of people with type 1 diabetes mellitus, specifically, at the cardiovascular level, muscle strength and insulin sensitivity⁽⁶⁾.

Aerobic exercise is a type of exercise that involves continuous and rhythmic movements of large muscle groups, such as walking, running and cycling.⁽⁸⁾ This impacts on the increase in mitochondrial density, insulin sensitivity, oxidative enzymes, blood vessel reactivity, pulmonary function, immune function and cardiac output. In type 1 diabetes mellitus, aerobic exercise increases cardiorespiratory fitness, decreases insulin resistance and improves lipid levels and endothelial function⁽⁶⁾, while in people with type 2 diabetes mellitus, it improves blood glucose control, insulin sensitivity, oxidative capacity and important related metabolic parameters⁽⁸⁾.

Resistance exercise is synonymous of strength training and includes movements using free weights, weight machines, body weight exercises or elastic resistance bands⁽⁸⁾. At the level of type 1 diabetes mellitus, resistance exercise in the control of capillary blood glucose is not well defined, however it can help to minimize the risk of hypoglycemia induced by physical exercise⁽⁶⁾. In people with type 2 diabetes mellitus, resistance exercise brings gains, namely in terms of strength, bone mineral density, blood pressure, lipid profile, cardiovascular health, insulin sensitivity and muscle mass⁽⁸⁾.

In relation to mobility and balance exercises, these are more relevant in elderly people with diabetes. The limited joint mobility often observed in this population results in part from the formation of advanced glycosylation end-products, which accumulate during normal aging and are accelerated by hyperglycemia⁽⁶⁾.

Stretching exercises contribute to increased mobility, but do not affect glycemic control, while balance exercises can reduce the risk of falls⁽⁶⁾.

The specialist nurse in rehabilitation nursing has specialized knowledge and skills, intervening in an individual and unique way, taking into account the needs, characteristics, abilities and tolerance of each person⁽⁹⁾.

It is also responsible for monitoring and implementing rehabilitation programs, evaluating and making the necessary adjustments in the care delivery process. In this way, it makes it possible to improve the quality of life, through the improvement of functionality and autonomy, involving physical, social and emotional dimensions⁽⁹⁾. This systematic literature review is intended to identify: "What are the benefits of physical exercise for people with diabetes?". It was chosen because of its current prevalence, which gives it special importance in the area of expertise of the Specialist Nurse in Rehabilitation Nursing.

Thus, this systematic literature review (SLR) aims to assess the effects of physical exercise in people with diabetes.

MATERIAL AND METHODS

Nursing Research is a systematic, scientific and rigorous method that seeks to develop and deepen knowledge in this area, seeking to answer questions or solutions to problems for the benefit of the person, family and community⁽¹⁰⁾.

Scientific investigations in the field of nursing have been increasing, especially clinical research, with well-designed methods and a strong level of evidence, in order to support evidence-based practice (EBP)⁽¹¹⁾.

SLR is a scientific methodology that makes it possible to identify, evaluate and abbreviate studies carried out by researchers, academics and health professionals. The starting point is a well-designed and formulated question using systematic and clear methods, also allowing for the collection and analysis of data from the studies that were included in the review⁽¹²⁻¹³⁾. For an analysis of all the available evidence, it is essential to follow the following steps: clearly define the objectives considering the eligibility criteria; explicit and reproducible methodology, systematic research that shows that all studies meet the eligibility criteria; evaluation of the authenticity of the results of the included studies⁽¹²⁻¹³⁾.

The research question of this study was conducted through the PICO method - Participant (Type of Participants); Intervention (Type of Intervention); Comparison (comparison); Outcomes (Type of Results), as shown in table 1.

| | |
|------------------|--|
| Participants (P) | People with diabetes |
| Intervention (I) | Physical activity |
| Comparison (C) | People with diabetes who do not exercise |
| Results (O) | Health benefits (e.g. well-being, quality of life...). |

Table 1 – PICO Method

Having said that, the following research question was defined for this Systematic Literature Review: **"What are the benefits of Physical Exercise for People with Diabetes?"**.

The research for the systematic review of the literature was defined as a function of the research question, the descriptors related to each of the components of the PICO strategy and keywords as shown in table 2. The descriptors were previously validated in the platform Descriptors in Health Sciences and Medical Subject Headings.

| Criteria | Starting Questions | Descriptors | Keywords |
|------------------|---|---|---|
| Participants (P) | People with Diabetes | Diabetes | |
| Intervention (I) | Physical exercise | Physical exercise Rehabilitation Nursing | Exercise Frequency, Intensity, Duration, Modality, Exercise Type |
| Comparison (C) | Diabetics who do not do physical exercise | | |
| Results (O) | Benefits to health | Glycemia quality of life | |

Table 2 – PICO Method, Descriptors and Keywords

The investigation took place in November 2018 through two independent surveys. Based on the aforementioned descriptors, the research was carried out in electronic database platforms: EBESCO host, Medline and Virtual Health Library.

Given the specificity of the topic and the large number of studies/articles found, it was necessary to define inclusion and exclusion criteria (Table 3) in order to help in the selection of studies/articles relevant to the development of the topic in question.

| Elegibility criteria | Inclusion criteria | Exclusion criteria |
|----------------------|--|--|
| Participants (P) | People with diabetes | People with other pathology |
| Intervention (I) | Physical exercise | |
| Study Design | Randomized Controlled Experimental Study | Systematic Literature Review, Other Quantitative Studies and Qualitative Studies |
| Time of publication | Article published between 2014 and 2018 | |
| Language | Article published in Portuguese, English and Spanish | |
| Article availability | Full article and open access | Incomplete article or incurring costs |

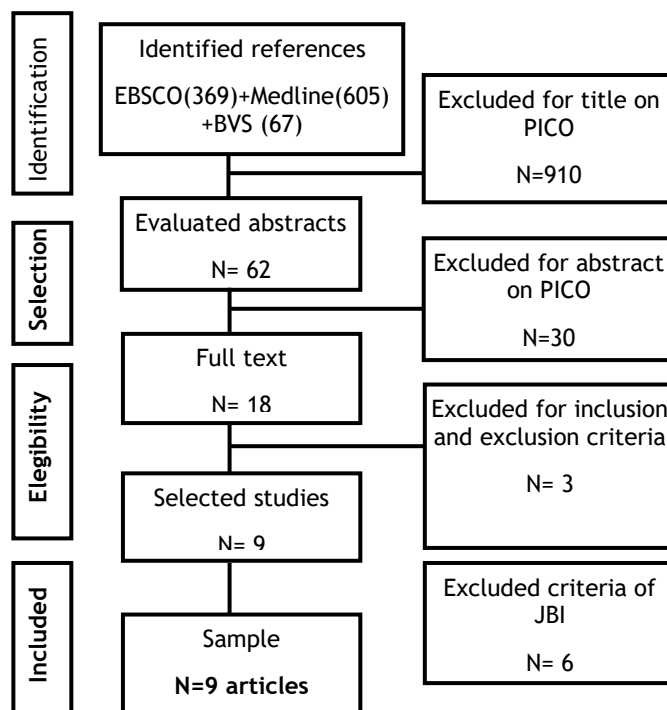
Table 3 - Eligibility Criteria

From the bibliographic research process carried out with this methodology, we obtained 1039 articles for the initial selection. Out of these, 910 were rejected by title or subject and 30 by abstract. Out of the resulting 18, 7 were excluded after analysis of the full text, as they did not meet the defined inclusion criteria, with the final result of 10 articles included that met the inclusion criteria.

Table 4 describes the process of combining descriptors and keywords for searching the databases. Figure 1 illustrates the PRISMA⁽¹⁴⁾ flowchart corresponding to the identification, analysis, selection and inclusion of articles.

| Boolean Conjugation | Medline | BVS | EBSCOhost |
|--|---------|-----|-----------|
| ((exercise)OR(physical activity))AND(diabetes) | 605 | 67 | |
| ((Physical activity) OR (Exercise)) AND (Diabetes) | | | 369 |
| Total of articles | 1039 | | |

Table 4 – Boolean Conjugation

Figure 1 – Identification, analysis and selection of articles.⁽¹⁴⁾

The articles selected for full reading were independently evaluated by two investigators, taking into consideration the methodological quality criteria proposed by the Joanna Briggs Institute (JBI), Assessment and Review of Information⁽¹⁵⁾ and articles which met more than 75% of the criteria were selected.

The information was extracted from the articles on authors, year, country, sample, data on physical exercise (modality, frequency, intensity, volume and duration), conclusions and level of evidence. The levels of evidence of the included studies were classified according to the criteria of the Registered Nurses Association of Ontario, as shown below: Ib-Evidence determined from at least one randomized controlled study⁽¹⁶⁻¹⁷⁾.

RESULTS

In this SLR, 9 articles were published in the following years: 2014^(20-21,23), 2015⁽¹⁹⁾, 2016⁽²⁴⁾ and 2017^(18,22,25-26). The sample of people with diabetes who underwent the intervention ranged between 12⁽¹⁸⁾ and 536⁽²⁶⁾. The control group ranged between 5⁽¹⁸⁾ and 149⁽²⁶⁾. All studies included (Table 5) are experimental studies, with level of evidence Ib, that is, evidence obtained from a well-designed study and through at least one randomized controlled study⁽¹⁵⁾, which is therefore an added value for this SLR.

| Author, year, country | Participants | Objective | Intervention | Results | Level of evidence |
|---|--|--|--|---|---|
| Asuako, Benjami m; et al ⁽¹⁸⁾ 2017 Gana | 12 people with diabetes treated at the KATH Diabetic Unit with a diagnosis of diabetes for less than fifty years, outpatient / age 20 to 68 years, sedentary and free from complications. 7 people in the intervention group (IG) 5 people in the control group (CG) | To evaluate the effects of aerobic exercise on fasting plasma glucose and lipid profiles (FPG/LP) of people with diabetes | Eight weeks of aerobic training between August 2015 and March 2016 For 8 weeks: between August 2015 and March 2016 Modality: Walk without using a crosswalk Exercise Type: aerobic Exercise frequency: 3 times/week Intensity: moderate Exercise volume: Not defined Duration: 45 min Control Group: did not develop any physical activity | - Weight loss of 4.85 kg (7.0%) - 4.08kg / m ² (7.3%) reduction in BMI FPG reduced by 43.5% (5.28mmol / l) after eight weeks of training with aerobic exercises compared to the control group - Decrease of values in the profiles of LDL-C (0.33mmol / l, 11.9%), CT (0.47mmol / l, 5.3%) and T (0.48mmol / l, 29.4%) of IG patients and increased HDL-CC (0.16mmol / l, 7.1%) | Level Ib Randomized and controlled study |
| Parra-Sánchez, J; et al ⁽¹⁹⁾ (2015) Spain. | 100 participants with type 2 diabetes Age between 65 and 80 years-old, sedentary 50% control group (IG) and 50% intervention group (CG). | To analyze whether an exercise program can modify glycated hemoglobin (HbA1c), blood pressure (BP), body mass index (BMI), lipids, cardiovascular risk profile (CR), self-perceived health status (SHS) and pharmaceutical expenditure (PE). | For 3 months Primary Care: 2 rural health areas. Naval moral Health Area. Cáceres. Extremadura. Spain Modality: it was not defined Exercise type: controlled aerobic Exercise frequency: 2 times / week Intensity: it was not defined Exercise volume: it was not defined Duration: 50 min Control Group: they did not develop any physical activity | Significant decrease in; HbA1c: $0.2 \pm 0.4\%$ (95% CI: 0.1 to 0.3); Systolic BP: 11.8 ± 8.5 mmHg (95% CI: 5.1 to 11.9), BMI: 0.5 ± 1 (95% CI: 0.2 to 0.8); Total cholesterol: 14 ± 28.2 mg / dl (95% CI: 5.9 to 22.2); LDL: 18.3 ± 28.2 mg / dl 95% CI: 10.2 to 26.3), RVC: $6.7 \pm 7.7\%$ (95% CI: 4.5 to 8.9), EP: 3.9 ± 10.2 € (95% CI: 0.9 to 6.8) and Increase in SHS: 4.7 ± 5.7 (95% CI: 3 to 6.3). | Level Ib Randomized and controlled, blind study. |
| Dixit, Shenil ; et al ⁽²⁰⁾ 2014 India | 87 People with type 2 diabetes with diabetic neuropathy 47 people in the control group with a mean age of 59.45 years 40 people in the intervention group with a mean age of 54.4 years | To evaluate the effect of 8-week moderate-intensity aerobic exercise (40-60% of heart rate) on the quality of life of neuropathy in type 2 diabetes. | The study was conducted in a tertiary setting in Karnataka, India, from October 2009 to December 2010 For 8 weeks: between October 2009 and December 2012 Modality: treadmill Type of exercise: aerobic Intensity: moderate Exercise frequency: 5 to 6 days/week Volume: Not defined Duration: minimum 150 min/week and maximum 360 min/week Control Group: did not develop any physical activity | When comparing the results of the control and the RANOV study group: No significant changes: - in the mean values of anthropometric measurements using RANOVA ($p < 0.05$) - ($p < 0.05$) in the mean values of glycemic control With significant changes: Significant difference: - ($p < 0.05$) in the mean values of MDNS - ($p < 0.05$) on quality of life measures - ($p < 0.05$) in the mean values of conduction velocity of the distal segment of the peroneal nerve ($df = 1.62$, $F = 5.14$ and $p = 0.03$) and of the sural sensory nerve ($df = 1.60$, $F = 10.16$ and $p \setminus 0.001$) - for nerve conduction velocities in two groups, there was a significant difference between both groups ($p < 0.05$) | Level Ib Randomized and controlled study |
| Taylor, J.; et al 2014 ⁽²¹⁾ Arkansas | 21 people with type 2 diabetes aged between 18 and 69 years 10 people in the moderate intensity exercise training group (MOD group) 11 people in the high intensity exercise training group (HIGH group). | To investigate the effects of moderate versus high-intensity exercise on fitness and physical condition in people with type 2 diabetes. | From September 2011 to August 2012. MOD Group: aerobic training Modality: treadmill Type of exercise: aerobic Intensity: 30% to 45% FC reserve Exercise frequency: 3 times/week Volume: Not defined Duration: 20min Endurance training Modality: resistance machines and weights Exercise type: resistance Intensity: 75% of 8-RM Exercise frequency: 2 times/week Volume: 4 sets of 8 reps Duration: Not defined HIGH group aerobic training Modality: treadmill Type of exercise: aerobic Intensity: 50% to 65% FC reserve Exercise frequency: 3 times/week Volume: Not defined Duration: 20 min Endurance training Modality: resistance machines and weights Exercise type: resistance Intensity: 100% of 8-RM Exercise frequency: 2 times/week | Mean glucose levels before after exercise and after 1 hour after exercise MOD group 204.5 mg / dL (SD 92.3), 181.1 mg / dL (SD 84.2) and 172.0 mg / dL (SD 81.3) HIGH group 140.0 mg/d SD 34.4), 109.8 mg/dL (SD 17.9) and 118.5 mg/dL (SD 33.2). Little significant differences (but with improvements) between groups in relation to: exercise capacity, muscle strength and physical condition | Level Ib Randomized and controlled study |

| | | | | | |
|---|--|---|--|--|---|
| | | | Volume: 4 sets of 8 reps Duration: - Not defined | | |
| Karimi, Hossein, et al ⁽²²⁾ 2017 Pakistan | 102 participants Experimental group (n = 51) with a mean age of 53.74 ± 8.75 years Control group (n = 51) with a mean age of 55.08 ± 7.67 years | To determine the effects of a supervised structured aerobic exercise training program (SSAET) on interleukin-6 (IL-6), nitric oxide synthase 1 (NOS-1) and cyclooxygenase-2 (COX-2) in type 2 diabetes. | For 25 weeks From January 2015 to June 2016. SSAET combined with routine medication and diet plan was applied in the experimental group Control group treated with routine medication and diet plan Modality: treadmill Type of exercise: aerobic Intensity: Not defined Exercise frequency: Not defined Volume: Not defined Duration: 30 min in the first week increasing by 30 min each week for a total of 4 weeks | The SSAET program, routine medication and eating plan improve IL-6 values in the experimental group, compared to a control group controlled by routine medication and eating plan, where deterioration in IL-6 was observed. | Level Ib Randomized and controlled study |
| Schreuder, TH; et al ⁽²³⁾ 2014 England and Netherlands | 15 males diagnosed with type 2 diabetes for at least 2 years -Exercise with double blocker (EX-ET) - Physical exercise with placebo (EX + placebo) | To assess physical fitness in people with type 2 diabetes | For 8 weeks. All participants completed a questionnaire about their physician and medication use. All individuals underwent the same exercises: Modality: Bicycle and resistance machines Exercise type: aerobic and resistance exercise circuit Frequency: 3 times a week Intensity: moderate Volume: Not defined Duration: 60 minutes | No effect of the 8-week intervention on glucose homeostasis was found. | Level Ib Randomized and controlled study |
| Leehey, DJ; et al 2016 ⁽²⁴⁾ USA | 36 male patients Age between 49-81 Groups: - Exercise + diet management (n = 18) - Diet alone (n = 18). | To determine the effects of structured exercise physical fitness, kidney function, endothelial function, inflammation, and body composition in these patients. | For 12 weeks Exercise + diet management group Modality: treadmill Exercise Type: Aerobic and Resistance Frequency: 3 times a week Intensity: Not defined Volume: Not defined Duration: Not defined Control group: diet only, no exercise | No significant changes in: - urine albumin to creatinine ratio, - estimated glomerular filtration rate, - endothelial function, inflammation or body composition between groups. Controlled exercise improved exercise capacity in the obese diabetic person with CKD but not body composition or kidney function. | Level Ib Randomized and controlled study |
| Otten, Julia; et al ⁽²⁵⁾ 2017 Sweden | 32 people with type 2 diabetes (age 59 ± 8 years) followed a Paleolithic diet for 12 weeks. 2 groups: Paleolithic diet and standard care (SD) exercise recommendations Paleolithic diet with supervised exercise sessions of 1 h three times a week (PD-EX) | To evaluate the effects of a Paleolithic diet with and without supervised exercise on fat mass, insulin sensitivity and glycemic control | Group (DP) Modality: brisk walking Exercise Type: aerobic Frequency: daily Intensity: moderate Volume: Not defined Duration: 30 minutes Group (PD-EX) Modality: brisk walking, sprints, leg press, seated leg extensions, leg curls, hip raises, flat and incline bench presses, seated rows, dumbbell rows, pull-downs lat shoulder raises, back extensions, burpees, sit- wall ups, step-ups and ball shots Exercise Type: aerobic and resistance Frequency: 3 times/week Intensity: moderate Volume: in resistance training 10 to 15 repetitions each exercise 2 to 4 sets Duration: 60min | Diminuição: - Massa de gordura :5,7 kg (IQR: -6,6, -4,1; p <0,001); - da Leptina em 62% (p <0,001); - Pressão Arterial - Triglicéridos - HbA _{1c} em 0,9% (-1,2, -0,6; p <0,001); Melhoria: - Sensibilidade à insulina e controle glicêmico - Participantes sexo masculino diminuíram a massa magra em 2,6 kg | Level IB Randomized and controlled study |
| Vlaar MA, et al ⁽²⁶⁾ (2017) Netherlands | 536 South Asians aged 18 to 60 years at risk for diabetes Intervention group (n = 283): motivational interview, family session, cooking classes, supervised physical activity program Control group (n = 253) - received generic lifestyle advice | To investigate the effectiveness of an intensive, culturally-oriented lifestyle intervention to prevent DM2 and cardiovascular risk factors among South Asian Surinamese in primary care. | From May 18, 2009 to October 11, 2010 Intervention Group: Modality: Any physical activity; Exercise Type: Undefined Intensity: Moderate to Intense Frequency: - Not defined Intensity: Not defined Volume: - Not defined Duration: Not defined Control Group: received current guidelines for diet and physical activity | A culturally targeted lifestyle intervention in primary care did not change eating behavior and physical activity in a group of South Asian people at risk for type 2 diabetes | Level Ib Randomized and controlled study |

Table 5: Included articles

DISCUSSION

The modalities of physical exercise most applied in the selected studies were: walking^(18,20-21,23-24), resistance machines, free weight^(22,25) and bicycle⁽²⁴⁾. The type of physical exercise recommended for the diabetic person will depend on some factors, namely their baseline physical condition, preferences, available means or the presence of physical limitations⁽¹⁹⁾.

The analyzed studies resorted essentially to aerobic exercises, with the exception of the studies of Karimi et al.,⁽²²⁾ and Otten et al.,⁽²⁵⁾ that combined aerobic and resistance exercises. Some studies reported that the combination of aerobic physical exercise in addition to resistance training may be better than any of them separately⁽²⁰⁾.

The frequency of exercise evidenced in the studies ranged between twice a week⁽¹⁹⁾ and 5 to 6 times a week⁽²⁰⁾ and lasted between 30 minutes⁽²²⁾ and 60 minutes⁽²⁴⁻²⁵⁾ for each session of exercise. The minimum frequency of exercise recommended by the American Diabetes Association is 150 minutes per week of moderate aerobic exercise over at least three days a week; the Spanish Diabetes Society, on the other hand, recommends exercise sessions lasting at least 45 minutes, three times a week, divided into pre-warming, the main phase and finally relaxation⁽²⁰⁾.

Exercise intensity was not evaluated equally in the articles analyzed and not all made reference to this parameter. Asuako et al.,⁽¹⁸⁾ assessed intensity using the maximum heart rate, a value obtained using a pulse oximeter version 803, China, placed during exercise and using the online Pace Calculator application.

In the studies carried out by Dixit et al.,⁽²⁰⁾ and Taylor et al.,⁽²¹⁾, the exercise intensity was evaluated using the Karvonen formula ($\text{Training heart rate} = \text{Rest heart rate} + (\text{Intensity}) \times (\text{Maximum heart rate} - \text{Heart rate at rest})$). Dixit et al.,⁽²⁰⁾ used a heart rate monitor (Polar Electro Oy, Kempele, Finland) and used it to monitor heart rate continuously during aerobic exercise.

It should be noted that in the analyzed studies, the characterization of the exercise was not always complete (modality, type of exercise, frequency, intensity, volume and duration) which limited the analysis, somehow limiting the generalization of the results.

In the analysis performed, only two articles combined the study of exercise with a specific type of diet⁽²⁵⁻²⁶⁾.

Otten et al.,⁽²⁵⁾ combined physical exercise with a paleolithic diet, a diet based on the consumption of lean meat, fish, seafood, eggs, vegetables, fruits, berries and nuts and excluding cereals, dairy products, vegetables, refined fats, refined sugars and salt. In previous studies, the paleolithic diet had beneficial metabolic effects on obesity and the type of diabetes⁽²⁵⁾.

Vlaar et al.,⁽²⁶⁾ combined physical exercise with a healthy diet based on the national food guidelines for South Asia and which includes 2 pieces of fruit/day, vegetables (200g/day), whole wheat (whole wheat

products exclusively), rice (only brown rice) and 3 meals a day/regular time.

By analyzing the articles, we found that there are important health gains for people with diabetes associated with the practice of physical exercise. The most used variables in most studies and which show these gains were glucose⁽²⁰⁾, HbA1c⁽¹⁹⁻²⁵⁾, body weight⁽¹⁸⁻²⁵⁾ and cholesterol⁽¹⁸⁻¹⁹⁾, associated with more controlled glycated hemoglobin values and lower cardiovascular risk, also improving the psychosocial health status and decreasing pharmaceutical costs⁽¹⁹⁾.

Practical implications

Physical exercise has a positive effect on the health of the diabetic person, however, the type of exercise, duration, frequency and intensity to use in reducing blood glucose should be clarified in future experimental studies.

Sedentary lifestyle and obesity in people with diabetes are factors that mark physical fitness. In this sense, nurses, doctors and other caregivers should promote greater encouragement and monitoring (intra- and extra-hospital) in order to improve these people's adherence to physical activity in general and to physical exercise in particular. It should be noted that physical activity is defined as any body movement produced by muscle contraction that results in energy expenditure above the resting level, and physical exercise is characterized by planned, organized and repeated body movements, with the objective of maintaining or improving one or more components of physical fitness⁽²⁷⁾.

Rehabilitation Nursing can have a decisive role in increasing the practice of physical exercise in people with diabetes. And specialist nurses in rehabilitation nursing must participate in the production of evidence in this area, participate in decision-making related to health, as well as in the construction of health policies aimed at adopting healthy lifestyles related to the practice of physical exercise in people with diabetes.

Study limitations

The studies that integrated this SLR had some limitations, namely: the small sample size, limiting the generalization of the results, not all articles analyzed characterized physical exercise and those that did did not address all criteria, specifically, frequency, volume, duration and intensity. Regarding intensity, few studies have used scales to describe intensity as low, moderate or vigorous, which makes this assessment less objective. In addition, there is little scientific production on this topic, which was an obstacle to the realization of this RSL. Finally, it refers to the reduced number of databases accessed, as well as the language and time frame used, which can contribute to the reduced number of studies identified and included in the last step.

CONCLUSION

With this SLR and after analyzing the 9 studies, we can conclude that exercise brings benefits to people with diabetes, namely in terms of reducing fasting plasma glucose, glucose hemoglobin values, reducing body weight and cholesterol, as well as improving the person's quality of life.

This study allowed increasing knowledge in rehabilitation nursing, as well as contributing to the assessment of the benefits of structured physical exercise in people with diabetes. However, there were gaps in the description of exercises in terms of modality, frequency, intensity, volume, duration and progression. Further studies are recommended, with a more robust sample, where interventions within the scope of physical exercise are more objectively described, as well as the assessment instruments that allow not only to define exercise intensity, but also to demonstrate prescription-sensitive gains exercise performed by specialist nurses in rehabilitation nursing.

BIBLIOPGRAPHIC REFERENCES

- Kerner W, Brückel J. Definition, Classification and Diagnosis of Diabetes Mellitus. *Exp Clin Endocrinol Diabetes*. 2014 Jul;122(07):384-6. Acessível em <https://doi.org/10.1055/s-0034-1366278>
- American Diabetes Association. 2. Classification and diagnosis of diabetes. *Diabetes care*. 2015 Jan 1;38(Supplement 1):S8-16. Acessível em <https://doi.org/10.2337/dc15-S005>
- World Health Organization. Global report on diabetes. Geneva: World Health Organization; 2016. Acessível em: <http://apps.who.int/iris/bitstream/handle/10665/204871/9?sequence=1>
- Zimmet P, Alberti KG, Magliano DJ, Bennett PH. Diabetes mellitus statistics on prevalence and mortality: facts and fallacies. *Nat Rev Endocrinol*. 2016 Oct;12(10):616-22. <https://www.nature.com/articles/nrendo.2016.105>
- Observatório Nacional da Diabetes. Diabetes Factos e Números o ano de 2015-Relatório Anual do Observatório Nacional da Diabetes. Sociedade Portuguesa de Diabetologia. 2016.
- Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, Horton ES, Castorino K, Tate DF. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. *Diabetes Care*. 2016 Nov 1;39(11):2065-79. Acessível em <https://doi.org/10.2337/dc16-1728>
- Biazzon AC. Influência da atividade física no tratamento da diabetes mellitus tipo 1 e tipo 2. *Rev Saúde Biol*. 2018 Mar 14;12(2):68-73. <http://revista2.grupointegrado.br/revista/index.php/sabios2/article/view/1744/983>
- Kirwan JP, Sacks J, Nieuwoudt S. The essential role of exercise in the management of type 2 diabetes. *Cleve Clin J Med*. 2017 Jul;84(7 Suppl 1):S15. Acessível em <https://dx.doi.org/10.3949%2Fccjm.84.s1.03>
- Petronilho F, Machado M. Teorias de Enfermagem e Autocuidado: Contributos para a Construção do Cuidado de Reabilitação. in Marques-Vieira CM, Sousa LM (Eds). *Cuidados de Enfermagem de Reabilitação à pessoa ao longo da vida*. Loures: Lusoditacta; 2017:3-14.
- Ordem dos Enfermeiros. Investigação em enfermagem: Tomada de posição. Lisboa: Ordem dos Enfermeiros; 2006.
- Danski MT, de Oliveira GL, Pedrolo E, Lind J, Johann DA. Importância da prática baseada em evidências nos processos de trabalho do enfermeiro/Importance of evidence-based practice in nurse's work processes. *Ciênc Cuid Saúde*. 2017 Apr;16(2). DOI: 10.4025
- Sousa LMM, Firmino CF, Marques-Vieira CMA, Severino S, Pestana HCFC. Revisões da literatura científica: tipos, métodos e aplicações em enfermagem. *Rev Port Enferm Reabil*. 2018; 1(1): 46-55.
- Galvão TF, Pereira MG. Systematic reviews of the literature: steps for preparation. *Epidemiol Serv Saúde*. 2014 Mar;23(1):183-4. Acessível em <http://dx.doi.org/10.5123/S1679-49742014000100018>
- Moher D, Shamseer L, Clarke M, Gherzi D, Liberati A, Petticrew M, Shekelle P, Stewart LA. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev*. 2015 Dec;4(1):1. Acessível em <https://doi.org/10.1186/2046-4053-4-1>
- Joanna Briggs Institute's. User Manual: Version 5.0 System for the Unified Management. Assessment and Review of Information. Joanna Briggs Institute's. 2011. Acessível em: <http://joannabriggs.org/assets/docs/sumari/SUMARI-V5-User-guide>
- Sousa LM, Marques-Vieira CM, Severino SS, Antunes AV. Metodologia de Revisão Integrativa da Literatura em Enfermagem. *Rev Inv Enferm*. 2017; S2(21):17-26 Disponível em: <http://hdl.handle.net/20.500.12253/1311>
- Registered Nurses Association of Ontario (RNAO). Falls Prevention: Building the Foundations for Patient Safety. A Self Learning Package. Toronto: Registered Nurses Association of Ontario; 2007.
- Asuako B, Moses MO, Eghan BA, Sarpong PA. Fasting plasma glucose and lipid profiles of diabetic patients improve with aerobic exercise training. *Ghana Med J*. 2017;51(3):120-7. Acessível em <http://dx.doi.org/10.4314/gmj.v51i3.5>
- Parra-Sánchez J, Moreno-Jiménez M, Nicola CM, Nocua-Rodríguez II, Amegló-Parejo MR, del Carmen-Peña M, Cordero-Prieto C, Gajardo-Barrena MJ. Evaluación de un programa de ejercicio físico supervisado en pacientes sedentarios mayores de 65 años con diabetes mellitus tipo 2. *Aten Primaria*. 2015 Nov 1;47(9):555-62. Acessível em <https://doi.org/10.1016/j.aprim.2015.01.006>
- Dixit S, Maiya A, Shastri B. Effect of aerobic exercise on quality of life in population with diabetic peripheral neuropathy in type 2 diabetes: a single blind, randomized controlled trial. *Res Qual Life*. 2014 Jun 1;23(5):1629-40. Acessível em DOI 10.1007/s11136-013-0602-7
- Taylor JD, Fletcher JP, Mathis RA, Cade WT. Effects of moderate-versus high-intensity exercise training on physical fitness and physical function in people with type 2 diabetes: a randomized clinical trial. *Phys Ther*. 2014 Dec 1;94(12):1720-30. Acessível em <https://doi.org/10.2522/ptj.20140097>
- Karimi H, Rehman SS, Gillani SA. Effects of Supervised Structured Aerobic Exercise Training Program on Interleukin-6, Nitric Oxide Synthase-1, and Cyclooxygenase-2 in Type 2 Diabetes Mellitus. *J Coll Physicians Surg Pak*. 2017 Jun 1;27(6):352-5. Acessível em: https://inis.iaea.org/search/search.aspx?orig_q=RN:48076473
- Schreuder TH, Duncker DJ, Hopman MT, Thijssen DH. Randomized controlled trial using bosentan to enhance the impact of exercise training in subjects with type 2 diabetes mellitus. *Exp Physiol*. 2014 Nov 1;99(11):1538-47. Acessível em <https://doi.org/10.1113/expphysiol.2014.081182>
- Leehey DJ, Collins E, Kramer HJ, Cooper C, Butler J, McBurney C, Jelinek C, Reda D, Edwards L, Garabedian A, O'Connell S. Structured exercise in obese diabetic patients with chronic kidney disease: a randomized controlled trial. *Am J Nephrol*. 2016;44(1):54-62. Acessível em <https://doi.org/10.1159/000447703>
- Otten J, Stomby A, Waling M, Isaksson A, Tellström A, Lundin-Olsson L, Brage S, Ryberg M, Svensson M, Olsson T. Benefits of a Paleolithic diet with and without supervised exercise on fat mass, insulin sensitivity, and glycemic control: a randomized controlled trial in individuals with type 2 diabetes. *Diabetes Metab Res Rev*. 2017 Jan;33(1):e2828. Acessível em <https://doi.org/10.1002/dmrr.2828>
- Vlaar EM, Nierkens V, Nicolaou M, Middelkoop BJ, Busschers WB, Stronks K, van Valkengoed IG. Effectiveness of a targeted lifestyle intervention in primary care on diet and physical activity among South Asians at risk for diabetes: 2-year results of a randomised controlled trial in the Netherlands. *BMJ open*.

2017 Jun 1;7(6):e012221. Acessível em <https://doi:10.1136/bmjopen-2016-012221>

27. Santa-Clara H, Pinto I, Santos V, Pinto R, Melo X, Almeida JP,

Pimenta N, Abreu A, Mendes M. Atividade física e exercício físico: especificidades no doente cardíaco. Rev Factores de Risco. 2015, 35:28-35. Acessível em. <http://hdl.handle.net/10400.17/2154>

EXERCÍCIO FÍSICO NA PESSOA COM DEMÊNCIA: REVISÃO SISTEMÁTICA DE LITERATURA.

EJERCICIO FÍSICO EN LA PERSONA CON DEMENCIA: REVISIÓN SISTEMÁTICA DE LA LITERATURA.

PHYSICAL EXERCISE IN A PERSON WITH DEMENTIA: SYSTEMATIC REVIEW OF LITERATURE

DOI 10.33194/rper.2019.v2.n1.04.4562 | Submitted on 5.3.2019 | Approved on 24.06.2019

 Diana Vanessa Ferreira Maia¹;  Rui Miguel de Andrade Gaspar²;  António Manuel Gradíssimo Costa²;
 Filipe Manuel Gonçalves Dias³;  Helena Castelão Figueira Carlos Pestana⁴;  Luís Manuel Mota de Sousa⁵

1 - Centro hospitalar Lisboa Ocidental, Hospital Egas Moniz, Lisboa, Portugal; 2- Centro hospitalar Lisboa Ocidental, Hospital S. Francisco Xavier, Lisboa, Portugal; 3 - Centro Hospitalar Universitário Lisboa Central, Hospital Curry Cabral, Lisboa, Portugal; 4 - Escola Superior de saúde Atlântica, Barcarena, Portugal; 5 - Universidade de Évora, Escola Superior de Enfermagem S. João de Deus, Évora, Portugal

RESUMO

Introdução: A demência é caracterizada por um conjunto de transtornos que englobam uma perda progressiva das funções cognitivas e afeta a destreza que é necessária ao desenvolvimento normal das atividades de vida diária.

Objetivo: Identificar os benefícios do exercício físico a nível cognitivo, sensorial e motor na pessoa com demência.

Método: revisão sistemática da literatura com a questão de pesquisa “Quais os benefícios do exercício físico em pessoas com demência?”. A pesquisa foi realizada com recurso a plataformas de bases de dados eletrónicas EBSCOHost e Biblioteca Virtual em Saúde, tendo sido identificados, selecionados, avaliados na qualidade metodológica e incluídos artigos de acordo com as recomendações do PRISMA.

Resultados: Foram incluídos 7 estudos que cumpriam os critérios de inclusão, ou seja, estudos primários experimentais, que abordam a prática de exercício físico em pessoas com demência, publicados nos últimos 5 anos (2014-2018), em português, inglês e espanhol, com texto integral de livre acesso.

Conclusões: Esta revisão sistemática de literatura revela evidência dos efeitos benéficos do exercício sobre cognição, agitação, depressão e capacidade motora em pessoas com demência.

Descritores: Atividade Física; Exercício Físico; Demência; Doença Alzheimer; Enfermagem em Reabilitação.

RESUMEN

Introducción: La demencia es caracterizada por un conjunto de trastornos que engloban una pérdida progresiva de las funciones cognitivas y afecta la destreza que es necesaria para el desarrollo normal de las actividades de vida diaria.

Objetivo: Identificar los beneficios de ejercicio físico a nivel cognitivo, sensorial y motor en la persona con demencia.

Método: Revisión Sistemática de la Literatura con la cuestión de la investigación “¿Cuáles son los beneficios del ejercicio físico en las personas con demencia?”. La investigación fue realizada con recurso a plataformas de bases de datos electrónicas EBSCOHost y Biblioteca Virtual en Salud, habiendo sido identificados, seleccionados, evaluados en la calidad metodológica e incluidos artículos de acuerdo con las recomendaciones del PRISMA.

Resultados: Se incluyeron siete estudios que cumplieron los criterios de inclusión, es decir, estudios primarios experimentales que aborden el ejercicio físico en personas con demencia, publicado en los últimos cinco años (2014-2018), en portugués, Inglés y Español, con texto integral de libre acceso.

Conclusiones: Esta revisión sistemática de la literatura revela evidencia de los efectos del ejercicio sobre cognición, agitación, depresión y capacidad motora en personas con demencia.

Descriptores: Actividad Física; Ejercicio físico; Demencia; Enfermedad Alzheimer; Enfermería en Rehabilitación.

ABSTRACT

Background: Dementia is characterized by a set of disorders involving a progressive loss of cognitive functions as well as affecting the skill necessary for the normal development of activities of daily living.

Objective: To identify the benefits of physical exercise at the cognitive, sensory and motor level in the person with dementia.

Method: Systematic Review of literature, started with the question: "What are the benefits of physical exercise in people with dementia?". The research was carried out using the electronic database platforms: EBSCOHost and BVS,

having been identified, selected, evaluated in a methodological quality and included articles that take into account the PRISMA recommendations.

Results: There were included seven studies meeting the inclusion criteria, that is, primary experimental studies, addressing the practice of physical exercise in people with dementia and Alzheimer Disease, published in the last 5 years (2014-2018), in Portuguese, English and Spanish, were included, with full text of free access.

Conclusions: This Systematic Review reveals evidence of the beneficial effects of physical exercise on cognition and motor ability in people with dementia.

Keywords: Physical Activity; Physical exercise; Dementia; Alzheimer Disease; Rehabilitation Nursing

INTRODUCTION

Health at a Glance 2017, from the Organization for Economic Co-operation and Development (OECD), reports that dementia is one of the leading causes of death. In 2015, it represented 4.5% in women and 2.1% in men. The same study places Portugal in 4th place with 19.9 cases per thousand inhabitants, only surpassed by Germany, Italy and Japan, the latter occupying the top of the table with 23.3 cases per thousand inhabitants, while the OECD average is situated in the 14.8. As average life expectancy increases in Portugal, the number of dementia cases increases, and it is estimated that this number will increase to 31.3 per thousand inhabitants by 2037⁽¹⁾.

Although it mostly affects the elderly, dementia is not a normal consequence of aging. Dementia is a group of disorders that comprise a progressive loss of cognitive functions and affect the dexterity that is necessary for the normal development of activities of daily living (ADL)⁽²⁻³⁾ among them, attention, short- and long-term memory, activity and movement planning⁽⁴⁾, which leads to person's development loss, causing changes in their family and social environment, due to their dependence state⁽⁵⁾.

Alzheimer's disease is the most common form, accounting for about 60-70% of dementia cases. Among the less frequent forms of dementia, we can highlight vascular, mixed, Lewy body and Parkinson's disease dementias, among others⁽⁵⁾.

Thus, Alzheimer's Disease of still unknown cause, leads to neurodegeneration and the consequent (progressive and irreversible) worsening of brain functions, culminating in the total loss of autonomy⁽⁶⁾.

The initial symptoms include memory loss, spatial and temporal disorientation, confusion and problems regarding reasoning and thinking, causing changes in the person's behavior, personality and functional capacity, and hindering the performance of their ADL⁽⁶⁾.

At the moment, there is no treatment to stop the progression of the disease and pharmacological treatment is limited to alleviating the symptoms caused by dementia⁽⁷⁾.

The studies carried out indicate that changes in lifestyles and physical exercise can prevent or delay the onset of dementia^(8,9). These data suggest that physical exercise improves neuropsychological functioning, although leisure activities can also bring

improvements. Thus, an aerobic physical exercise program can be an adjuvant alternative to maintain and improve these functions⁽⁹⁾.

The Specialist Nurse in Rehabilitation Nursing (SNRN), according to the Regulation of Specific Competences, has the competence to design, implement, evaluate and reformulate motor and cardiorespiratory training programs, depending on the expected results⁽¹⁰⁾ in which the prescription of physical exercise is inserted.

The starting question of this systematic literature review (SLR) is: what are the benefits of physical exercise in people with dementia?

The objective of the SLR is to identify the benefits of physical exercise at the cognitive, sensory and motor levels in people with dementia.

MATERIAL AND METHODS

Among the various types of reviews, SLR is the most used, and is defined "*as a systematic, explicit and reproducible method that allows the identification, evaluation and synthesis of studies carried out by researchers, academics and health professionals*"^(11: 47) in order to reduce biases. It is a method that allows for a rigorous synthesis of all research related to a specific question, thus making it possible to obtain the best evidence, which is why it is considered one of the pillars for evidence-based practice⁽¹¹⁾.

To perform an SLR, seven steps must be taken into account: 1) construction of the research protocol; 2) formulation of the question; 3) research studies; 4) selection and review of studies; 5) critical evaluation of each of the articles; 6) data collection; 7) synthesis of results/data⁽¹¹⁾.

To formulate the research question, we used the recommendations of the Joanna Briggs Institute (JBI)⁽¹²⁾ based on the PICO strategy. Each dimension of the PICO contributed to define the inclusion criteria: Population (P) - People with dementia including Alzheimer's Disease as it is a more frequent typology of dementia; Intervention (I) - Physical exercise; Comparison (C) and Results (O) - Benefits of exercise.

This resulted in a research question: "What are the benefits of physical exercise for people with dementia?"

The descriptors related to each of the components of the PICO strategy were: Dementia; Alzheimer Disease; Physical Exercise; Physical Activity, previously

validated in the Health Sciences Descriptors and Medical Subject Headings platform.

The inclusion criteria were defined as: experimental and quasi-experimental primary studies, which address the practice of physical exercise in people with dementia and Alzheimer's disease, published over the last 5 years (2014-2018), in Portuguese, English and Spanish, with free access full text.

The survey was conducted during the months of October and November 2018 through the EBSCOHost electronic database platforms (CINAHL Complete; Cochrane Collection Plus; Nursing & Allied Health Collection: Expanded; MEDLINE® Complete; Library, Information Science & Technology Abstracts; Medic Latina), Virtual Health Library (VHL).

The search was carried out by two people simultaneously, from October 20th to November 24th, 2018, taking into account the following Boolean conjugation with the descriptors in English:

((Physical Exercise) OR (Physical Activity)) AND ((Alzheimer Disease) OR Dementia))

Table 1 describes the process of combining descriptors and keywords for searching the databases. Figure 1 illustrates the PRISMA flowchart corresponding to the identification, analysis, selection and inclusion of articles.

| Boolean Conjugation | EBSCO | BVS |
|--|-------|------|
| ((Physical Exercise) OR (Physical Activity)) AND ((Alzheimer Disease) OR (Dementia)) | 3430 | 1019 |

Table1 – Boolean Conjugation

The articles selected for full reading were independently evaluated by two investigators, according to methodological quality criteria proposed by the JBI⁽¹²⁾, with only articles with more than 75% of the criteria being selected.

Information was extracted from the articles about authors, year, country, sample, data on modality, intensity, volume, frequency and duration of physical exercise. The classification of the levels of evidence of the included studies was based on the criteria of the Registered Nurses Association of Ontario⁽¹³⁾.

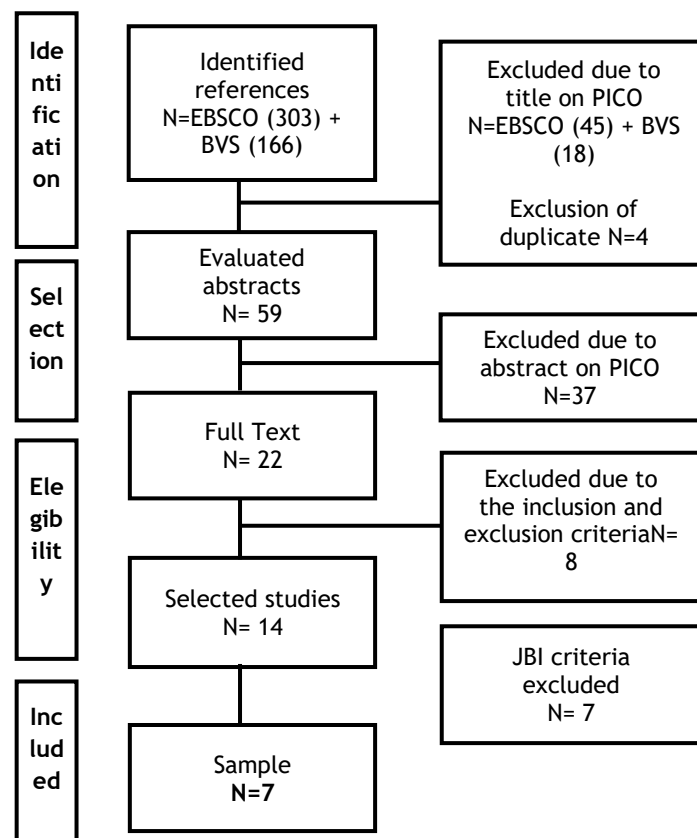


Figure 1 – Identification, analysis and selection of articles ⁽¹⁴⁾.

RESULTS

Seven articles were included in this RSL, published in the following years 2015^(15,16,17,19), 2016^(18,21) and 2017⁽²⁰⁾, the sample of people varied between 30⁽²¹⁾ and 170⁽¹⁵⁾. Regarding the control group, it ranged between 15^(16,21) and 116⁽¹⁹⁾. Duration of studies between 8 weeks⁽¹⁸⁾ and 15 months⁽¹⁹⁾. All studies included (Table 2) are experimental primary studies according to the Nurses Association of Ontario with levels of evidence Ib, that is, evidence obtained from at least one controlled study⁽¹³⁾.

| Author, year, country | Participants | Objective | Intervention | Results | Evidence Level |
|--|---|--|---|--|----------------|
| Telenius E., et al. 2015, Norway(15) | Total (n=170) Experimental group (n=87) Control group (n=83) | To investigate the effect of a high-intensity functional exercise program on balance, mobility, and activities of daily living and neuropsychiatric symptoms in nursing home residents. | Duration of study: 12 weeks Experimental group: Modality - Muscle strengthening exercises (five minutes of warm-up, at least two strength exercises for the lower limb muscle and two balance exercises) Intensity - High Frequency - twice a week Volume - two sets and 12 reps Duration - 50 to 60 minutes Control group: Recreational activities (reading, games, listening to music and socializing) | The results demonstrate that the high intensity muscle strengthening exercise program has statistically positive effects on balance, mobility and activities of daily living and reduced apathy and agitation. In the control group there was a decline in the function of activities of daily living. | Ib |
| Holthoff VA., et al. 2015, Germany(16) | Total (n=30) Experimental group (n = 15) Control group (n = 15) | To investigate the effects of physical activity in people with Alzheimer's Disease and its benefits in activities of daily living in the home environment. | Duration of study: 12 weeks Experimental group: Modality - Use of the pedalboard Intensity-two to four, degree of difficulty 0-20 Frequency - three times a week Volume - not defined Duration - 30 to 60 minutes Control group: Monthly visit by a doctor for counseling and change of sedentary habits and its implications. | The results demonstrated considerable benefits in the participants' physical activity and cognitive function. They suggest that physical exercise in Alzheimer's Disease contributes to reducing the caregiver's burden on ADL at home. | Ib |
| Morris JK., et al. 2015 USA(17) | Total (n=76) Experimental group (n = 39) Control group (n = 37) | To investigate the benefits of aerobic exercise on functional capacity and people with Alzheimer's Disease. | Study duration: 26 weeks Experimental group: Modality - aerobic exercise Intensity - heart rate (HR) gradually increasing from 40-55% to 60-75% of HR in reserve. Borg (6-20) Frequency - three to five sessions per week Volume - not defined Duration - 150 minutes Control group: Modality - non-aerobic exercise Intensity - HR<100bpm Frequency - three to five sessions per week Volume - not defined Duration - 150 minutes | The results demonstrate benefits in functional capacity (Caring for Activities of Daily Living) in people with Alzheimer's Disease | Ib |
| Lee HJ, Kim KD. 2016 Republic of Korea(18) | Total n=60 Experimental group (n = 30) Control group (n=30) | To determine the effect of a physical and cognitive exercise program on cognitive functions and activities of daily living in an environment of elderly people with dementia admitted to a day care center. | Duration of study: eight weeks Experimental group: Modality - Otago exercises, (Motor coordination and balance exercises) Intensity - Frequency - Three times a week Volume - not defined Duration -30 minutes Control group: Performed the same activities as the Experimental Group except physical exercise | The results demonstrate that the physical exercise program improves cognitive function and activities of daily living in an environment in people with mild dementia. | Ib |
| Cancela JM., et al. 2015. Spain(19) | Total n=189 Experimental group n= 73 Control group (n= 116) | To identify the effects of an exercise program on cognitive decline, memory, depression, functional dependence and neuropsychiatric disorders in institutionalized people with dementia. | Duration of study: 15 months Experimental group: Modality - aerobic physical activity on a static bicycle Intensity - Low Daily frequency Volume - not defined Duration - Minimum 15 minutes Control group: Sedentary recreational activities (card games, reading, crafts). | The results demonstrate that there was a significant decrease in cognitive function in the control group, while in the exercise group there was a slight improvement in neuropsychiatric symptoms, memory function and functional mobility. | Ib |
| Souto Barreto P., et al. 2017 France(20) | Total (n=98) Experimental group (n=48) Control group (n=50) | To compare the effects of physical exercise on the ability to perform activities of daily living in the environment, physical activities and cognitive function compared to a non-physical intervention (social intervention) in people with dementia living in nursing homes. | Duration of study: 24 weeks Experimental group: Modality - Combined exercises for coordination, balance, muscle strengthening, aerobic and cooling exercises Intensity - moderate Frequency - twice a week Volume - not defined Duration - 60 minutes | The study did not show statistically significant differences between the performance of physical exercise and recreational activities. However, it showed that people who practiced physical exercise had fewer falls than in the social intervention group. | Ib |

| | | | | | |
|--------------------------------------|---|--|---|---|----|
| | | | Control group: Group activities twice a week for 60 minutes. The activities were new to the participants and included music therapy and arts and crafts activities. | | |
| Menezes AV., et al. 2016, Brazil(21) | Total (n = 30) Experimental group (n=15) Control group (n=15) | To identify the effect of physical exercise on cognition, mobility and functional independence of elderly people with cognitive impairment and mild dementia living in a nursing home. | Duration of study: four months Experimental group: Modality - Stretching followed by muscle strengthening exercises, motor coordination, balance and gait training with cognitive stimulation (music therapy) Intensity - blood pressure and respiratory rate were measured at the beginning and end of each session Frequency - once a week Volume - not defined Duration - 60 minutes Control group: Did not perform physical activity | The results showed a positive effect on balance and mobility, however, they did not show significant effects on cognition and functional independence, although in the control group there was a decline in functional capacities that was not reflected in the experimental group. | 1b |

Table 2: Systematization of the information provided by the articles

DISCUSSION

The analysed studies present a variety of results, namely: cognitive function and memory^(16,18-19); balance and risk of falling^(15,20-21); mobility^(15-16,19,21); ADL^(15-18,21) and role of the caregiver^(15-16,19,21); apathy, agitation and depression⁽¹⁹⁾. Regarding the modalities, studies were carried out through muscle strengthening exercise programs^(15,20-21), aerobic exercises^(17,19-20), combined motor coordination and balance exercises⁽²⁰⁻²¹⁾ (Otago's exercises)⁽¹⁸⁾, gait⁽²¹⁾, use of pedalboard⁽¹⁶⁾ and static bicycle⁽¹⁹⁾, which encompass different characteristics in terms of frequency, intensity, volume and duration. Otago's Exercise program consists of a set of lower limb muscle strengthening exercises, balance exercises and a walking plan. They are prescribed individually, take about 30 minutes and are performed three times a week, however, walking it is performed at least twice a week, and the progression increases throughout the sessions.⁽²²⁾

The intensity varies between mild^(16,19), moderate⁽²⁰⁾ and high⁽¹⁵⁾, despite being little explored in the presented articles. It is observed that the ways of prescribing intensity varied a lot, with seven predictors: Maximum Heart Rate (HRmax); Maximum Oxygen Consumption (VO2max); Resting Heart Rate (FCR); Peak Oxygen Consumption (VO2peak); Thresholds: T1: Anaerobic threshold and T2: Respiratory Compensation Point (CRP); Peak Heart Rate (HRpeak) and Useful Functional Capacity.⁽²³⁾ And, according to the guidelines of the American College of Sports Medicine for Exertion tests and their prescription⁽²⁴⁾, the intensity should be categorized by cardiorespiratory exercises, resistance exercises, flexibility exercises and neuro-motor exercises, being recommended for the latter, two or three days a week, 20-30 minutes a day and should involve motor skills, namely balance, agility, coordination, training with proprioceptive exercises and multifaceted activities, to improve coordination skills and reduce the risk of falls in the elderly. It recommends aerobic activity with an intensity of 40 to 60% of the reserve heart rate, or 11 to 13 on the Borg scale⁽²⁵⁾. It also states that the duration is related to the intensity of the exercise, thus, a lower intensity should be maintained for a longer period of time and due to

the potential risks associated with high intensity exercises, light to moderate intensity with greater duration for the non-athlete adult.

Cognitive function and memory

Cognitive and memory benefits have been documented in other studies⁽²⁶⁻²⁷⁾. Through this review, the performance of exercises using a crankset, 3 times a week for 30 to 60 minutes⁽¹⁶⁾, Otago exercises⁽¹⁸⁾ 3 times a week and exercise bike for 15 minutes daily⁽¹⁹⁾ showed positive results in cognitive functions and memory. It is noteworthy that after 15 months of study there was a decline in cognitive abilities and memory in the group where only recreational activities were practiced⁽¹⁹⁾.

Apathy, depression and agitation

One of the benefits of exercise found in the analysed studies was a slight improvement in depression⁽¹⁹⁾, and this result was achieved through the implementation of aerobic exercise training on a static bicycle for 15 minutes a day over a period of 15 months. In turn, the improvements in apathy and agitation⁽¹⁵⁾ were achieved through muscle strengthening exercises (five minutes of warm-up, at least two strength exercises for the lower limb muscle and two balance exercises), for 50 minutes two times a week for a period of 12 weeks.

According to other studies⁽²⁸⁾, the practice of physical exercise represents a way to treat depression and improve agitation and apathy, in addition to providing significant improvements in other physiological parameters. Furthermore, these results do not agree with the study carried out by DeVreede⁽²⁹⁾, where he states that there seems to be weak or non-existent evidence in the improvement of apathy.

Mobility

Mobility is an important factor with regard to the ability to perform basic activities of daily living and tasks such as walking, transferring, climbing and descending stairs and dressing the lower body⁽³⁰⁾.

With regard to mobility, this was mentioned as one of the benefits of physical exercise in studies^(15,16,19,21), where there were several modalities used, muscle strengthening exercises^(15,21), aerobic exercise^(16,19), motor coordination⁽²¹⁾, balance^(15,21) and gait training⁽²¹⁾. However, the intensity, frequency and duration of the exercises were different in all studies, so it is not possible to establish a comparison with the different modalities in order to understand which one presents the most benefits in terms of physical exercise.

These results are in line with other studies⁽³¹⁾ that report that physical exercise is a viable intervention for people with dementia and that the benefits far outweigh the risks, in addition to highlighting the use of physical exercise to improve mobility.

Balance and Falls

According to analyzed articles, people with dementia have a double increase in falls risk compared to non-demented people⁽³²⁾. The consequences of falls are in many cases harmful. The fear of falling itself is a risk factor for inactivity and can create a vicious circle⁽³³⁾. Therefore, increasing mobility through muscle strengthening exercises improves balance, potentially reducing the risk of falls⁽³⁴⁾.

Regarding what was verified in the studies that include this research, it is verified that there is an improvement in balance when implementing a high-intensity muscle strengthening exercise program and a combined program of motor coordination, balance and gait^(15,18,20). Regarding the intensity, it varies from moderate to high, at a frequency that varies between 2 to 5 times a week^(15,18,20) with 2 sets of 12 repetitions⁽¹⁵⁾.

It is noteworthy that the use of music therapy when performing the exercises can produce benefits in carrying out the activity⁽²¹⁾.

In a 24-week study there was no statistical evidence of motor or cognitive benefits, however there was a significant reduction in the number of falls⁽²⁰⁾.

Activity of daily living and the Caregiver's role

People with dementia have higher levels of dependence than others and are more likely to need assistance with activities of daily living^(35,36).

Exercise leads to improved ability to perform activities of daily living e por sua vez improves functional capacity. The studies that demonstrate these results have resorted to implementing aerobic exercise three to five times a week with a progressive intensity, through a heart rate gradually increased from 40-55% to 60-75% of the reserve heart rate for a duration of 150 minutes in total⁽¹⁷⁾ and the use of pedalboards three times a week⁽¹⁶⁾. In these studies, there is a decrease in the caregiver burden, while in the control group there was a considerably increased effect⁽¹⁶⁾. Some studies have shown that behavioral symptoms in dementia are a source of anguish and a burden for family and professional caregivers and are associated with the

rapid increase in institutionalization of people with dementia⁽³⁷⁾.

Physical exercise is of fundamental importance, as it improves functional physical capacities and reintegrates the person into daily tasks, which enables their social reintegration⁽³⁸⁾.

Practical implications

The Regulation of Specific Competences of the SNRN recognizes competences to design, implement, evaluate and reformulate motor and cardiorespiratory training programs⁽¹⁰⁾. In this sense, the SNRN has theoretical and practical knowledge that allows him to develop skills in the area of physical exercise prescription in populations with special needs (such as people with dementia) and specific goals.

The SNRN should use physical exercise in order to be able to extract its benefits. Therefore, we recommend the implementation of aerobic exercise and muscle strengthening exercises in people with dementia, demonstrating that the improvement of cardiorespiratory fitness through this type of exercise can be important to reduce disease progression and bring clear benefits in improving their functional capacity, in addition to that, this type of exercises offer a low-cost, low-risk and widely available intervention⁽¹⁷⁾. For this, it is essential that physical exercise is included as a therapeutic and/or prophylactic resource in Rehabilitation Nursing plans for people with dementia.

Study limitations

This study has some limitations; firstly, the access to databases, as the limited number of studies prevented us from investigating other potential studies to be included.

Another limitation that we consider important is the fact that only one study was carried out at home, as well as the severity of functional incapacity and the burden of caregivers being poorly explored, which does not allow us to sustainably conclude the benefit of physical exercise for the people with dementia who remain at home as well as for their their caregivers.

Another limitation of the study refers to the small number of included studies, its heterogeneity and the wide range of exercise interventions prevented the analysis of the best exercise. Parameters such as modality and intensity are superficially addressed in most of the studies carried out; in relation to the volume it was only referenced in one study, making it difficult to make a connection between the modality adopted and the expected results in order to guide the exercise practice with a view to achieving certain benefits. Once this issue is addressed, in the future, the SNRN will be able to establish specific guidelines for the prescription of physical exercise in people with dementia.

CONCLUSION

The initial goal of this SLR was achieved as evidence is revealed of the beneficial effects of physical exercise on cognition and motor skills in people with dementia.

Thus, we were able to answer the research question and realize that interventions that combine aerobic exercise, strength, endurance, balance and motor coordination are essential interventions to produce improvements in the health and well-being of people with dementia, not only over time, but also when compared to other interventions, such as sedentary social and recreational activities.

Studies have shown significant improvements in areas such as cognition, agitation, mood, mobility and functional capacity. Although the frequency, intensity and volume of the studied exercises vary and even though the optimal parameters have not yet been determined, the analysis of this review concludes that a physical activity program based on aerobic exercises, such as the use of pedalboards at a frequency of 3 to 5 times a week, at an intensity that goes up to 60 to 75% of the reserve heart rate and with a duration of 30 to 50 minutes, it can bring benefits in terms of increased capacity to perform ADL. It is also concluded that a program of high intensity muscle strengthening exercises with emphasis on the lower limbs, with 2 sets of 12 repetitions at a frequency of 2 to 5 times a week can have effects on balance and motor coordination.

In future studies, an activity plan that includes specific exercises with well-defined characteristics should be instituted, as well as the possibility of being carried out at home with the training and intervention of caregivers to be taken into account.

Finally, it remains to be recognized that despite the countless knowledge that is already possessed, doubts still remain concerning the physical exercise to be prescribed, namely the duration, volume and intensity needed, and thus extracting the maximum benefits from it for people with dementia. Answering these questions is fundamental for exercise prescription by the SNRN.

BIBLIOGRAPHIC REFERENCES

1. Organisation for Economic Co-operation and Development [OECD]. Health at a Glance 2017: OECD Indicators, OECD Publishing, Paris; 2017. [cited 2018 Oct 26]. Available from: https://doi.org/10.1787/health_glance-2017-en.
2. Organización Mundial de la Salud. Demencia. [Web page] 2017. [cited 2018 Oct 26]. Available from: <http://www.who.int/es/news-room/fact-sheets/detail/dementia>
3. Davis DH, Creavin ST, Yip JL, Noel-Storr AH, Brayne C, Cullum S. Montreal Cognitive Assessment for the diagnosis of Alzheimer's disease and other dementias. Cochrane Database. Syst Rev [Internet]. 2015 Oct 29 [cited 2018 Oct 26];(10). Available from: <http://doi.wiley.com/10.1002/14651858.CD010775.pub2>
4. Beydoun MA, Beydoun HA, Gamaldo AA, Teel A, Zonderman AB, Wang Y. Epidemiologic studies of modifiable factors associated with cognition and dementia: systematic review and meta-analysis. BMC Public Health [Internet]. 2014 Jun;14(1):643. Available from: <https://doi.org/10.1186/1471-2458-14-643>
5. Bahar-Fuchs A, Clare L, Woods B. Cognitive training and cognitive rehabilitation for persons with mild to moderate dementia of the Alzheimer's or vascular type: a review. *Alzheimers Res Ther*

- [Internet]. 2013;5(4):35. Available from: <https://doi.org/10.1186/alzrt189>
6. Direção Geral da Saúde. Dia Mundial da Doença de Alzheimer. Lisboa: Direção Geral da Saúde. 2015. [Web page] 2018. [cited 2018 Oct 26] Available from: <https://www.dgs.pt/em-destaque/dia-mundial-da-doenca-de-alzheimer-21-de-setembro.aspx>
 7. Groot C, Hooghiemstra AM, Raijmakers PGHM, van Berckel BNM, Scheltens P, Scherder EJA, et al. The effect of physical activity on cognitive function in patients with dementia: A meta-analysis of randomized control trials. *Ageing Res Rev* [Internet]. 2016;25:13-23. Available from: <https://doi.org/10.1016/j.arr.2015.11.005>
 8. Farina N, Rusted J, Tabet N. The effect of exercise interventions on cognitive outcome in Alzheimer's disease: a systematic review. *International Psychogeriatrics*. Cambridge University Press; 2014;26(1):9-18. Available from: <https://doi.org/10.1017/S1041610213001385>
 9. Antunes HKM, Santos-Galduroz RF, De Aquino Lemos V, Bueno OFA, Rzezak P, de Santana MG, et al. The influence of physical exercise and leisure activity on neuropsychological functioning in older adults. *Age (Omaha)* [Internet]. 2015 Jul;37(4):71. Available from: <https://doi.org/10.1007/s11357-015-9815-8>
 10. Regulamento das Competências Comuns do Enfermeiro Especialista Lisboa: Ordem dos Enfermeiros, Diário da República, 2.ª série—N.º 35—18 de Fevereiro.
 11. Sousa LMM, Firmino CF, Marques-Vieira CMA, Severino S, Pestana HCFC. Revisões da literatura científica: tipos, métodos e aplicações em enfermagem. *Rev Port Enferm Reabil*. 2018; 1(1): 46-55. Disponível em: <http://www.aper.pt/ficheiros/revista/rpern0.pdf>
 12. Joanna Briggs Institute. User manual: Version 5.0 system for the unified management, assessment and review of information. Recuperado de <http://joannabriggs.org/assets/docs/sumari/SUMARI-V5-User-guide.pdf> [Links]. 2012
 13. Registered Nurses' Association of Ontario. Falls prevention: building the foundations for the patient safety. A self-learning package. Toronto: Registered Nurses' Association of Ontario. 2007 Available in: http://nao.ca/sites/nao-ca/files/Falls_Prevention_-_Building_the_Foundations_for_Patient_Safety._A_Self_Learning_Package.pdf
 14. Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA). Welcome to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). 2015. Available from: <http://www.prisma-statement.org/>
 15. Telenius EW, Engedal K, Bergland A. Long-term effects of a 12 weeks high-intensity functional exercise program on physical function and mental health in nursing home residents with dementia: a single blinded randomized controlled trial. *BMC Geriatr* [Internet]. 2015 [cited 2018 Nov 24];15(1):158. Available from: <https://doi.org/10.1186/s12877-015-0151-8>
 16. Holthoff VA, Marschner K, Scharf M, Steding J, Meyer S, Koch R, et al. Effects of physical activity training in patients with Alzheimer's dementia: results of a pilot RCT study. *Plos One* [Internet]. 2015 Apr 17 [cited 2018 Nov 24];10(4):e0121478.
 17. Morris JK, Vidoni ED, Johnson DK, Van Sciver A, Mahnken JD, Honea RA, et al. Aerobic exercise for Alzheimer's disease: A randomized controlled pilot trial. *Scholarly A, editor. PLoS One* [Internet]. 2017 Feb 10 [cited 2018 Nov 24];12(2):e0170547. Available from: <https://dx.plos.org/10.1371/journal.pone.0170547>
 18. Lee HJ, Don Kim K. Effect of physical activity on cognition and daily living activities of the elderly with mild dementia. *J Phys Ther Sci* [Internet]. 2018;30(3):428-33. Available from: https://www.jstage.jst.go.jp/article/jpts/30/3/30_jpts-2017-551/_article
 19. Cancela JM, Ayán C, Varela S, Seijo M. Effects of a long-term aerobic exercise intervention on institutionalized patients with dementia. *J Sci Med Sport* [Internet]. 2016 Apr 1 [cited 2018 Nov 24];19(4):293-8. Available from: <https://doi.org/10.1016/j.jsams.2015.05.007>
 20. de Souto Barreto P, Cesari M, Denormandie P, Armaingaud D, Vellas B, Rolland Y. Exercise or social intervention for nursing home residents with dementia: a pilot randomized, controlled trial. *J Am Geriatr Soc*. 2017 Sep [cited 2018 Nov 24];65(9):E123-

9. Available from: <https://doi.org/10.1111/jgs.14947>
21. Menezes AV, Aguiar A da S de, Alves EF, et al. Efetividade de uma intervenção fisioterapêutica cognitivo-motora em idosos institucionalizados com comprometimento cognitivo leve e demência leve. *Cien Saude Colet* [Internet]. 2016 Nov [cited 2018 Nov 24];21(11):3459-67. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S141381232016001103459&lng=pt&tlng=pt
22. Thomas S, Mackintosh S, Halbert J. Does the “Otago exercise programme” reduce mortality and falls in older adults? A systematic review and meta-analysis. *Age Ageing*. 2010;39(6):168-7.
23. Araújo PA, Guimarães SN, de Sousa Guidarini FC. Exercício físico com tratamento não farmacológico das doenças cardiovasculares: Qual a intensidade ideal?. *Revista Brasileira de Prescrição e Fisiologia do Exercício (RBPFE)*. 2014;8(44):11
24. American College of Sports Medicine. Diretrizes de ACSM para os testes de esforço e sua prescrição. Rio de Janeiro: Guanabara Koogan; 2018
25. Williams N. The Borg Rating of Perceived Exertion (RPE) scale. *Occup Med* [Internet]. 2017 Jul 1;67(5):404-5. Available from: <http://dx.doi.org/10.1093/occmed/kqx063>
26. Phillips VL, Diwan S. The incremental effect of dementia-related problem behaviors on the time to nursing home placement in poor, frail, demented older people. *J. am. geriatr. soc.* 2003 Feb;51(2):188-93.
27. Selbæk G, Engedal K. Stability of the factor structure of the Neuropsychiatric Inventory in a 31-month follow-up study of a large sample of nursing-home patients with dementia. *Int Psychogeriatrics* [Internet]. 2012 Jan 20 [cited 2018 Nov 24];24(01):62-73. Available from: http://www.journals.cambridge.org/abstract_S104161021100086X
28. Batista JI, de Oliveira A. Efeitos psicofisiológicos do exercício físico em pacientes com transtornos de ansiedade e depressão. *Rev Corpoconsciência*. 2016 Oct 6;19(3):1-0
29. de Vreede PL, Samson MM, van Meeteren NLU, Duursma SA, Verhaar HJJ. Functional-task exercise versus resistance strength exercise to improve daily function in older women: a randomized, controlled trial. *J Am Geriatr Soc.* [Internet]. 2005;53(1):2-10. Available from: <https://doi.org/10.1111/j.1532-5415.2005.53003.x>
30. Stubbs B, Patchay S, Soundy A, Schofield P. The Avoidance of Activities due to Fear of Falling Contributes to Sedentary Behavior among Community-Dwelling Older Adults with Chronic Musculoskeletal Pain: A Multisite Observational Study. *Pain Med* [Internet]. 2014 Nov 1;15(11):1861-71. Available from: <http://dx.doi.org/10.1111/pme.12570>
31. Lam FM, Huang M-Z, Liao L-R, Chung RC, Kwok TC, Pang MY. Physical exercise improves strength, balance, mobility, and endurance in people with cognitive impairment and dementia: a systematic review. *J Physiother* [Internet]. 2018 Jan 1 [cited 2018 Nov 28];64(1):4-15. Available from: <https://doi.org/10.1016/j.jphys.2017.12.001>
32. Blankevoort CG, Van Heuvelen MJ, Boersma F, Luning H, De Jong J, Scherder EJ. Review of effects of physical activity on strength, balance, mobility and ADL performance in elderly subjects with dementia. *Dement. geriatr. cogn. disord.* [Internet]. 2010;30(5):392-402. Available from: <https://doi.org/10.1159/000321357>
33. Jensen J, Nyberg L, Gustafson Y, Lundin-Olsson L. Fall and injury prevention in residential care-effects in residents with higher and lower levels of cognition. *J. am. geriatr. soc.* [Internet]. 2003 May;51(5):627-35. Available from: <https://doi.org/10.1034/j.1600-0579.2003.00206.x>
34. Selbæk G, Engedal K, Bergh S. The prevalence and course of neuropsychiatric symptoms in nursing home patients with dementia: a systematic review. *J Am Med Dir Assoc.* [Internet]. 2013 Mar 1;14(3):161-9. Available from: <https://doi.org/10.1016/j.jamda.2012.09.027>
35. Helvik AS, Engedal K, Benth JS, Selbæk G. A 52 month follow-up of functional decline in nursing home residents-degree of dementia contributes. *BMC Geriatr* [Internet]. 2014;14(1):45. Available from: <https://doi.org/10.1186/1471-2318-14-45>
36. Bennett HP, Corbett AJ, Gaden S, Grayson DA, Kril JJ, Broe GA. Subcortical vascular disease and functional decline: A 6-year predictor study. *J Am Geriatr Soc.* 2002 Dec;50(12):1969-77.
37. Brodaty H, McGilchrist C, Harris L, KE P. Time until institutionalization and death in patients with dementia: Role of caregiver training and risk factors. *Arch Neurol* [Internet]. 1993 Jun 1;50(6):643-50. Available from: <http://dx.doi.org/10.1001/archneur.1993.00540060073021>
38. Paulo TR, Castellano SM, Santos WL, Campos DR, Campos LA. O exercício físico funcional para idosos institucionalizados: um novo olhar para as atividades da vida diária. *Estud. interdiscip. envelhec.* 2012;413-27.

EXERCÍCIO FÍSICO NA PESSOA COM DEPRESSÃO: REVISÃO SISTEMÁTICA DA LITERATURA

EJERCICIO FÍSICO EN LA PERSONA CON TRASTORNO DEPRESIVO: REVISIÓN SISTEMÁTICA DE LA LITERATURA

PHYSICAL EXERCISE IN THE PERSON WITH DEPRESSIVE DISORDER: A SYSTEMATIC LITERATURE REVIEW

DOI 10.33194/rper.2019.v2.n1.05.4565 | Submitted 07.03.2019 | Approved 24.06.2019

 Inês de Jesus Rocha¹;  Carla Alexandra Fundevila de Barros²;  Ana Maria Pinto Mateus¹;
 Rosa Cristina Rodrigues Correia²;  Helena Castelão Figueira Carlos Pestana³;  Luís Manuel Mota de Sousa⁴

1 - Centro Hospitalar Universitário Lisboa Central Hospital Curry Cabral, Portugal; 2 - Centro Hospitalar Lisboa Norte, Hospital Santa Maria, Lisboa, Portugal; 3 - Escola Superior de saúde Atlântica, Barcarena, Portugal; 4 - Universidade de Évora, Escola Superior de Enfermagem S. João de Deus, Évora, Portugal

RESUMO

Introdução: A depressão é das formas mais comuns de distúrbio mental e uma das maiores causas de problemas de saúde da atualidade. Tem surgido a necessidade de aliar ao tratamento farmacológico, tratamentos adjuvantes tais como a psicoterapia e a prática de exercício físico, no tratamento deste transtorno.

Objetivo: identificar quais os benefícios do exercício físico na pessoa com depressão.

Método: Revisão Sistemática da Literatura, que utiliza as recomendações do Joanna Briggs Institute na estratégia PICO e as recomendações PRISMA, foi formulada a questão de pesquisa “**quais os benefícios do exercício físico na pessoa com transtorno depressivo?**” A pesquisa foi realizada com recurso a plataformas de bases de dados eletrônicas EBSCOhost e B-on.

Resultados: Foram incluídos nove estudos que cumpriam os critérios de inclusão, e onde se descreveram e analisaram o tipo, frequência, volume e duração de cada modalidade de exercício físico praticado em cada um dos estudos.

Conclusões: Os resultados obtidos permitem concluir que independentemente da frequência, duração e intensidade da prática de exercício físico no transtorno depressivo, esta diminui os sintomas depressivos, melhorando também a forma física, função cognitiva e bem-estar da pessoa com transtorno depressivo.

Descritores: Transtorno depressivo; treino de exercício; atividade física; Enfermagem em Reabilitação.

RESUMEN

Introducción: El trastorno depresivo es una de las formas más comunes de trastorno mental y una de las mayores causas de problemas de salud en la actualidad. Ha surgido la necesidad de aliar al tratamiento farmacológico, tratamientos adjuvantes tales como la psicoterapia y la práctica de ejercicio físico en este trastorno.

Objetivo: Identificar cuales son los beneficios del ejercicio físico en una persona con un trastorno depresivo.

Método: Revisión sistemática de la literatura, que utiliza las recomendaciones de Joanna Briggs Institute con la estrategia PICO y las recomendaciones PRISMA, se formuló la cuestión de investigación “¿cuáles son los beneficios del ejercicio físico en una persona con trastorno depresivo?” La búsqueda se realizó con recursos a plataformas de bases de datos electrónicas EBSCOhost y B-on.

Resultados: Se incluyeron nueve estudios que cumplían los criterios de inclusión, y donde se describieron y analizaron el tipo, frecuencia y duración del ejercicio físico practicado en cada uno de los estudios.

Conclusiones: Los resultados obtenidos permiten concluir que independentemente de la frecuencia, duración, volumen e intensidad de la práctica de ejercicio físico en el tratamiento depresivo, ésta disminuye los síntomas depresivos, mejorando también la forma física, función cognitiva y el bienestar de la persona con trastorno depresivo.

Palabras clave: Trastorno depresivo; entrenamiento de ejercicio; actividad física; Enfermería en Rehabilitación.

ABSTRACT

Background: Depressive disorder is currently one of the most common forms of mental disorder and one of the greatest causes of health problems. There has been a need to combine the pharmacological approach with adjuvant treatment such as psychotherapy and physical exercise in the treatment of this disorder.

Objective: To identify the benefits of physical exercise in the person with depressive disorder.

Method: Systematic Literature Review that was based on the recommendations of the Joanna Briggs Institute on PICO strategy and based on PRISMA. The research question raised was “What are the benefits of physical exercise in people

with Depressive Disorder?”. The research was carried out using the electronic database platforms: EBSCOHost and B-on.

Results: A sample of nine studies was included that fulfilled the eligibility and methodological quality criteria, where the type, volume, frequency and duration of the physical exercise practiced in each of the studies were described and analyzed.

Conclusions: The results obtained allow us to conclude that regardless of the frequency, duration and intensity of physical exercise in depressive disorder, it decreases the depressive symptoms, improving also the physical fitness, the cognitive function and the well-being of the person with this disorder.

Key words: Exercise training, physical activity, depressive disorder, rehabilitation nursing.

INTRODUCTION

Depression is considered a mental disorder that is characterized by the manifestation of depressive episodes once or twice a week. These episodes are expressed by the loss of interest and pleasure in activities of daily living (ADL). Persistent mood changes associated with emotional, cognitive and behavioral symptoms translating into loss of self-esteem, feelings of guilt and incapacity⁽¹⁾.

Depression is a prevalent disease throughout life that affects 10 to 20% of the population in different countries, being the main responsible for the disability caused by mental disorders and substance use (about 40.5% of the total years of life adjusted for disability)⁽²⁾.

People with depression, in many cases, have associated comorbidities, increasing the negative impact on their quality of life, not only in social activities and ADL, but also in the increase in hospitalizations and mortality⁽³⁾.

In order to counteract depressive symptoms, there is a growing need to find strategies and therapies that make it possible to reduce these symptoms. In this sense, the use of non-drug therapies, such as physical exercise, can have a positive effect on decreasing depressive symptoms. This is well tolerated by people with depressive disorder, with good adherence, but it has to be administered, prescribed, managed supported and/or carried out by health professionals with specific training in exercise prescription⁽⁴⁾. Physical exercise is understood as the planned, organized and repeated body movements in order to maintain or improve one or more components of physical fitness⁽⁵⁾. There is evidence that physical exercise is an adjunct to the treatment of major depressive disorder, with beneficial effects in people⁽⁶⁾. Thus, with the systematic literature review (SLR), we intend to find an answer to the following question: what are the benefits of physical exercise for people with depression?

Thus, it is intended to identify the benefits of physical exercise for people with depression.

MATERIAL AND METHODS

A literature review aims to systematize the studies of clinical practice in health care, which can be expressed in various ways. SLR is defined as an investigation method focused on a clearly formulated question, which, through systematic, explicit and reproducible methods, allows the identification, evaluation and synthesis of studies with relevant evidence. This is

carried out by researchers, academics and health professionals, allowing the collection and analysis of data from the studies that are included in the review⁽⁷⁾.

For the present study, an SLR to publications worldwide was carried out between January 2014 and November 2018.

The recommendations of the Joanna Briggs Institute (JBI) were considered, which resulted in the research question from the PICO strategy⁽⁸⁻¹⁰⁾, the research question was formulated “What are the benefits (O) of physical exercise (I) in the person with depressive disorder (P) compared to the control group (C)?” where each PICO dimension contributed to define the inclusion criteria: Population (P) - People with depressive disorder; Intervention (I) - physical exercise, and Comparison (C) - people with depression who do not exercise compared to a group of people with depressive disorder who are subject to complementary therapy, exercise, and Results (O) - benefits of physical exercise in people with depressive disorder.

The descriptors related to each of the components of the PICO strategy were previously validated in the Descriptors in Health Sciences and Medical Subject Headings platform. The following Keywords were also used: exercise training, physical activity, and depressive disorder.

The following were defined as inclusion criteria for articles: (Table 1) quantitative studies, published in the last 4 years (2014-2018), in Portuguese, English and Spanish, with accessible full text.

| Inclusion criteria | Exclusion criteria |
|--|---|
| Person with Depressive syndrome (or simply) with depression. | |
| Experimental studies | Other quantitative studies, qualitative studies and systematic literature review. |
| Studies published between 2014 and 2018. | Studied published before 2014 |
| Studies published in Portuguese, English and Spanish. | |

Table1- Criteria of inclusion and exclusion.

The research was carried out by four investigators simultaneously, in the period between October and November 2018, and for it the following databases were used: EBSCOHost and online library B-on.

The articles selected for full reading were independently evaluated by two investigators, according to methodological quality criteria proposed by the JBI⁽⁸⁾, with only articles with more than 75% of the criteria being selected.

Information was extracted from the articles on authors, year, country, sample, data on the intervention (frequency, intensity, volume, duration and modality), conclusions and level of evidence. The classification of the levels of evidence of the included studies was based on the criteria of the Registered Nurses Association of Ontario^(9, 11).

RESULTS

From the bibliographic research process carried out with this methodology, on the EBSCOhost platform we obtained 1,138 articles for initial selection. After insertion of the inclusion criteria, 156 articles were found. Out of these, 117 were rejected by title or subject and 33 by abstract. Out of the 6 resulting articles, all were excluded after analysis of the full text, as they did not meet the defined inclusion criteria.

By replicating the same methodology on the B-on platform, 1,967 articles were found, of which 702 articles were selected after insertion of the inclusion criteria. Of these, 658 were rejected by title or subject and 31 by abstract. Of the 13 resulting, 4 were excluded after reading the entire text, as they did not meet the defined inclusion criteria. As a final result, 9 articles that meet the inclusion criteria were obtained.

Table 2 describes the process of combining descriptors and keywords for searching the databases. Figure 1 illustrates the PRISMA⁽¹²⁾ flowchart corresponding to the identification, analysis, selection and inclusion of articles.

| Boolean Conjugation | EBSCO | B-on |
|--|-------|-------|
| ((exercise training) OR (physical activity)) AND (depressive disorder) | | |
| Total of Articles | 1,138 | 1,967 |

Table 2 – Boolean Conjugation

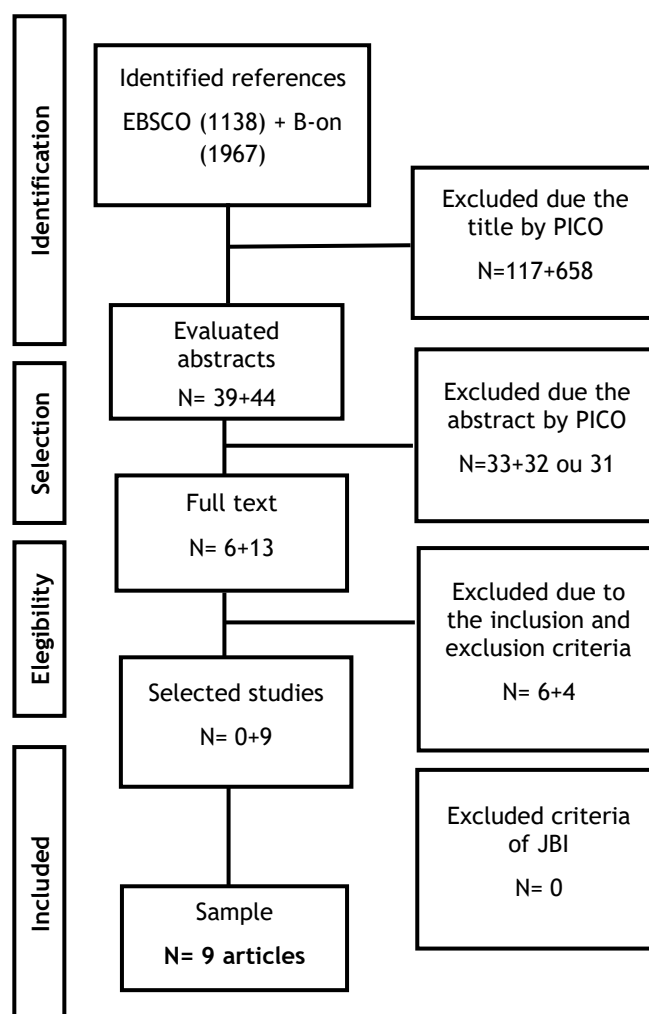


Figure 1 – Identification, analysis and selection of articles^(12.)

In summary, 9 articles were included in this SLR that were published from 2015 to 2018.

The sample of people/participants in the different studies ranged between 14⁽¹⁷⁾ and 310⁽²¹⁾ and for the control group, the number of participants ranged between 6⁽¹⁷⁾ and 310⁽²¹⁾. All studies included (table 2) are descriptive studies, with evidence level IB, that is, evidence obtained from a well-designed study, and from at least one randomized controlled study ⁽¹⁰⁻¹¹⁾ (Table 3).

| Author, year, country | Participants | Objective | Intervention | Results | Evidence level |
|---|---|--|--|--|----------------|
| Minghetti <i>et al.</i> , 2018, Switzerland ⁽¹³⁾ | Total (n=59) Intervention group (n=29) (n=21 women n= 8 men) Control group (n=30) (n=25 women; n= 6 men) | To evaluate the benefit of sprint interval training in people with depression compared to continuous aerobic exercise | <u>Duration of study:</u> 4 weeks <u>Intervention Group:</u> Modality - Interval sprint training on bicycle Frequency - 3 sessions/week Intensity - High Duration -25 sprint attacks of 30 seconds Volume - 2 sets and 4-6 reps <u>Control group:</u> Modality -Aerobic exercise Frequency - 3 sessions/week Intensity - Moderate Duration -20 min | The practice of sprinting at short intervals has similar effects to the practice of aerobic exercise in people with depressive disorder. Both had beneficial effects in reducing depressive symptoms. | IB |
| Kerling <i>et al.</i> , 2017, Germany ⁽¹⁴⁾ | Total (n=30) Intervention group (n=20) (n=8 women; n=12 men) Control group (n=10) (n=4 women; n=6 men) | To evaluate the benefit of sprint interval training in people with depression compared to continuous aerobic exercise | <u>Duration of study:</u> 6 weeks <u>Intervention group:</u> Modality - Aerobic and resistance exercises Frequency - 3 sessions/week Intensity - Moderate Duration - 45 minutes (25 minutes on bicycle and 20 minutes on resistance machine) <u>Control group:</u> Modality - Walking, ball games and stretching exercises Frequency - 3 sessions/week Intensity - Low Duration - 20 minutes | There was a slight increase in muscle mass in the intervention group while in the control group there was a slight decrease in muscle mass. | IB |
| Kerling <i>et al.</i> , 2015, Germany ⁽¹⁵⁾ | Total (n=42) Intervention group (n=22) (n=10 women; n=12 men) Control group (n=20) (n=6 women; n=14 men) | To examine whether people receiving an exercise program as an adjunct to hospital treatment benefit in terms of physiological and psychological factors. | <u>Duration of study:</u> 6 weeks <u>Intervention group:</u> Modality - Static bicycle Frequency - 3 sessions/week Intensity - Moderate Duration - 45 minutes <u>Control group:</u> Modality - Walking, ball games and stretching Frequency - 3 sessions/week Intensity -moderate-intensity physical activity Duration - 20 minutes | In people with depressive disorder, the practice of physical exercise as an adjuvant treatment improves physical/functional and psychological fitness. When depressive disorder and cardiometabolic disorders are present, physical exercise is recommended as adjuvant therapy. | IB |
| Olson <i>et al.</i> , 2015, USA ⁽¹⁶⁾ | Total (n=30) Intervention group(n=15) (n=11 women; n=4 men) Control group (n=15) (n=13 women; n=2 men) | To evaluate the effect of moderate-intensity aerobic exercise on cognitive control, depressive symptoms and ruminative thoughts. | <u>Duration of study:</u> 8 semanas <u>Intervention group:</u> Modalities - Aerobic exercises (treadmill or static bicycle) Volume - Absent, continuous exercise Frequency - 3 sessions/week Intensity - Moderate Duration - 45 minutes of continuous exercise <u>Control group:</u> Modalities - Stretching exercises Volume - 3 sets (20 second stretches, with a 40 second rest period between stretches) Frequency - 3 sessions/week Intensity - Light Duration - 30-40 minutes/week | A moderate-intensity aerobic exercise program improves cognitive control (conflict management), ruminative thinking and reduced depressive symptoms in people with depressive disorder. These results supported the demand that exercise could be a neurobehavioral treatment for cognitive control in people with depressive disorder. | IB |
| Haller <i>et al.</i> , 2018, Germany ⁽¹⁷⁾ | Total (n=20) Intervention group (n=14) (n=10 women n=4 men) Control group (n=6) (n=3 men n=3 women) | To evaluate the feasibility, acceptability and effectiveness of an individualized approach to physical exercise on a web platform for people with moderate to severe depression. | <u>Duration of study:</u> 8 weeks <u>Intervention group</u> Modality - Resistance (through elastic bands) and strength (running on treadmill) Volume - 3 sets (12 reps) Frequency - 1 to 2 times a week Intensity - Moderate Borg < 4 (reduce if Borg > 7) Duration - 0-60 minutes <u>Control group</u> Modality - resistance (through bands) and strength (running on a treadmill) Volume - 3 sets (12 reps) Frequency - 1 to 2 sessions/week | Improved quality of life (subjective well-being and social performance), self-efficacy and physical activity. Decrease in depressive symptoms. | IB |

| | | | | | |
|---|---|---|---|--|----|
| | | | Intensity - Moderate Borg < 4 (reduce if Borg > 7) Duration - 10-20 minutes | | |
| Carneiro et al., 2015, Portugal ⁽¹⁸⁾ | Total (n=26) Control group (n=10) (n=10 women) Intervention group (n=16) (n=16 women) (group 1: n= 9 moderate-intensity exercises. Group 2: n=7 low intensity exercises) | To measure the effect of a structured and individualized physical exercise program, supervised by a physical education teacher, as a complement to antidepressant therapy in the treatment of women with depressive disorder. | <u>Duration of study:</u> 16 weeks <u>Intervention group:</u> Modality - Aerobic exercise (traditional games, indoor/outdoor natural circuit exercises with resistance bands, jump ropes, fitness balls, dance and brisk walk test - 6 minutes). Frequency - 3 sessions/week Intensity - Group 1: moderate Group 2: low (Borg scale) Duration - 45-50 minutes/week (10 minutes of warm-up, 30 minutes of aerobic exercise and 5 minutes of stretching) <u>Control group:</u> Group to perform only antidepressant drug therapy. | A structured, supervised exercise program is suitable not only as an adjunct therapy but as a primary option. It improves quality of life, reduce depressive and anxiety symptoms. Simultaneously it improves the physical/functional fitness of the participants. As for the intensity of the exercises, there were no differences in results when comparing the intervention subgroups. | IB |
| Pentecost et al., 2015, England ⁽¹⁹⁾ | Total (n=60) Intervention group (n=30) (n=12 women; n=18 men) Control group (n=30) (n=17 women; n=13 men) | To compare a group of people undergoing a self-help program based on behavioral activation under the supervision of a Psychological Wellness Practitioner with a group of people undergoing the same self-help program combined with physical activity. | <u>Duration of study:</u> 12 weeks <u>Intervention group:</u> Modality - Self-help program (manual, assessment sessions with Psychological Wellness professionals and self-determination training teachings) associated with activities monitored by a pedometer, Frequency - 1 session/week Intensity - Light Duration - Evaluation and follow-up sessions from 25 to 35 minutes <u>Control group:</u> Modality - self-help manual associated with a set of low-intensity cognitive behavioral therapy interventions. Frequency - 1 session/week Intensity - Low cognitive intensity. Duration - assessment and follow-up sessions from 25 to 35 minutes | Study results indicate that there was acceptance of the use of self-help manuals by participants as well as Psychological Well-Being professionals. In this study, people increased their levels of physical activity, monitored by a pedometer. This monitoring encouraged the establishment of new goals and changed the personal behavioral activation program. They understood the joint importance of activities as a method to aid their recovery and improved cognitive ability. | IB |
| Ólafsdóttir et al., 2017, Iceland ⁽²⁰⁾ | Total (n=15) (n=12 women; n=3 men) Intervention group; (n=15) Control group: (n=15) The study was carried out in two periods with the same group of participants | To know the effects of physical exercise in a group of people with depressive and anxiety disorder, comparing to the same group of people undergoing only Cognitive Behavioral Therapy Transdiagnosis. | <u>Duration of study:</u> De 5 a 8 semanas <u>Intervention group:</u> Modality - Aerobic Exercises Frequency - 3 sessions/week Intensity - Moderate Duration - 60 minutes <u>Control group:</u> Modality - Transdiagnostic Cognitive Behavioral Group Therapy Frequency - 1 session/week Duration - 120 minutes (behavioral therapy group) | Physical exercise has beneficial effects in reducing depressive symptoms in people with depressive disorder and anxiety. The group, when submitted to physical exercise presented results a little better than when submitted to Transdiagnostic Cognitive Behavioral Group Therapy. | IB |
| Helgadóttir et al., ⁽²¹⁾ 2016, Sweden. | Total (n 620) Control group (n=310) (n=310 women) Intervention group (n=310) (n=310 women) (group 1: n=106 low intensity, group 2: n=105 moderate intensity, group 3: n=99 High intensity) | To verify the response between physical exercise performed at three levels of intensity, with similar frequency and duration, and the severity of post-treatment depression. Compare the various levels of intensity and severity of post-treatment depression. | <u>Duration of study:</u> 12 Semanas <u>Intervention group:</u> Modality - Yoga, Mindfulness (group 1), aerobics classes (group 2), vigorous exercise (group 3) Frequency - 3 sessions/week Intensity - Group 1 - Low, Group 2 - Moderate, Group 3 - High Duration - 55 minutes <u>Control group:</u> Modality - Group to perform only Usual treatment of depressive disorders (TAU) | The four groups showed a significant reduction in the Montgomery-Åsberg Depression Rating Scale (MADRS) scores at post-treatment. The reductions in the three exercise groups were similar (7.4 to 9.4 points), and in all of them greater than the reduction observed in the TAU group (5.4 points). Regarding the training intensities used, although the differences were not significant, there was a reduction of almost 2 points in the MADRS score in group 1 compared to group 2. | IB |

Table 3 – Description of the included articles.

DISCUSSION

In order to understand the benefits of physical exercise in people with depressive disorder, we analyzed

different studies in which a variety of strategies were found, such as the use of physical exercise and/or cognitive-behavioral therapies to reduce depressive symptoms⁽¹³⁻²¹⁾.

Through research from different studies, it was possible to verify some similarities in the interventions used by the various authors, who used parameters such as modality, intensity, frequency, volume and duration of the different types of exercises.

Given the diversity of exercises presented by the authors, they were grouped according to the associated intensity. We were able to verify that the study by Minghetti et al.⁽¹³⁾, comparing two groups of people, in which one of them practiced interval sprint training (high intensity exercise) and the other continuous aerobic physical exercise (moderate intensity exercise), found benefits of both physical exercise practices in the treatment of depressive disorders. Thus, it was not clear whether high-intensity physical exercise had a better conditioning when it is compared to moderate-intensity exercise.

This same line of thought was found by Helgadóttir et al.⁽²¹⁾ who, when comparing the different types of intensities of physical exercise practice, did not find significant differences between them. However, it was found that in the low intensity exercise group (yoga) there was a reduction of almost 2 points in the MADRS score compared to the moderate/aerobic exercise group.

Olson et al.⁽¹⁶⁾, go against what has already been described, since these authors also concluded that the practice of light intensity exercise allows for improvements in the cognitive level and in the reduction of depressive symptoms.

Shuch et al.⁽²⁾ report in their study that exercises of moderate to high intensity showed better results; however they highlight the fact that the study sample is small, being difficult to extrapolate.

But given the above, none of the articles managed to present advantages regarding the duration of the exercises. The exercise intensities ranged between light and moderate, with a variation in duration between 20-60 minutes^(16-18,20), with the exception of the high-intensity exercises⁽¹³⁾ which was performed in sessions of 25 repetitions of lasting 30 seconds (followed by 30 seconds of total rest).

Regarding the frequency of exercises, it ranged from one to three times a week for a period ranging from four to sixteen weeks⁽¹³⁻²¹⁾.

It was found that the physical exercise performed more frequently^(16,18,21) allowed to obtain more evident improvements than for those ones who only performed it once or twice^(17,19).

When talking about the impact of physical exercise on people with depressive disorder undergoing pharmacological therapy compared to people with depressive disorder who underwent therapy at the behavioral level⁽²¹⁾, it was found that according to the MADRS score reductions in the three exercise groups were similar, and in all three were greater than the reduction observed in drug therapy. In the same perspective, Carneiro et al.⁽¹⁸⁾ found that the group of people undergoing pharmacological therapy combined with physical exercise had an improvement in quality of

life and a reduction in depressive and anxiety symptoms, also improving physical fitness.

Pentecost et al.⁽¹⁹⁾ report that the use of self-help manuals in behavioral activation therapy with encouragement to exercise facilitated adherence to its treatment and proved to be an option to consider in the treatment of depressive symptoms.

In turn, Ólafsdóttir et al.⁽²⁰⁾ concluded that physical exercise can be a highly recommended alternative to the detriment of the transdiagnostic cognitive behavioral group. Minghetti et al.⁽¹³⁾, on the other hand, found that the association of these brought significant improvements in the reduction of symptoms of depression. Therefore, combining a physical exercise program with antidepressant therapy and cognitive behavioral therapy⁽¹⁵⁾ resulted in an improvement in cardiovascular capacity and a reduction in metabolic risk factors.

In the same line of thought, Helgadóttir et al.⁽²¹⁾ also found that physical exercise helped to prevent somatic disorders, such as cardio and cerebrovascular diseases and metabolic diseases. Knapen et al.⁽¹⁾ suggest that there is an improvement in the metabolic level. In addition to improving physical health, there was an improvement in terms of body image, coping strategies to deal with stress, consequently improving quality of life and independence in activities of daily living in elderly people with depression.

As the loss of muscle mass is a consequence of the depressive disorder, Kerling et al.⁽¹⁴⁾ concluded that the practice of regular aerobic exercise (resistance training) is effective in preserving mass in people with depression. However, the authors mentioned that more studies are needed to prove a concrete improvement in this field.

Knapen et al.⁽¹⁾ also reveal that the implementation of motivational strategies in exercise plans seems to improve the motivation of people with depression, as well as their long-term adherence to exercise.

Shuch et al.⁽²⁾ also state that the results in the improvement of symptoms of depression using physical exercise are more evident when there are no other associated comorbidities and when the exercises were supervised by qualified professionals.

In other studies, it was possible to see evidence of physical exercise in reducing depressive symptoms. Tu et al.⁽³⁾ concluded that in people with stable heart failure and depression, physical exercise (aerobic and strength exercises) was beneficial in improving depressive symptoms and still has positive effects on self-esteem and social interaction.

Kerling et al.⁽⁶⁾ reveal that physical exercise has a positive impact on the serum concentrations of the neurotransmitter in the brain. An assessment of neurotransmitter levels before and after structured and supervised training in people with major depression has shown beneficial results and therefore exercise should be considered as an adjuvant treatment.

All these studies highlight the importance of physical exercise programs to be supervised by professionals

with relevant training as it seems that the dropout rates of interventions decrease when given by these professionals (physical education teacher, health professionals, and instructors).

Practical implications

In general, all the studies included report that physical exercise is beneficial and that it promotes an improvement in the quality of life of people with depression and under pharmacological therapy⁽¹³⁻²¹⁾.

More than subjecting the person with depression to a rigid physical exercise plan, it must be kept active. Studies have shown that regardless of the modality, frequency and/or intensity used, the person needs to be motivated. For this, it is essential that the choice of physical exercise and/or physical activity is carried out according to personal tastes, as it increases the interest and motivation to practice it.

In view of these results, and knowing that people with depression show varying degrees of anxiety and lack of motivation, it is important that these physical exercise plans are carried out by qualified health professionals, as they allow for monitoring and maintenance of the exercise plan. In this way, there is a more personalized follow-up of the person and, whenever necessary, an adjustment in the exercise plan to obtain better results.

Study Limitations

The limitations found are related to the heterogeneity of the articles, namely the existence of articles that compare groups of people with major depression and a group of people with depression and anxiety. Others, in turn, make comparisons between groups that only perform pharmacological therapy versus groups that perform pharmacological therapy and perform physical exercise⁽¹⁵⁾. And still other studies compare groups undergoing behavioral therapies (cognitive behavioral group therapy^(16,20) and behavioral activation therapy⁽¹⁹⁾) versus groups performing physical exercise.

We were also faced with the heterogeneity of groups regarding gender. There is a predominance of the female gender^(13,16-18,20-21) in the studies presented, which causes a bias in replicating the studies for the population with depression.

The small number of people in the sample^(14,16-18,20) was also a limitation presented by some of the authors. As well as the difficulty of monitoring people in the execution and fulfillment of the interventions proposed by the study.

There is a consensus among the studies that physical exercise is beneficial, however, based on the points mentioned above, the variety of exercises was so extensive that it did not allow us to draw specific conclusions about the benefit that each exercise alone had in improving the depressive symptoms. It was not possible to establish a direct comparison between studies, with regard to the specific physical exercises used, since the selection of activities according to the

degree of intensity was divergent between the studies, which made it impossible to make a specific conclusion for the selection of a certain type of exercise over another.

CONCLUSION

After the SLR, we can conclude that there is an improvement in quality of life, cognitive improvement, and decrease in depressive symptoms when practicing a training plan of exercises of light to moderate intensity under the supervision of health professionals in the treatment of depressive disorder.

The included studies recommend that the person with depression and under pharmacological therapy should remain physically active regardless of the type, frequency or intensity of physical exercise performed. In addition, the motivation, as well as the preference of physical activity to be practiced by the person with depression should be taken into account in detriment of a structured and rigid plan, thus obtaining better results.

Finally, the goal of depression treatment should not be limited to the remission of depressive symptoms, but focus on functional recovery, social participation and improvement of the person's physical health.

Considering the results obtained from this SLR, as well as its limitations, it seems essential to continue with the investigation in this field of knowledge, since physical exercise is a promising strategy and should be included as a treatment option for people with depression. And finally, objectively define the interventions and select the assessment instruments that allow measuring the level of effectiveness and also verifying the transferability of these interventions in other contexts.

BIBLIOGRAPHIC REFERENCES

1. Knapen J, Vancampfort D, Moriën Y, Marchal Y. Exercise therapy improves both mental and physical health in patients with major depression. *Disabil Rehabil.* 2015 Jul 31;37(16):1490-5. Acessível em: <https://doi.org/10.3109/09638288.2014.972579>
2. Schuch FB, Vancampfort D, Richards J, Rosenbaum S, Ward PB, Stubbs B. Exercise as a treatment for depression: a meta-analysis adjusting for publication bias. *J Psychiatr. Res.* 2016 Jun 1;77:42-51. Acessível em: <https://doi.org/10.1016/j.jpsychires.2016.02.023>
3. Tu RH, Zeng ZY, Zhong GQ, Wu WF, Lu YJ, Bo ZD, He Y, Huang WQ, Yao LM. Effects of exercise training on depression in patients with heart failure: a systematic review and meta-analysis of randomized controlled trials. *Eur J Heart Fail.* 2014 Jul;16(7):749-57. Acessível em: <https://doi.org/10.1002/ejhf.101>
4. Stubbs B, Vancampfort D, Rosenbaum S, Ward PB, Richards J, Soundy A, Veronese N, Solmi M, Schuch FB. Dropout from exercise randomized controlled trials among people with depression: a meta-analysis and meta regression. *J Affect Disord.* 2016 Jan 15;190:457-66. Acessível em: <https://doi.org/10.1016/j.jad.2015.10.019>
5. Santa-Clara H, Pinto I, Santos V, Pinto R, Melo X, Almeida JP, Pimenta N, Abreu A, Mendes M. Atividade física e exercício físico: especificidades no doente cardíaco. *Rev Factores de Risco.* 2015, 35:28-35.
6. Kerling A, Kück M, Tegtbur U, Grams L, Weber-Spickschen S, Hanke A, Stubbs B, Kahl KG. Exercise increases serum brain-

- derived neurotrophic factor in patients with major depressive disorder. *J Affect Disord.* 2017 Jun 1;215:152-5. Acessível em: <https://doi.org/10.1016/j.jad.2017.03.034>
7. Sousa LMM, Firmino CF, Marques-Vieira CMA, Severino S, Pestana HCFC. Revisões da literatura científica: tipos, métodos e aplicações em enfermagem. *Rev Port Enferm Reabil.* 2018; 1(1): 46-55. Acessível em: <http://www.aper.pt/ficheiros/revista/rpern0.pdf>.
8. The Joanna Briggs Institute (AT). Joanna Briggs Institute's user manual: version 5.0 system for the unified management. Assessment and Review of Information. Adelaide: Joanna Briggs Institute; 2011. Acessível em: <http://joannabriggs.org/assets/docs/sumari/SUMARI-V5-User-guide.pdf>
9. Sousa LM, Marques JM, Firmino CF, Frade F, Valentim OS, Antunes AV. Modelos de formulação da questão de investigação na Prática Baseada na Evidência. *Rev Inv. Enferm.* 2018; S2(23): 31-39. Acessível em: <http://hdl.handle.net/20.500.12253/1287>
10. Sousa, LMM, Vieira, CMA, Severino, SS, Antunes, AV. A metodologia de Revisão Integrativa da Literatura em Enfermagem. *Rev Inv. Enferm.* 2017; S2(21): 17-26. Acessível em: <http://hdl.handle.net/20.500.12253/1311>
11. Registered Nurses' Association of Ontario (CA). Falls Prevention: Building the Foundations for Patient Safety. A Self Learning Package. Toronto, Canada: Registered Nurses' Association of Ontario; 2007. Acessível em: <https://rnao.ca/bpg/guidelines/resources/falls-prevention-building-foundations-patient-safety-selflearning-package>
12. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med.* 2009; 6(7): e1000097. Acessível em: <https://doi.org/10.1371/journal.pmed1000097>.
13. Minghetti A, Faude O, Hanssen H, Zahner L, Gerber M, Donath L. Sprint interval training (SIT) substantially reduces depressive symptoms in major depressive disorder (MDD): A randomized controlled trial. *Psychiatry Res.* 2018 Jul 1; 265:292-7. Acessível em: <https://doi.org/10.1016/j.psychres.2018.04.053>
14. Kerling A, Hartung D, Stubbs B, Kück M, Tegtbur U, Grams L, Weber-Spickschen TS, Kahl KG. Impact of aerobic exercise on muscle mass in patients with major depressive disorder: a randomized controlled trial. *Neuropsychiatr Dis Treat.* 2018; 14:1969. Acessível em: <https://doi.org/10.2147/NDT.S167786>
15. Kerling A, Tegtbur U, Gützlaff E, Kück M, Borchert L, Ates Z, Frieling H, Hüper K, Hartung D, Schweiger U, Kahl KG. Effects of adjunctive exercise on physiological and psychological parameters in depression: a randomized pilot trial. *J Affect Disord.* 2015 May; 177:1-6. Acessível em: <https://doi.org/10.1016/j.jad.2015.01.006>
16. Olson RL, Brush CJ, Ehmann PJ, Alderman BL. A randomized trial of aerobic exercise on cognitive control in major depression. *Clin Neurophysiol.* 2017 Jun;128(6):903. Acessível em: <https://doi.org/10.1016/j.clinph.2017.01.023>
17. Haller N, Lorenz S, Pfirrmann D, Koch C, Lieb K, Dettweiler U, Simon P, Jung P. Individualized Web-Based Exercise for the Treatment of Depression: Randomized Controlled Trial. *JMIR mental health.* 2018;5(4):e10698. Acessível em: <https://doi.org/10.2196/10698>
18. Carneiro LS, Fonseca AM, Vieira-Coelho MA, Mota MP, Vasconcelos-Raposo J. Effects of structured exercise and pharmacotherapy vs. pharmacotherapy for adults with depressive symptoms: a randomized clinical trial. *J Psychiatr Res.* 2015 Dec 1;71:48-55. Acessível em: <https://doi.org/10.1016/j.jpsychires.2015.09.007>
19. Pentecost C, Farrand P, Greaves CJ, Taylor RS, Warren FC, Hillsdon M, Green C, Welsman JR, Rayson K, Evans PH, Taylor AH. Combining behavioural activation with physical activity promotion for adults with depression: findings of a parallel-group pilot randomised controlled trial (BACPac). *Trials.* 2015 Dec 1;16(1):367. Acessível em: <https://doi.org/10.1186/s13063-015-0881-0>
20. Ólafsdóttir KB, Kristjánsdóttir H, Saavedra JM. Effects of exercise on depression and anxiety. A comparison to transdiagnostic cognitive behavioral therapy. *Community Ment Health J.* 2018 Aug 1;54(6):855-9. Acessível em: <https://doi.org/10.1007/s10597-017-0213-9>
21. Helgadóttir B, Hallgren M, Ekblom Ö, Forsell Y. Training fast or slow? Exercise for depression: a randomized controlled trial. *Prev Med.* 2016 Oct 1; 91:123-31. Acessível em: <https://doi.org/10.1016/j.ypmed.2016.08.011>

FUNCIONALIDADE DE PESSOAS SUBMETIDAS A ARTROPLASTIA TOTAL DO OMBRO POR FRATURAS DO ÚMERO PROXIMAL: ESTUDO RETROSPECTIVO

FUNCIONALIDAD DE PERSONAS SOMETIDAS A ARTROPLASTIA TOTAL DEL HOMBRO POR FRACTURAS DEL HÚMERO PROXIMAL: ESTUDIO RETROSPECTIVO

FUNCTIONALITY OF PEOPLE SUBMITTED TO TOTAL SHOULDER ARTHROPLASTY BY PROXIMAL HUMERUS FRACTURES: RETROSPECTIVE STUDY

DOI 10.33194/rper.2019.v2.n1.06.4558 | Submitted 21.02.2019 | Approved 27.06.2019

Carolina Tiago Afonso¹; Miguel Pinto Freitas¹; Nuno Gonçalo Pais¹; Daniel Ramos Pires¹;
 André Novo²; Afonso Salgado Ruano¹

1 - Unidade Local de Saúde do Nordeste; 2 - Escola Superior de Saúde do Instituto Politécnico de Bragança; NurseID - CINTESIS

RESUMO

Objetivo: Identificar retrospectivamente, em pessoas submetidas a artroplastia total do ombro por fraturas do úmero proximal, o tipo de artroplastia utilizado, os scores funcionais do ombro, as complicações registadas, a influência do tempo decorrido desde a fratura e a colocação do implante no resultado funcional final.

Método: Estudo retrospectivo entre os anos 2014 e 2017. Foram identificadas as seguintes variáveis: idade, sexo, tempo entre a fratura e a cirurgia, tipo de artroplastia, cimentação, modularidade, reabilitação, complicações, tempo de seguimento e funcionalidade. Foram recolhidos dados dos instrumentos *Constant Shoulder Score* e *American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form*.

Resultados: Amostra constituída por 12 mulheres e 3 homens com idade média de 78 anos e um tempo médio entre a fratura e a cirurgia de 29,4 dias. A nível de funcionalidade observou-se que as pessoas com próteses inversas apresentaram melhores resultados em comparação com as submetidas a hemiartroplastia (53,2 vs. 41,1 e 68,5 vs. 44,6). O seguimento foi feito durante 29,4 meses.

Conclusão: A escolha de prótese inversa parece ser a melhor opção de tratamento e que permite melhor funcionalidade. A modularidade protésica é importante.

Descritores: Fraturas do úmero; Intervenção Cirúrgica; Procedimentos Ortopédicos; Artroplastia do ombro; Reabilitação

RESUMEN

Objetivo: Identificar retrospectivamente, en personas sometidas a artroplastia total del hombro por fracturas del húmero proximal, el tipo de artroplastia utilizado, la puntuación funcional del hombro, las complicaciones registradas, la influencia del tiempo transcurrido desde la fractura y la colocación del implante en el resultado funcional final.

Método: estudio retrospectivo entre 2014 y 2017. Se identificaron las siguientes variables: edad, sexo, tiempo entre fractura y cirugía, tipo de artroplastia, cementación, modularidad, rehabilitación, complicaciones, tiempo de seguimiento y funcionalidad. Fueron recogidos datos de los instrumentos *Constant Shoulder Score* y *American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form*.

Resultados: Muestra compuesta por 12 mujeres y 3 hombres con una edad media de 78 años y un tiempo medio entre la fractura y la cirugía de 29,4 días. En términos de funcionalidad, se observó que las personas con prótesis inversa presentaron mejores resultados en comparación con las sometidas a hemiartroplastia (53,2 vs. 41,1 y 68,5 vs. 44,6). El seguimiento se realizó durante 29,4 meses.

Conclusión: La prótesis inversa parece ser la mejor opción de tratamiento y que permite una mejor funcionalidad. La modularidad protésica es importante.

Descriptores: Fracturas humerales; Procedimientos quirúrgicos; Procedimientos ortopédicos; Artroplastia total del hombro; Rehabilitación

ABSTRACT

Objective: To retrospectively identify, in people submitted to total shoulder arthroplasty for proximal humeral fractures, the type of arthroplasty used, the functional shoulder scores, the recorded complications, the influence of the elapsed time from the fracture and the placement of the implant in the final functional outcome.

Method: Retrospective study between 2014 and 2017. The following variables were identified: age, sex, time between fracture and surgery, type of arthroplasty, cementation, modularity, rehabilitation, complications, follow-up time and functionality. Data from the scales *Constant Shoulder Score* and *American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form* were obtained.

Results: Sample comprised of 12 women and 3 men with mean age of 78 years-old and a mean time between fracture and surgery of 29.4 days. In terms of functionality, it was observed that people with inverse prosthesis presented better results compared to the ones submitted to hemiarthroplasty (53.2 vs. 41.1 and 68.5 vs. 44.6). The follow-up duration was 29.4 months.

Conclusion: The reverse prosthesis seems to be the best treatment option and allows better functionality. Prosthetic modularity is important.

Keywords: Humeral fractures; Surgical Procedures; Orthopedic Procedures; Total shoulder replacement; Rehabilitation

INTRODUCTION

Fractures of the proximal humerus (FPH) are the third most frequent fractures; only surpassed by hip and distal radius fractures⁽¹⁾. They have an incidence of 4-6%, affecting more women than man. They mostly occur due to low-energy trauma and in the elderly people⁽²⁾.

The type of treatment to be instituted depends on factors such as the patient's age, functional demand, dominance, comorbidities, type of fracture and its classification⁽³⁾.

Although most FPH are treated conservatively, it is estimated that up to 20% of them require surgical treatment. Due to the population aging, the number of FPH can increase and consequently the percentage that need a surgical intervention as well⁽⁴⁾.

The FDP treatments of 3 or 4 parts Neer is a challenge. Initially, hemiarthroplasty (HA) was recommended as the ideal treatment, due to the difficulty of closed reduction and the risk of avascular necrosis of the humeral head⁽⁵⁾. It was also recommended for fractures with a "head-split" component⁽⁶⁾.

However, complex FPH that affect the tuberosities are technically demanding to treat and their poor positioning is correlated with worse functional results, if the option is HA⁽⁷⁾.

Currently, inverse total shoulder arthroplasty (ITSA) has been shown to be effective in the treatment of 3 or 4 parts Neer's fractures in elderly patients with rotator cuff arthropathy⁽⁸⁻¹¹⁾, with good functional results⁽¹²⁻¹⁴⁾, and the latter depend less on the positioning of the tuberosities than on HA⁽¹⁵⁾.

The progressive increase in the number of these cases treated with arthroplasties can lead to long-term complications that require a surgeon with technical skills to resolve them. Revision surgery for an HA or ITSA also leads to less predictable functional results and higher complication rates⁽¹⁶⁻¹⁸⁾.

Among the complications described, aseptic or septic unsealing, instability, wear of the glenoid component and incompetence/rupture of the rotator cuffs are highlighted⁽¹⁹⁻²¹⁾.

The development of modular implants allows for greater ease in revision surgeries, with the possibility of preserving the humeral component and converting

from an HA to an ITSA⁽²²⁾. The time elapsed between the fracture and the surgery is considered a factor that affects the final result in HA.

This study aims to retrospectively identify, in people undergoing total shoulder arthroplasty for fractures of the proximal humerus, the type of arthroplasty used, the functional scores of the shoulder, the complications recorded, the influence of the time elapsed since the fracture and the placement of the implant in the final functional result.

METHOD

Retrospective consultation study of clinical files in which patients undergoing HA and ITSA due to FPH were included, in the period from January 1, 2014 to March 31, 2017, in an Orthopedics and Traumatology Service.

Electronic clinical files were consulted, and demographic characteristics (age and gender), type of FPH (Neer classification), time elapsed between fracture diagnosis and initial surgery for HA or ITSA, need for cementation and prosthetic modularity were recorded, need for revision, complications, follow-up time and participation in a regular rehabilitation program.

The functional results of each patient were collected from two previously applied instruments:

- Constant Shoulder Score (CSS)⁽²³⁾, adapted for Portugal⁽²⁴⁾, is a 100-point scale that is divided into four subscales - pain, activities of daily living, strength and joint range of motion.

- American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES)⁽²⁵⁾, Portuguese version⁽²⁵⁾, being divided into two sections, one clinical and one self-administered. This second section presents a 100-point scale consisting of two dimensions, a pain subscale worth 50 points, and ten daily life activities items worth the remaining 50 points.

Ethical and deontological procedures were complied with and the best interests of patients, namely their anonymity were safeguarded.

Descriptive and inferential statistical analysis of the data was performed using the IBM SPSS statistics software, version 23. The results are presented in absolute value and as a percentage when it is justified to facilitate their interpretation. Mean values are

shown followed by the standard deviation (mean±standard deviation). For the inferential analysis, the non-parametric Mann-Whitney U test was used to compare the groups operated early and late and the groups submitted to HA vs. ITSA. The assumed p value for this study was $p \leq 0.05$.

RESULTS

During the time covered by our study, 15 shoulder arthroplasties were performed by FPH in 12 women and 3 men. The mean age of the sample was 78 years-old. (Table 1)

We recorded 6 Neer 2-part FPH cases, 2 Neer 3-part FPH cases and 7 Neer 4-part FPH cases. (Table 1)

The average time between fracture diagnosis and surgery was 29.4 days (Table 1), with 9 of the patients undergoing early surgery (up to 3 weeks after diagnosis). We registered 6 cases of late surgery (3 weeks after diagnosis).

10 ITSA were performed, with the particularity of 3 of them as salvage treatment of failure of conservative treatment (two cases of 2-part Neer FPH and one 3-part Neer FPH) and 2 of them as rescue treatment of initial treatment failure with osteosynthesis (both FPH 2 parts of Neer). 5 HA were recorded. (Table 2)

All procedures were performed by the same surgeon.

Except for 2 cases of ITSA, all implants were cemented and all placed prostheses were modular. (Table 2)

| Gender | | Age (years) | | | Follow-up time (days) | Fracture type (Neer) | | |
|--------|---|-------------|-----|------------|-----------------------|----------------------|-----------|-----------|
| F | M | Min | Max | Average±DP | Average±DP | 2-parts | 3-parts | 4-parts |
| 12 | 3 | 89 | 63 | 77.60±7.76 | 29.40±48.04 | 6 (40%) | 2 (13.3%) | 7 (46.7%) |

Table 1: Demographic data of the sample: gender (F-female; M-male) and age; follow-up time; fracture classification (Neer classification).

| Type of arthroplasty | | Cementation | | Modularity |
|---|----|-------------|----------|------------|
| ITSA | HA | Uncemented | Cemented | |
| 10 (5 rescue; 3 conservative treatment failures; 2 osteosynthesis failures) | 5 | 2 (ATIO) | 13 | 15 |

Table 2: Type of arthroplasty used (ITSA - inverse total shoulder arthroplasty; HA - hemiarthroplasty); Cementation of arthroplasties; Modularity.

| Functional Scores | | | | Complications | | |
|-------------------|------|------|------|---------------|----------------|---------------------------|
| CSS(%) | | ASES | | Infection | Stem migration | "Impingement" subacromial |
| HA | ATRO | HA | ATRO | 1 (ATRO) | 1 (HA) | 1 (HA) |
| 53.2 | 41.1 | 44.6 | 68.5 | | | |

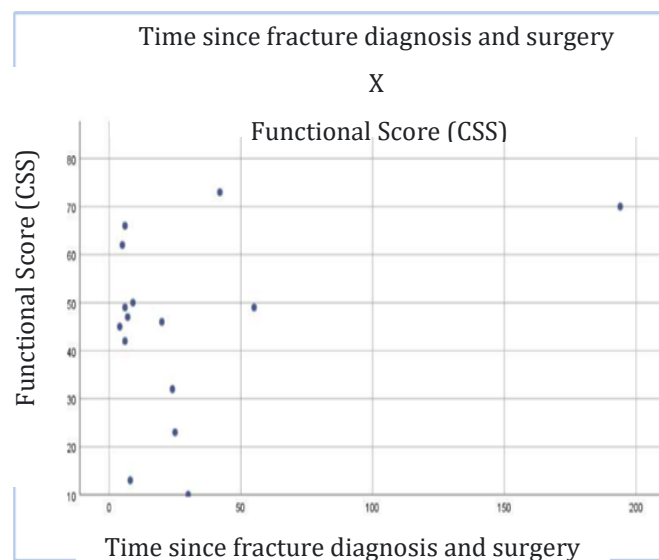
Table 3: Functional scores (CSS – Constant Shoulder Scores; ASES – American Shoulder and Elbow Score) for the type of arthroplasty used (ITSA – Inverse Total Shoulder Arthroplasty; HA – hemiarthroplasty); Registered complications.

Regarding the functionality of the groups, for the group of patients undergoing HA, the mean score was 53.2% and 44.6, respectively for CSS and ASES; in the group of patients undergoing ITSA, the mean scores were 41.1% and 68.5, respectively for CSS and ASES (Table 3).

Results with statistical significance were not obtained in the comparative study of the mean values of CSS and ASES between the groups which underwent early and late surgeries (Graphics 1 and 2).

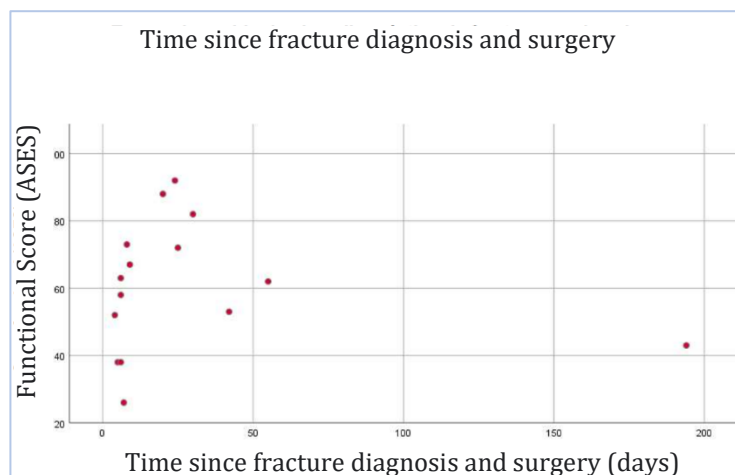
In the comparative study of functional scores between patients undergoing HA and ITSA, there was a statistically significant value ($p < 0.05$) for ASES of patients with ITSA (Graphic 2).

The complications that were recorded were divided into a case of acute infection of an ITSA, a case of proximal migration of the HA's nail requiring revision



(with conversion to ITSA), a case of sub-acromial impingement of an HA (Table 3) needing revision with conversion into arthroscopic shoulder surgery for treatment of rotator cuff tear (ATRO). In revision surgeries, no complications were recorded.

Graphic 1 - Relation between the time since fracture diagnosis and surgery and the CSS (Constant Shoulder Score) functional score



Graphic 2 - Relation between time since fracture diagnosis and surgery and ASES functional score

DISCUSSION

Generally speaking, most FPH can be treated conservatively. On the other hand, FPH with surgery indication are typical of the elderly who, due to osteoporosis inherent to their age, increase the complexity of these fractures^(16,26,27). In fact, a study recently published by Jung et al.⁽²⁸⁾ reported a rate of refraction of more than 18% in elderly people with osteoporosis. The mean age of patients treated in the present study was 78 years-old, which reflects the aging population of the geographic covered area and which is corroborated by several review articles published since 2015⁽²⁹⁻³²⁾.

The currently increasing literature recommends ITSA as a first-line treatment in complex FPH in the elderly people with surgical criteria, when osteosynthesis is not indicated⁽⁸⁻¹¹⁾. ITSA is also increasingly recommended as a rescue treatment when primary treatments have failed⁽¹⁹⁻²¹⁾, recognizing the importance of prosthetic modularity for revision surgeries⁽²²⁾.

The complications recorded were those foreseen in any shoulder arthroplasty, however complications of vascular-nervous involvement were not recorded⁽¹⁶⁾.

In the comparative study of functional outcomes in patients undergoing HA versus ITSA, the best score was recorded for ITSA, but only with statistical significance for the ASES score ($p < 0.05$). These data are in agreement with the literature, which states that ITSA allows better functional results when compared to HA⁽⁸⁻

¹¹⁾. The results obtained by the ASES assessment are in line with the results found by other studies, namely 64.14 points described in the work published by Horneff et al.⁽³³⁾, 66 points in the work developed by Wagner et al.⁽³⁴⁾, 59 points in the article published in 2017 Holschen et al. and 65.3 points in another article published by the same team^(35,36). Regarding the CSS assessment, the results found range from 57 to 45% in the study developed by Lignel et al.⁽³⁷⁾, 63% in the article published by Holschen et al., 52.9% in the publication by Giardella et al.⁽³⁸⁾ to 73% in the study carried out by Schliemann et al.⁽³⁹⁾. The present study was not able to assess the influence of the time interval from FPH diagnosis to surgery on functional outcomes. The comparative study of functional scores between early and late operated patients was not statistically significant ($p > 0.05$). The fact that the sample in this study was relatively small and that 5 of the cases were implants performed as rescue treatment may have negatively influenced this comparative study.

CONCLUSION

The present study concludes that FPH with surgical criteria are typical of an aging population with poor bone stock.

For complex FPH and in the elderly without criteria for osteosynthesis, this study concludes that ITSA seems to be the best option as a first-line treatment in FPH with surgical criteria and it allows the patient to have better postoperative functionality, with regard to the ASES score.

It can also be concluded that prosthetic modularity is an asset in revision surgeries, making this procedure intrinsically more demanding, safer and simpler.

Therefore, despite a short experience and a small sample of cases, we can deduce that there are good practices regarding the treatment offered and that the most current international recommendations are followed.

In terms of the limitations of the present study, the small sample size, the relatively short follow-up time, the different contexts and experiences of the rehabilitation team and the type of prosthesis used, which was not homogeneous, can be indicated.

For the future, it is suggested to extend the follow-up time, create a specific intervention and rehabilitation team and improve the implant model.

REFERENCES

1. Baron JA, Barrett JA, Karagas MR. The epidemiology of peripheral fractures. *Bone*. 1996 Mar;18(3 Suppl):209S-213S.
2. Court-Brown CM, Garg A, McQueen MM. The translated two-part fracture of the proximal humerus. Epidemiology and outcome in the older patient. *J Bone Joint Surg Br*. 2001 Aug;83(6):799-804. Available from: <https://doi.org/10.1016/j.otsr.2008.09.002>
3. Neer CS. Displaced proximal humeral fractures. I. Classification and evaluation. *J Bone Joint Surg Am*. 1970 Sep;52(6):1077-89.
4. Hanson B, Neidenbach P, de Boer P, Stengel D. Functional outcomes after nonoperative management of fractures of the proximal humerus. *J Shoulder Elb Surg*. 2009 Jul;18(4):612-21. Available from: <https://doi.org/10.1016/j.jse.2009.03.024>

5. Neer CS. Displaced proximal humeral fractures. II. Treatment of three-part and four-part displacement. *J Bone Joint Surg Am*. 1970 Sep;52(6):1090-103.
6. Greiwe RM, Vargas-Ariza R, Bigliani LU, Levine WN, Ahmad CS. Hemiarthroplasty for head-split fractures of the proximal humerus. *Orthopedics*. 2013 Jul;36(7):e905-11. Available from: <https://doi.org/10.3928/01477447-20130624-21>
7. Kralinger F, Schwaiger R, Wambacher M, Farrell E, Menth-Chiari W, Lajtai G, et al. Outcome after primary hemiarthroplasty for fracture of the head of the humerus. A retrospective multicentre study of 167 patients. *J Bone Joint Surg Br*. 2004 Mar;86(2):217-9.
8. Chambers L, Dines JS, Lorch DG, Dines DM. Hemiarthroplasty for proximal humerus fractures. *Curr Rev Musculoskelet Med*. 2013 Mar;6(1):57-62. Available from: <https://doi.org/10.1007/s12178-012-9152-9>
9. Gallinet D, Clappaz P, Garbuio P, Tropet Y, Obert L. Three or four parts complex proximal humerus fractures: hemiarthroplasty versus reverse prosthesis: a comparative study of 40 cases. *Orthop Traumatol Surg Res*. 2009 Feb;95(1):48-55. Available from: <https://doi.org/10.1016/j.otsr.2008.09.002>
10. Cuff D, Clark R, Pupello D, Frankle M. Reverse shoulder arthroplasty for the treatment of rotator cuff deficiency: a concise follow-up, at a minimum of five years, of a previous report. *J Bone Joint Surg Am*. 2012 Nov 7;94(21):1996-2000. Available from: <https://doi.org/10.2106/JBJS.K.01206>
11. Guery J, Favard L, Sirveaux F, Oudet D, Mole D, Walch G. Reverse total shoulder arthroplasty. Survivorship analysis of eighty replacements followed for five to ten years. *J Bone Joint Surg Am*. 2006 Aug;88(8):1742-7. Available from: <https://doi.org/10.2106/JBJS.E.00851>
12. Singhal K, Rammohan R. Going forward with reverse shoulder arthroplasty. *J Clin Orthop Trauma*. 2018 Jan;9(1):87-93. Available from: <https://doi.org/10.1016/j.jcot.2017.10.002>
13. van der Merwe M, Boyle MJ, Frampton CMA, Ball CM. Reverse shoulder arthroplasty compared with hemiarthroplasty in the treatment of acute proximal humeral fractures. *J Shoulder Elb Surg*. 2017 Sep;26(9):1539-45. Available from: <https://doi.org/10.1016/j.jse.2017.02.005>
14. Frombach AA, Brett K, Lapner P. Humeral Head Replacement and Reverse Shoulder Arthroplasty for the Treatment of Proximal Humerus Fractures. *Open Orthop J*. 2017;11:1108-14. Available from: <https://doi.org/10.2174/1874325001711011108>
15. Reuther F, Petermann M, Stangl R. Reverse Shoulder Arthroplasty in Acute Fractures of the Proximal Humerus: Does Tuberosity Healing Improve Clinical Outcomes? *J Orthop Trauma*. 2019 Feb;33(2):e46-51. Available from: <https://doi.org/10.1097/BOT.0000000000001338>
16. Stone MA, Namdari S. Surgical Considerations in the Treatment of Osteoporotic Proximal Humerus Fractures. *Orthop Clin North Am*. 2019 Apr;50(2):223-31. Available from: <https://doi.org/10.1016/j.ocl.2018.10.005>
17. Chalmers PN, Boileau P, Romeo AA, Tashjian RZ. Revision Reverse Shoulder Arthroplasty. *J Am Acad Orthop Surg*. 2019 Jun 15;27(12):426-36. Available from: <https://doi.org/10.5435/JAAOS-D-17-00535>
18. Boileau P. Complications and revision of reverse total shoulder arthroplasty. *Orthop Traumatol Surg Res*. 2016 Feb;102(1 Suppl):S33-43. Available from: <https://doi.org/10.1016/j.otsr.2015.06.031>
19. Besch L, Daniels-Wredenhagen M, Mueller M, Varoga D, Hilgert R-E, Seekamp A. Hemiarthroplasty of the shoulder after four-part fracture of the humeral head: a long-term analysis of 34 cases. *J Trauma*. 2009 Jan;66(1):211-4. Available from: <https://doi.org/10.1097/TA.0b013e31815d9649>
20. Cadet ER, Ahmad CS. Hemiarthroplasty for three- and four-part proximal humerus fractures. *J Am Acad Orthop Surg*. 2012 Jan;20(1):17-27. Available from: <https://doi.org/10.5435/JAAOS-20-01-017>
21. Robinson CM, Page RS, Hill RMF, Sanders DL, Court-Brown CM, Wakefield AE. Primary hemiarthroplasty for treatment of proximal humeral fractures. *J Bone Joint Surg Am*. 2003 Jul;85(7):1215-23. Available from: <https://doi.org/10.2106/00004623-200307000-00006>
22. Flury MP, Frey P, Goldhahn J, Schwyzer H-K, Simmen BR. Reverse shoulder arthroplasty as a salvage procedure for failed conventional shoulder replacement due to cuff failure--midterm results. *Int Orthop*. 2011 Jan;35(1):53-60. Available from: <https://doi.org/10.1007/s00264-010-0990-z>
23. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res*. 1987 Jan;(214):160-4.
24. Leal SM, Cavalheiro L. Constant Score e Shoulder Pain and Disability Index (SPADI)-Adaptação cultural e linguística. Monogr Coimbra Esc Super Tecnol da Saúde Coimbra. 2001;
25. Ruivo RM, Pezarat-Correia P, Carita AI. Versão Portuguesa do American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES). *Rev Port Ortop e Traumatol*. 2015;23(4):288-97.
26. Ratajczak K, Szczesny G, Malyk P. Comminuted fractures of the proximal humerus - principles of the diagnosis, treatment and rehabilitation. *Ortop Traumatol Rehabil*. 2019 Apr 30;21(2):71-86. Available from: <https://doi.org/10.5604/01.3001.0013.1544>
27. Misra S, Vaishya R, Tripathi V, Maheshwari J. Practice guidelines for proximal humeral fractures. *J Clin Orthop Trauma*. 2019 May;10(3):631-3. Available from: <https://doi.org/10.1016/j.jcot.2019.04.005>
28. Jung H-S, Nho J-H, Ha Y-C, Jang S, Kim H-Y, Yoo J-I, et al. Incidence of Osteoporotic Refractures Following Proximal Humerus Fractures in Adults Aged 50 Years and Older in Korea. *J bone Metab*. 2019 May;26(2):105-11. Available from: <https://doi.org/10.11005/jbm.2019.26.2.105>
29. Schumaier A, Grawe B. Proximal Humerus Fractures: Evaluation and Management in the Elderly Patient. *Geriatr Orthop Surg Rehabil*. 2018 Jan 25;9:215145851775051. Available from: <https://doi.org/10.1177/2151458517750516>
30. Longo UG, Petrillo S, Berton A, Denaro V. Reverse total shoulder arthroplasty for the management of fractures of the proximal humerus: a systematic review. *Musculoskelet Surg*. 2016 Aug;100(2):83-91. Available from: <https://doi.org/10.1007/s12306-016-0409-0>
31. Xie L, Ding F, Zhao Z, Chen Y, Xing D. Operative versus non-operative treatment in complex proximal humeral fractures: a meta-analysis of randomized controlled trials. *Springerplus*. 2015;4:728. Available from: <https://doi.org/10.1186/s40064-015-1522-5>
32. Slobogean GP, Johal H, Lefaivre KA, MacIntyre NJ, Sprague S, Scott T, et al. A scoping review of the proximal humerus fracture literature. *BMC Musculoskelet Disord*. 2015 May 10;16:112. Available from: <https://doi.org/10.1186/s12891-015-0564-8>
33. Horneff JG, Nicholson TA, Namdari S, Williams GR, Abboud JA. The Midterm Results of the Delta Xtend Reverse Shoulder System: A Five-Year Outcome Study. *Arch bone Jt Surg*. 2018 Nov;6(6):532-8.
34. Wagner ER, Hevesi M, Houdek MT, Cofield RH, Sperling JW, Sanchez-Sotelo J. Can a reverse shoulder arthroplasty be used to revise a failed primary reverse shoulder arthroplasty? *Bone Joint J*. 2018 Nov;100-B(11):1493-8. Available from: <https://doi.org/10.1302/0301-620X.100B11.BJJ-2018-0226.R2>
35. Holschen M, Franetzk B, Witt K-A, Liem D, Steinbeck J. Is reverse total shoulder arthroplasty a feasible treatment option for failed shoulder arthroplasty? A retrospective study of 44 cases with special regards to stemless and stemmed primary implants. *Musculoskelet Surg*. 2017 Aug;101(2):173-80. Available from: <https://doi.org/10.1007/s12306-017-0467-y>
36. Holschen M, Siemes M-K, Witt K-A, Steinbeck J. Five-year outcome after conversion of a hemiarthroplasty when used for the treatment of a proximal humeral fracture to a reverse total shoulder arthroplasty. *Bone Joint J*. 2018 Aug 1;100-B(6):761-6. Available from: <https://doi.org/10.1302/0301-620X.100B6.BJJ-2017-1280.R1>
37. Lignel A, Berhouet J, Loirat M-A, Collin P, Thomazeau H, Gallinet D, et al. Reverse shoulder arthroplasty for proximal humerus fractures: Is the glenoid implant problematic? *Orthop Traumatol Surg Res*. 2018 Oct;104(6):773-7.
38. Giardella A, Ascione F, Mocchi M, Berlusconi M, Romano AM, Oliva F, et al. Reverse total shoulder versus angular stable plate treatment for proximal humeral fractures in over 65 years old patients. *Muscles Ligaments Tendons J*. 7(2):271-8.

- 39.Schliemann B, Theisen C, Kösters C, Raschke MJ, Weimann A.
Reverse total shoulder arthroplasty for type I fracture sequelae
after internal fixation of proximal humerus fractures. Arch Orthop
Trauma Surg. 2017 Dec;137(12):1677-83.

MOBILIZAÇÃO PRECOCE EM PESSOAS SUBMETIDAS A VENTILAÇÃO MECÂNICA INVASIVA: REVISÃO INTEGRATIVA DA LITERATURA

MOVILIZACIÓN PRECOZ EN PERSONAS SOMETIDAS A VENTILACIÓN MECÁNICA INVASIVA: REVISIÓN INTEGRATIVA DE LA LITERATURA.

EARLY MOBILIZATION IN PEOPLE UNDERGOING MECHANICAL INVASIVE VENTILATION: INTEGRATIVE REVIEW OF LITERATURE

DOI 10.33194/rper.2019.v2.n1.07.4563 | Submitted 05.03.2019 | Approved 27.06.2019

 **Pedro Cerol¹**;  **Jorge Martins¹**;  **Luís Manuel Mota de Sousa²**;  **Isabel Oliveira³**;  **Teresa Silveira³**

1 - Centro Hospitalar Universitário do Algarve, Unidade de Portimão, Portugal; 2 - Universidade de Évora, Escola Superior de Enfermagem S. João de Deus, Évora, Portugal; 3- Escola Superior de Saúde da Cruz Vermelha Portuguesa, Lisboa, Portugal

RESUMO

Introdução: A mobilização precoce na unidade de cuidados intensivos é considerada uma intervenção importante na prevenção de complicações relacionadas com a imobilidade e a ventilação mecânica, principalmente no desenvolvimento de fraqueza muscular generalizada.

Objetivo: Identificar os benefícios das várias modalidades terapêuticas utilizadas na mobilização precoce das pessoas em situação crítica, submetidas a ventilação mecânica invasiva.

Método: Realizou-se uma revisão integrativa da literatura. Formulou-se a seguinte questão através da estratégia PICO - o qual o estado do conhecimento sobre a mobilização precoce em pessoas em situação crítica submetidas a ventilação invasiva? A pesquisa foi realizada na plataforma EBSCOhost em setembro de 2018, nas bases de dados eletrônicas CINAHL e MEDLINE e foi definido o período compreendido entre janeiro de 2010 e setembro de 2018.

Resultados: Dos 397 artigos identificados, foram incluídos 9 artigos. A mobilização precoce em pessoa submetida a ventilação mecânica invasiva é considerada uma prática segura, uma vez que a ocorrência de eventos adversos é reduzida. Os principais benefícios são melhoria da capacidade funcional, diminuição das complicações associadas à imobilidade e ventilação mecânica invasiva, redução do número de dias sob ventilação mecânica invasiva e, consequentemente, à diminuição dos dias de permanência na unidade de cuidados intensivos e de internamento hospitalar. Esta intervenção diminui a morbidade e mortalidade hospitalar.

Conclusão: A mobilização precoce em pessoas submetidas a ventilação mecânica invasiva é segura e contribui para os ganhos em saúde quer a nível da pessoa/família, quer organizacional.

Descritores: Enfermagem em Reabilitação, Mobilização Precoce, Técnicas de Exercício e de Movimento, Ventilação Mecânica

RESUMEN

Introducción: La movilización precoz en la unidad de cuidados intensivos se considera una intervención importante en la prevención de complicaciones relacionadas con la inmovilidad y la ventilación mecánica, principalmente en el desarrollo de debilidad muscular generalizada.

Objetivo: Identificar los beneficios de las diversas modalidades terapéuticas utilizadas en la movilización precoz de las personas en situación crítica, sometidas a ventilación mecánica invasiva.

Identificar los beneficios de las diversas modalidades terapéuticas utilizadas en la movilización precoz de las personas en situación crítica, sometidas a ventilación mecánica invasiva.

Método: Se realizó una revisión integrativa de la literatura. Se formuló la siguiente cuestión: a través de la estrategia PICO: ¿cuál el estado del conocimiento sobre la movilización precoz en personas en situación crítica sometidas a ventilación invasiva? La investigación se realizó en la plataforma EBSCOhost en septiembre de 2018, en las bases de datos electrónicas CINAHL y MEDLINE y se definió el período comprendido entre enero de 2010 y septiembre de 2018.

Resultados: De los 397 artículos identificados, se incluyeron 9 artículos. La movilización precoz en persona sometida a ventilación mecánica invasiva se considera una práctica segura, ya que la aparición de eventos adversos es reducida. Los principales beneficios son la mejora de la capacidad funcional, disminución de las complicaciones asociadas a la inmovilidad y ventilación mecánica invasiva, reducción del número de días bajo ventilación mecánica invasiva y, consecuentemente, a la disminución de los días de permanencia en la UCI y de internamiento hospitalario. Esta intervención disminuye la morbilidad y mortalidad hospitalaria.

Conclusión: La movilización precoz en personas sometidas a ventilación mecánica invasiva es segura y contribuye a las ganancias en salud tanto a nivel de la persona/familia, bien organizacional.

Descriptores: Enfermería en Rehabilitación, Movilización Precoz, Técnicas de Ejercicio y de Movimiento, Ventilación Mecánica

ABSTRACT

Introduction: Early mobilization in the intensive care unit is considered an important intervention in the prevention of complications related to immobility and mechanical ventilation, mainly in the development of generalized muscular weakness.

Objective: To identify the benefits of the various therapeutic modalities used in the early mobilization of critically ill people submitted to invasive mechanical ventilation.

Method: It was performed an integrative review. The following question was formulated through the PICO strategy - what is the state of knowledge about early mobilization in critically placed people submitted to invasive ventilation? The research was carried out on the EBSCOhost platform in September 2018, in the electronic databases CINAHL and MEDLINE and the period between January 2010 and September 2018 was defined.

Results: Out of the 397 articles identified, 9 articles were included. Early mobilization in person submitted to invasive mechanical ventilation is considered a safe practice, since the occurrence of adverse events is reduced. The main benefits are improvement of functional capacity, reduction of complications associated with immobility and invasive mechanical ventilation, reduction of the number of days under invasive mechanical ventilation and, consequently, the reduction of the days of ICU stay and hospitalization. This intervention reduces hospital morbidity and mortality.

Conclusion: Early mobilization in people undergoing invasive mechanical ventilation is safe and contributes to health gains at both the person/family and organizational levels.

Keywords: Rehabilitation Nursing; Early Mobilization; Exercise and Movement Techniques; Mechanical Ventilation.

INTRODUCTION

Currently in Europe, due to critical illness, around 990,000 and 1,500,000 people/year are subjected to invasive mechanical ventilation (IMV). In more developed countries, intensive care units (ICU) are responsible for around 13.4% of total hospital costs, around 4.1% of national expenditure on health and around 0.56% of gross national product. The aging of the population and the expansion of the so-called diseases of civilization will lead to an increase in intensive care needs over the next 10 years, which some estimates predict at 160%⁽¹⁾.

As a result of the need for intensive treatment, people in critical condition remain bedridden for long periods. Their serious condition and the administration of vasopressor, sedative and neuromuscular blocker therapy affect the mobility of these people, exposing them to complications inherent to immobility such as atrophy, muscle dysfunction and weakness, decreased functional capacity, orthostatic hypotension, tachycardia, among others⁽²⁾. The development of generalized weakness associated with people in critical condition, especially those who need mechanical ventilation, is a significant and common complication⁽³⁾. Therefore, an approximate incidence of between 30% and 60% in people hospitalized in the ICU is indicated, with a loss of 4% to 5% of peripheral muscle strength per week during the period of immobility⁽⁴⁾. Hogdson et al.⁽⁵⁾ concluded that 52% of the patients in the study had muscle weakness associated with intensive care.

Immobility compromises the respiratory, cardiovascular, gastrointestinal musculoskeletal,

genitourinary, metabolic, cutaneous and neurological systems. Disuse, rest or inactivity of limbs or body and the loss of enervation promote a decline in muscle mass, strength and endurance⁽⁶⁾, leading to the development of several neuromuscular, pulmonary, cognitive and quality of life complications, which may last up to 5 years after discharge⁽⁷⁾. All these factors contribute to prolonging the length of stay in the ICU, resulting in an increased risk of complications, an increase in the morbidity and mortality rate and, consequently, higher costs⁽⁶⁾. Ågård et al.⁽⁸⁾ report that, during the first year of convalescence, people in critical situations fight for independence, trying to recover their physical strength and functional capacity and resume their family roles. This functional decline is accentuated in the ICU where the person is confined to bed most of the time⁽⁷⁾.

Rehabilitation of the person in critical condition initiated in the ICU is referred to as an important part of the care plan, being suggested as a relevant therapy in modifying the risk of developing sequelae in terms of physical and functional morbidity. Early mobilization, also called progressive mobility, refers to a pattern of increased activity starting with passive mobilization until ambulation, starting immediately after hemodynamic and respiratory stabilization, usually between 24 to 48 hours after admission in ICU⁽⁹⁾. The beginning of early mobilization is intended to prevent complications inherent to immobility in bed, minimize loss of mobility, optimize autonomy and facilitate weaning from the ventilator. Thus, its importance goes through the gains in functional capacity, but it has an impact on a higher level, on the person's independence and on the improvement of their quality of life⁽²⁾.

Previous research has identified barriers to implementing early rehabilitation programs that include deep sedation, inadequate staff and multidisciplinary cooperation, safety concerns, and ignorance about the benefits of early rehabilitation. Some ICUs have overcome these barriers by successfully implementing early rehabilitation into their routine, but even so, continued widespread implementation reduced and only 8% to 12% of people on mechanical ventilation were mobilized out of bed ⁽¹⁰⁾.

Early rehabilitation is safe and well tolerated, but it is not without risks. One should be alert to potential safety problems such as the physiological response to exertion, the need to change treatment plans, sedation, administration of vasopressors, accidental extubation and exteriorization of other devices. The occurrence of the events mentioned is residual and appeared in less than 4% of all interactions with people, none of them considered serious ⁽¹¹⁾.

The intervention of the rehabilitation nurse to the person undergoing IMV aims to improve the quality of life through the improvement of functionality (daily and instrumental activities), effort tolerance, reduction of complications of IMV and the success of weaning from the ventilator. Early rehabilitation, with regard to the person undergoing IMV, becomes increasingly essential, and this should be started within the first 24 hours ⁽¹²⁾. In this perspective, we identified the intervention of the specialist nurse in rehabilitation nursing, in the context of the person undergoing IMV, as a pressing need.

The research question we formulated for this study was: "What are the benefits of early mobilization in people undergoing invasive ventilation?" In order to respond to this identified problem, we defined the general objective as: analyzing the nursing intervention in early mobilization; and as specific objectives: describe the rehabilitation interventions that can be implemented for the person undergoing IMV and identify the benefits of this same intervention.

MATERIALS AND METHODS

Ethical aspects

Because it is an integrative review and does not involve human beings, did not need to go through the appraisal of an ethics collision. The ethical procedures to be considered in a work of this type were met, namely, the rigor in referencing and respect for the perspective of the authors of the articles included

Type of study

An integrative literature review is one of the research methods used in Evidence-Based Practice that allows for the incorporation of evidence into the clinical situation. It is based on scientific knowledge, with quality and cost-effective results ^(13, 14).

Methodological procedures

According to the constituent steps of an integrative literature review, the following question that motivated interest and research was defined in the first step, which is "What are the benefits of early mobilization in people undergoing invasive ventilation?" based on the PICO acronym, derived from the PICO in which P (Population) I (phenomenon of interest) and Co (context), the inclusion and exclusion criteria expressed in the following table were defined taking into account the acronym:

| | Inclusion criteria | Exclusion criteria |
|-----------------------------------|-------------------------------------|--|
| Population (P) | Adult person in critical situation; | Pediatric-age people and adults who are not in intensive care units; |
| Phenomenon of interest (I) | Benefits of early mobilization; | Interventions that are not related to early mobilization; |
| Context (Co) | Invasive ventilation; | People who are not undergoing invasive ventilation; |

Table 1 – Criteria of inclusion and exclusion.

This study included articles referring to adults aged over 19 years-old, full text from January 2010 and September 2018, without geographic limitations, and articles in English, Portuguese and Spanish. After reading the abstract and analyzing the articles, those that did not refer to the topic under study were excluded. The following descriptors were found, previously validated as descriptors used in health sciences in the DeCs and MESH platforms: "rehabilitation", "rehabilitation nursing", "early ambulation", "exercise movement techniques", "respiratory therapy" and "mechanical ventilation", "Respiration, Artificial".

Data source, identification and selection of studies

The search was carried out on the EBSCOhost platform in September 2018, in all electronic databases there included, on the period between January 2010 and September 2018 was defined for the publication dates of the researched articles. The words selected for the search were combined using the Boolean expressions AND and OR, obtaining the following search equation:

1. [(Ventilator weaning) OR (mechanical ventilation) OR (respiration, artificial)] n=100812
2. [(rehabilitation nursing) OR (rehabilitation) OR (early ambulation) OR (exercise movement techniques)] n=621380

3. ((Ventilator weaning) OR (mechanical ventilation) OR (respiration, artificial)) AND ((rehabilitation nursing) OR (Rehabilitation) OR (early ambulation) OR (exercise movement techniques)) n=2537

The articles selected for full reading were independently evaluated by two investigators, according to methodological quality criteria proposed by the JBI⁽¹⁴⁾. Only articles with more than 75% of the criteria were selected and the quality of the systematic review was evaluated with the Carneiro e Bogalho grill⁽¹⁵⁾.

Data extraction and analysis

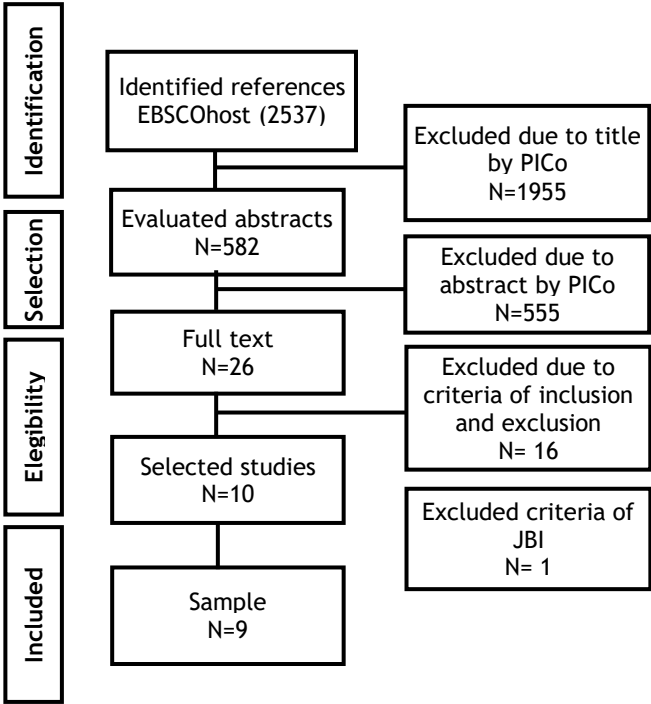
Information was extracted from the articles on authors, year, country, sample, data on metric properties, conclusions and level of evidence. The classification of the levels of evidence of the included studies was performed based on the criteria of the Registered Nurses Association of Ontario: 1A - systematic reviews (meta-analyses); Level 1B - prospective studies or experimental studies with randomly selected groups; Level II - quasi-experimental studies; Level III - descriptive studies and cohort studies; Level IV - expert opinion articles⁽¹⁷⁾.

The information collected from the articles was based on the following criteria: author, year, country, participants, objectives, interventions, results and the level of evidence. Information about the intervention was organized according to the frequency, intensity, volume, duration and modality of the therapeutic activity/physical exercise.

RESULTS

2537 references were identified and 8 articles were included (figure 1). After applying the method of evaluating the quality of articles through the Johanne Briggs Insitute grids, an article with some limitations regarding the methodology used and the selection of groups was chosen, however it was included because it fits into the theme⁽¹⁷⁾. It was also decided to include a systematic review of the literature in order to enrich this work ⁽¹⁸⁾.

The samples of articles are heterogeneous with great variability in the selection of control and intervention groups (Table 2).



Fluxograma 1 - identificação, análise e seleção dos artigos.

| Reference | Country | Authors | Year | Type of study | LE |
|--------------|-----------|--------------------------|------|--------------------------------|-----|
| Study 1 (19) | Australia | Hodgson C. et al. | 2015 | Prospective cohort | III |
| Study 2 (20) | USA | Castro E. et al. | 2015 | Descriptive | III |
| Study 3 (21) | Israel | Yousef-Brauner O. et al. | 2013 | Experimental (clinical trials) | 1B |
| Study 4 (22) | USA | Clark D. et al. | 2013 | Cohort | III |
| Study 5 (23) | England | McWilliams D. et al. | 2014 | Cohort | III |
| Study 6 (24) | Italy | Enrico M. et al. | 2011 | Cohort | III |
| Study 7 (25) | Brazil | Toccolini BF. et al. | 2014 | Cohort | III |
| Study 8 (26) | USA | Amidei C. et al. | 2013 | Quasi-experimental | II |
| Study 9 (27) | Brazil | Azevedo PM. et al. | 2015 | Systematic review | 1A |

Table 2 – Identification of studies (LE - Level of Evidence)

Then, an individualized synthesis of the main data of the articles included will be presented: study identification, participants, objectives, interventions, results.

| Reference | Participants | Objective | Intervention | Results |
|--------------|--|---|---|--|
| Study 1 (19) | N=192 | To evaluate the relationship between early mobilization in people under IMV and the occurrence of muscle weakness acquired in intensive care and subsequent recovery | <u>Modality:</u> Exercises in bed, sitting position on the edge of the bed, passive transfer to the armchair, orthostatic position at the bedside, transference from the bed to the armchair by the foot and walking. <u>Intensity:</u> low to moderate; | Increased muscle strength was associated with early mobilization during IMV, home discharge and increased survival at 90 days. The relationship between the presence of muscle weakness acquired in intensive care and the decrease in survival at 90 days was also established. |
| Study 2 (20) | N=56 Nurses | To evaluate and to improve the mindset of nurses in a surgical ICU regarding early mobilization in people under IMV before, 6 months after and 1 year after the implementation of an early mobilization protocol. | <u>Modality:</u> Application of a questionnaire to nurses in an ICU about early mobilization in people under IMV before, 6 months and 1 year after the implementation of an early mobilization protocol. | There was a change in mentality on this topic. Nurses found that early mobilization of people under IMV shortens hospital stay, decreases ventilator-associated pneumonia, deep vein thrombosis, and pressure ulcers. |
| Study 3 (21) | N=18; N=9 control group, N=9 intervention group. | To evaluate the effect of an intensive care protocol in people who suffered from muscle weakness acquired in intensive care, namely in terms of muscle strength, breathing and functional indices. | <u>Modality:</u> 1st phase (passive): passive mobilizations of the upper and lower limbs, change of position, manual pulmonary hyperinflation and bronchial aspiration; 2nd phase (active): active exercises using all the joints of each limb, breathing exercises for those who were breathing spontaneously, sitting on the edge of the bed, balance training and trunk exercises; 3rd phase (functional): adds to the previous phase mobility training such as the transfer from the lying position to the sitting position and from the sitting position to the standing position and walking training <u>Frequency:</u> the intervention group twice a day, control group once a day; <u>Intensity:</u> progressive, from low to moderate (passive, active, functional); <u>Volume:</u> 6 times per movement in the first phase passive mobilizations; <u>Duration:</u> 15 minutes of active exercises in the second and third phase; | There was a significant improvement in muscle strength (MRC) and maximum inspiratory pressure (MIP), and less significant in sitting balance. Early mobilization and intensive care showed a decrease in days spent in the ICU (18.11±3.1 days in the control group vs 13±4.6 days in the intervention group) and in the number of days on IMV (16 .22±2 days in the control group vs 9±5 days in the intervention group). There was no difference between groups in the percentage of people able to walk during ICU stay. |
| Study 4 (22) | N=2176; N=1044 control group, N=1132 experimental group | To evaluate the application of an early mobilization protocol on complication rates, days on IMV and the number of days of hospitalization. | <u>Modality:</u> Mode 1: (Unconscious people/ contraindication for active mobilization and progression to a sitting position) passive mobilizations and positioning; Modality 2: active/assisted or active mobilizations, mobility training and sitting on the bed; Modality 3: Active resisted mobilizations and sitting on the edge of the bed; Mode 4: get up into the chair and walk around. <u>Frequency:</u> 2 hourly positioning in the first modality; <u>Intensity:</u> progressively low to moderate, depending on the modality; | Reduction of 2.4 days of hospital stay after the implementation of the early mobilization program. Airway complications that led to endotracheal re-intubation were reduced by 50%. There was a decrease in the occurrence of pneumonia, deep vein thrombosis, airway, pulmonary and vascular complications. |
| Study 5 (23) | N=582; N=290 control group, N=292 intervention group. | To evaluate the impact of an early rehabilitation program on people under IMV and admitted to an intensive care unit. | <u>Modality:</u> daily passive mobilizations and positions in the acute phase of the disease or if under sedation. Subsequently, the sitting position on the edge of the bed was used and balance was assessed. If balance was present, transfer to the armchair was performed. If balance was absent or if there was restriction to sit on the edge of the bed, a transfer to a stretcher chair was performed, keeping supine during the transfer, or to a vertical table. Later, more active exercise and lifting was performed. If the person was able to remain in the standing position, walking training was started. <u>Frequency:</u> A third of the people had 2 sessions a day, total study averaging 1.3 times a day; <u>Duration:</u> Transfer to highchair - 2 times/day for 1 to 2 h; Stretcher chair - 1h to 3 times/day; <u>Intensity:</u> progressive, low to moderate; | After the introduction of the early rehabilitation program, there was a reduction of 2.5 days of hospital stay, 2, 4 days of ventilatory support, a 7% reduction in ICU mortality and an 11% reduction in hospital mortality. During the study, a decrease of 584 days of ICU stay was estimated. |
| Study 6 (24) | N=77 | To assess the degree of functional recovery after a rehabilitation program and the influence on hospital outcome in tracheostomized and chronically ventilated | <u>Modality:</u> active limb mobilizations, muscle strengthening to control the trunk and maintenance of body posture, activities of the upper and lower limbs to facilitate the transfer from the bed to the armchair and remain in an orthostatic position. Walking training, active-resisted mobilizations with | The success of ventilatory weaning and the in-hospital survival rate was 74% and 87%, respectively. A large percentage of people recovered in all domains of daily living activities at the time of discharge from the ICU. A higher degree of dependence on ADLs was also associated with a worse clinical outcome. |

| | | | | |
|--------------|---------------------------------------|--|--|--|
| | | people admitted for ventilatory weaning. | the use of weights and pedals (used in the upper and lower limbs) were performed. Pedal units and active-resisted mobilizations: <u>Frequency</u> : 6 times a week (at least 15 sessions), 2 times a day; <u>Intensity</u> : progressive, from low to moderate; <u>Volume</u> : Pedal unit - 30 revolutions per minute; Active-resisted mobilizations - 2 sets of 10 repetitions, load from 100g to 500g; <u>Duration</u> : Pedal unit - maximum of 30 minutes; Simultaneously, a ventilatory weaning protocol was applied with progressively longer periods of spontaneous breathing, regardless of physical training. | |
| Study 7 (25) | N=23 | To evaluate the effects of passive orthostatism on various clinical and physiological parameters in the person in critical condition, through the use of the verticalization table | <u>Modality</u> : verticalization table <u>Frequency</u> : once a day; <u>Intensity</u> : low, no hemodynamic repercussions; <u>Duration</u> : 1 st day - 30 th (5min.), 45 th (5min.) and 60 th (15min.); 2 nd day and remaining - 30 th (5min.), 45 th (5min.) and 60 th (5min.), 75 th (5min.) and 90 th (15min.); On average 5.2 days of this protocol were performed. | The greatest benefits were increased inspiratory muscle strength and increased level of consciousness. The increased level of consciousness can be explained by sensory stimulation due to the standing position. In this study, 5 people were extubated early due to the increased level of consciousness at the 90° position. Placing people in an orthostatic position did not reveal any physiological changes that could impede the procedure. |
| Study 8 (26) | N=30 | To assess the physiological responses to the implementation of an early passive exercise protocol to prevent muscle weakness in people on IMV. | <u>Modality</u> : passive mobilization of each lower limb through a device that performed knee flexion/extension (5° to 70° flexion). The two lower limbs were mobilized simultaneously and alternately, simulating walking; <u>Frequency</u> : a single session; <u>Intensity</u> : low, without hemodynamic repercussions; <u>Volume</u> : 20 extensions/flexions per minute; <u>Duration</u> : 20 minutes; | No changes in vital parameters assessed at different stages of the intervention. There was a decrease in the level of pain (BPS) during and 60 minutes after the intervention. |
| Study 9 (27) | N=6 studies Total=806 participants | To determine the effects of early mobilization on the functional rehabilitation of ICU patients. | Analysis of 6 studies: 2 Cohort studies and 4 Controlled Randomized studies. | Less length of stay in the ICU and hospital. Shortest time under IMV. Increase in the number of people able to walk. Less time until the 1st rise, ability to carry out active transfer to the chair, greater functional capacity, more independence in carrying out activities of daily living and higher score on the Barthel Index. Greater capacity to perform resistance exercises, significant increase in muscle strength and maximal inspiratory pressure. |

Table 3 – Information extracted from studies

DISCUSSION OF RESULTS

According to the selected studies, through this integrative literature review, the results obtained will be described according to different topics, namely the main interventions performed, which benefits come from early mobilization, safety, main barriers to proceed with the early mobilization of the person subjected to invasive mechanical ventilation, study weaknesses and, finally, recommendations for practice.

Rehabilitation interventions, Context

The data collection was carried out taking into account the frequency, intensity, duration, volume and modality in order to facilitate the prescription/application of therapeutic activities by specialist nurses in rehabilitation.

Several studies used protocols that were based on the progressive mobilization model, contemplating various levels of intervention, according to the clinical condition and capacity of the people, starting with passive mobilizations and culminating in standing up

and walking⁽²⁰⁻²⁴⁾. Despite mentioning the modalities performed, they did not mention in detail their frequency, intensity, duration and volume, so we will only describe the available information.

Study 3 used an early mobilization protocol that included 3 phases of modalities (passive, active and functional). The passive mobilizations of the first phase were performed 6 times per movement and the active exercises of the second and third phases lasted 15 minutes. People included in the intervention group underwent 2 daily sessions of this protocol⁽²¹⁾.

The early mobility protocol described by Morris et al. was used in Study 4, which consists of using 4 modalities of interventions. In this study, there was no reference to the frequency, volume, intensity or duration of the modalities performed; there was only reference to criteria necessary for the progression of the modality of interventions. The administration of vasopressor therapy was a condition for carrying out interventions related to modalities 3 and 4⁽²²⁾. This protocol was also used in Study 2, describing only that, in the first modality, passive mobilizations were performed three times a day in the upper and lower limbs. In the

remaining three modalities, they only describe the interventions carried out, but without referring to their frequency, volume, intensity or duration. The administration of vasopressors was not a contraindication for early mobilization, as long as it was in reduced doses and there was no orthostatic hypotension⁽²⁰⁾.

The protocol used in Study 5 consisted of performing daily passive positioning and mobilizations, active mobilizations and sitting on the edge of the bed, and transfer to a chair twice a day for 1 to 2 hours. One of the restrictions for bedside sitting included reduced doses of vasopressors (noradrenaline between 0.1-0.2 mcg/kg/min). If the person was not balanced nor had restrictions to sit on the bedside, they were transferred to a stretcher chair, keeping the supine position during the transfer, for 1 hour up to 3 times a day or, if they had orthostatic hypotension, they were transferred to the verticalization table with progressive increase in inclination until reaching the orthostatic position. As people improved, more active exercise was performed and, progressively, lifting and walking were started. Approximately one third of people performed 2 sessions per day and the number of sessions per day was 1.3⁽²³⁾.

As for Study 6, it used a care program that worked at 3 different levels. The first level consisted of the application of a ventilatory weaning protocol in which progressively longer periods of spontaneous breathing were performed. The second level of intervention refers to physical training, in which pedaling and resistance training were performed 6 times a week, with at least 15 sessions. The intensity and duration of pedaling were progressively increased (maximum of 30 minutes twice a day), as well as active-resisted mobilizations (maximum of 2 sets of 10 repetitions and loads from 100g to 500g). The third level of action consisted of evaluating nutritional support taking into account the duration of the physiotherapy session⁽²⁴⁾.

Regarding Study 1, several interventions were described, but there was no reference to the frequency, volume, intensity or duration of the modalities performed⁽¹⁹⁾.

Regarding the use of the verticalization table (Study 7), it was used on the first day up to 60° and on the second and remaining days up to 90°, as described in table 3. Vital parameters, Glasgow comas scale, Richmond Agitation Sedation Scale and the assessment of expiratory minute volume, tidal volume, rapid and shallow breathing index, and maximum inspiratory and expiratory peak pressure were evaluated at different degrees of inclination. On average 5.2 days of this protocol were performed. It should also be noted that the administration of vasopressor therapy was an exclusion criterion in the selection of participants⁽²⁵⁾.

Study 8 aimed to demonstrate the benefits of passive mobilizations with the use of the arthromotor. This intervention was performed once for 20 minutes at an intensity of 20 flexions/extensions per minute (flexion from 5° to 70°). Before starting this intervention, the person remained at rest for 30 minutes. At the end of the rest period, several parameters such as heart rate, mean arterial pressure, oxygen saturation, intracranial

pressure, cerebral perfusion pressure and the Behavioral Pain Scale were evaluated. These vital parameters were evaluated 5 and 10 minutes after the beginning of the intervention and, after the end of the intervention, there was a 60-minute rest period and vital parameters were evaluated again⁽²⁶⁾.

Benefits

The gain in people's functional capacity was described by several studies through the application of several instruments, namely the Medical Research Council muscle strength scale and Kendall scale, Manchester Mobility Score, sitting balance test according to Stolor's criteria, Barthel Index, Functional Independence Measure and also in the ability to perform activities of daily living, demonstrating improvement in these parameters in the intervention group^(21, 23, 24, 27). On the other hand, a greater degree of dependence on activities of daily living was associated with a worse clinical outcome⁽²⁴⁾. Studies have shown that early mobilization led to a decrease in the number of days of stay in the ICU and hospital admissions and to a reduction in morbidity and mortality^(19, 21-24, 27). These indicators of improvement in functional capacity, as well as the shortening of hospital stay days, translate into gains in health, for people and institutions, representing an important saving in resources.

Regarding respiratory function, studies have shown that there was a reduction in the number of days under IMV, an increase in maximum inspiratory pressure, a 50% reduction in endotracheal re-intubations due to airway complications, and another study reported that after the intervention was performed, people were extubated immediately due to the improved level of consciousness that the intervention provided^(21-23, 24, 25, 27).

Implementing early mobilization in people undergoing IMV reduced the occurrence of ventilator-associated pneumonia, pulmonary and vascular complications, deep vein thrombosis, and pressure ulcers^(20, 22). These obtained results contributed to a significant change in the mindset of nurses involved in a study, noting the importance of early mobilization and that this can be done safely⁽²²⁾.

Other important benefits reported in the studies under analysis were the improvement in the level of consciousness through placing people in an orthostatic position using the verticalization table, explained by the increase in sensory stimulation, and the improvement in comfort during the performance of passive mobilizations. This comfort may last for 60 minutes after the intervention^(25, 26).

All studies under analysis demonstrated numerous benefits of applying early mobilization to people in critical situations. These data obtained demonstrated health gains, both for the person and at the institutional level. Since the current policy is based on cost optimization in our National Health System, the application of early mobilization in intensive care units could have a significant impact.

Safety

In current clinical practice, patient safety has emerged as a key element in healthcare. The person hospitalized in the ICU is subject to several conditions that may increase the risk of carrying out early mobilization, as this may result in hemodynamic and ventilatory instability, accidental extubation or exteriorization of other medical devices. According to the studies, the implementation of early mobilization interventions is safe, with no reference to the occurrence of adverse events^(19, 20, 22, 24, 25).

Hemodynamic and ventilatory stability was considered an essential criteria for the implementation of early mobilization. The use of the verticalization table and passive mobilizations did not reveal physiological changes that could interrupt its execution^(25, 26). The administration of vasopressor therapy was not always an impediment to early mobilization^(21, 26). In one of the studies, vasopressor therapy was considered an exclusion criteria⁽²⁵⁾ and in other studies it was considered an absolute or relative contraindication, depending on the dose administered, thus adapting the type of intervention to which those patients were subjected^(20, 22, 23).

If early mobilization is properly implemented through the use of protocols, continuous monitoring of hemodynamic and ventilatory parameters is ensured and appropriate interventions are identified to overcome the barriers that may exist, early mobilization is safe for people and the risk of their application in daily practice is minimal, corroborated by the opinion of those authors. On the other hand, the training of the multidisciplinary team on the early mobilization of the person undergoing invasive mechanical ventilation is essential for them to be properly informed and prepared for its implementation. All these factors are fundamental to guaranteeing people's safety.

Barriers to early mobilization

The main barriers identified that prevented early mobilization were sedation and endotracheal intubation⁽¹⁹⁾. The use of protocols allowing an adequate management of the level of sedation, as well as the need for appropriate analgesia and management of delirium, are essential components for the person's ability to mobilize early and to cooperate with the future interventions⁽²⁸⁾. High levels of sedation make it impossible for the person to mobilize actively or out of bed, but they do not impede passive mobilizations, according to early mobilization protocols used in several studies^(22, 23, 25, 26). Some studies have changed sedation practices in order to reduce the impact of this barrier on early mobilization^(20, 22). With regard to endotracheal intubation, it is reported as a barrier to early mobilization due to the increased risk of extubation. One of the studies overcame this barrier through the acquisition of reinforcement devices for the fixation of endotracheal tubes⁽²⁰⁾. In addition to the risk of extubation, the exteriorization of other medical devices such as arterial and central venous catheters

have also been described as restrictive factors for early mobilization^(19, 20, 22).

Hemodynamic and ventilatory stability is a fundamental component for early mobilization. If the person does not have adequate cardiovascular and respiratory reserve, it can influence the evolution of the early mobilization process⁽²⁸⁾. Due to this fact, factors such as the need for high inspiratory oxygen fractions, high respiratory rates and unstable values of blood pressure or heart rate were considered exclusion criteria for early mobilization^(19, 21-26). The administration of vasopressors⁽¹⁹⁾ was sometimes considered an exclusion criterion⁽²⁵⁾ or an absolute or relative contraindication, depending on the dosage administered, thus making it necessary to adjust the type of intervention to be carried out^(20, 22, 23).

Mobilizing the person in critical condition, connected to several medical devices and in need of continuous hemodynamic and ventilatory monitoring, requires countless material and human resources, essentially when mobilization outside the bed is necessary. The need to strengthen human and material resources for the implementation of early mobilization protocols was confirmed by several studies, and these are not additional barriers in their implementation^(20, 22, 23). The involvement of the multidisciplinary team (doctor, specialist nurse in rehabilitation nursing, nurse, and physiotherapist) is essential for this practice to be effectively implemented.

Frailties of the studies

We would like to point out that some studies had a reduced number of participants^(20, 21, 24-26), as well as the short duration of some studies, which could jeopardize the benefits obtained through the interventions carried out^(25, 26).

Some studies, despite describing the modalities performed, do not specify their frequency, intensity, volume and duration. This information is essential to determine its impact on the results obtained^(19, 22, 23). Only 2 studies addressed the ventilatory component by performing breathing exercises or using a ventilatory weaning protocol^(21, 24). It should also be noted that only one study took into account the assessment of people's caloric needs, which is an important factor to take into account in the person's ability to carry out interventions⁽²⁴⁾.

In most of the studies analyzed, there is no reference to the presence of specialist nurses in rehabilitation. The exercises performed were essentially performed by the physiotherapists, what we consider a limitation of this study, as the aim of the study was to analyze the rehabilitation nursing interventions, in addition to describing the benefits of mobilization, the latter fact having been achieved.

Practical implications and for future investigations

The use of early mobilization protocols is one of the strategies used by the multidisciplinary team to facilitate the progression of mobility gains during

people's hospitalization, as well as ensuring greater safety in the care provided to people⁽²⁸⁾. We found that the use of a structured protocol is extremely important, in order to provide early uniformed mobilization for people in critical situations, with the aim of combating immobility and its sequelae⁽²⁰⁻²³⁾.

The identification of barriers that make early mobilization impossible is essential for this to be a consolidated practice in intensive care units. Some studies used a quality improvement model to implement early mobilization protocols, identified barriers to their implementation, trained a multidisciplinary team, and identified appropriate interventions to overcome the identified barriers, so that they would not impede their implementation^(20, 22).

Some studies were not exhaustive regarding the frequency, intensity, volume and duration of interventions performed, referring only to the different interventions performed. To better determine the impact of early mobilization interventions on the results obtained, further detailing these parameters is essential^(19, 22, 23).

The use of protocols, the promotion of a culture of early mobilization, the training of a multidisciplinary team and the identification of barriers, as well as the appropriate interventions to overcome them, are fundamental issues for professionals to be more trained and aware, leading to a effective dissemination of early mobilization in the ICU.

Study limitations

Regarding the present review, this presents conditionings that can be considered as limitations, since only studies in Portuguese, English and Spanish, full-text articles, freely accessible and within a time frame of January 2010 and September 2018, were included in the research. Still as a limitation, we would like to mention the use of a reduced number of databases.

CONCLUSION

Early mobilization has been reported as a necessary and essential intervention in the daily practice of caring for people in critical situations, being a determining factor in their recovery. Through the analysis of the 9 studies included, we found that early mobilization leads to an improvement in functional capacity, decreases the time on IMV and reduces the occurrence of various complications. Consequently, it will lead to a reduction in the number of days spent in the ICU and hospital stay, reduces morbidity, mortality and the number of readmissions. All of this indicates that interventions for early mobilization of people in critical situations have a direct influence on short and long-term recovery, that is, intra-hospital and after hospital discharge, bringing countless health gains.

We believe that early mobilization in people undergoing IMV, and in critically ill people in general, is endowed with benefits that can be performed safely, with a minimum report of adverse events. The lack of training

and action protocols was identified as the biggest gap in adherence to this practice, which is why we consider essential the creation of protocols for the implementation of these therapeutic measures.

The Specialist Rehabilitation Nurse plays a decisive role regarding the early mobilization carried out in the ICU. This should be considered a disseminator and promoter of a culture of early mobilization. With regard to this topic, there is a lack of studies carried out by nurses holding this specialty, which may be associated with the fact that they do not exercise their specific skills in intensive care units, which we consider a limitation of this integrative review.

BIBLIOGRAPHIC REFERENCES

1. Ministério da Saúde. RNEHR de Medicina Intensiva. 2017;3,4. Available from: <https://www.sns.gov.pt/wp-content/uploads/2017/08/RNEHR-Medicina-Intensiva-Aprovada-10-a>
2. Santos A, Oliveira I, Silveira T. Mobilização precoce em UCI. *Salutis Scientia*, 2010; 2, 20-24 Available from: <http://www.salutisscientia.esscvp.eu/Site/Artigo.aspx?artigoId=30463>
3. Albuquerque IM, Machado AD. Impacto da mobilização precoce em (de la movilidad temprana en) pacientes de terapia intensiva. *Salud(i)Ciencia (Impresa)*. 2015;21:403-8. Available from: https://www.researchgate.net/profile/Isabella_Albuquerque/publication/282848751_Impacto_da_mobilizacao_precoce_em_de_la_movilidad_temprana_en_pacientes_de_terapia_intensiva_Impact_of_early_mobilization_in_intensive_care_patients/links/561e3f6c08ae50795afd933c/Impacto-da-mobilizacao-precoce-em-de-la-movilidad-temprana-en-pacientes-de-terapia-intensiva-Impact-of-early-mobilization-in-intensive-care-patients.pdf
4. Santos F, Mandelli PG, Ostrowski VR, Tezza R, da Silva Dias J. Relação entre mobilização precoce e tempo de internação em uma unidade de terapia intensiva. *Revista Eletrônica Gestão & Saúde*. 2015 Jan 12;6(2):1394-407. Available from: <http://periodicos.unb.br/index.php/rgs/article/view/22475/16072>
5. Hodgson C, Bellomo R, Berney S, Bailey M, Buhr H, Denehy L, Harrold M, Higgins A, Presneill J, Saxena M, Skinner E. Early mobilization and recovery in mechanically ventilated patients in the ICU: a bi-national, multi-centre, prospective cohort study. *Crit Care*. 2015 Dec 1;19(1):81. P 1-10 Available from: <https://link.springer.com/article/10.1186/s13054-015-0765-4>
6. Severino, S. Enfermagem de Reabilitação à Pessoa Submetida a Ventilação Mecânica. In: Marques-Vieira, C. Santos, LL. Cuidados de Enfermagem de Reabilitação à Pessoa ao Longo da Vida. Primeira E. Loures: Lusodidacta - Soc. Port. de Material Didático, Lda.; 2017. P 365-378
7. Martinez BP, Bispo AO, Duarte AC, Neto MG. Declínio funcional em uma unidade de terapia intensiva (UTI). *movimento*. 2013;5(1). P 1-5. Available from: https://www.researchgate.net/profile/Mansueto_Neto/publication/257169739_Functional_decline_in_intensive_care_unit_ICU/links/0a85e53b2eee6ec14d000000/Functional-decline-in-intensive-care-unit-ICU.pdf
8. Ågård AS, Egerod I, Tønnesen E, Lomborg K. Struggling for independence: A grounded theory study on convalescence of ICU survivors 12 months post ICU discharge. *Intensive Crit Care Nurs*. 2012 Apr 1;28(2):105-13. https://pure.au.dk/portal/files/51944995/Struggling_for_independence.pdf20
9. Azevedo PM, Gomes BP. Efeitos da mobilização precoce na reabilitação funcional em doentes críticos: uma revisão sistemática. *Referência*. 2015 Jun. IV(5) 129-38. Available from: http://www.scielo.mec.pt/scielo.php?pid=S0874-02832015000200015&script=sci_arttext&tlng=em
10. Eakin MN intensive care unit: a qualitative analysis. *J Crit Care*. 2015 Aug 1;30(4):698-704. Available from: <https://sci-hub.tw/10.1016/j.jcrc.2015.03.019>, Ugbah L, Arnautovic T, Parker AM, Needham DM. Implementing and sustaining an early

- rehabilitation program in a medical
11. Jong, N. Rehabilitation in the Intensive Care Unit. In: He, K. Yap, S. Joo, L. Handbook of Rehabilitation Medicine. Singapore. World Scientific Publishing. 2017. P133-139. Available from: https://scihub.tw/10.1142/9789813148727_0012
12. Duque, H. Ferreira, A. Sousa, L. Reabilitação Respiratória na Pessoa Submetida a Ventilação Invasiva. In: Cordeiro, M; Menoita, E. Manual de boas práticas na reabilitação respiratória: conceitos, Princípios e Técnicas. 1 ed. Loures. Lusociência; 2012. P194-211
13. Vilelas J. Investigação: O processo de construção do conhecimento. 2 ed. Lisboa: Edições Sílabo; 2017.
14. JBI User Manual: System for the Unified Management. Assessment and Review of Information. Joanna Briggs Institute's. Version 2.5. 2011.
15. Bugalho A, Carneiro AV. Intervenções para aumentar a adesão terapêutica em patologias crônicas. Lisboa: Centro de Estudos de Medicina Baseada na Evidência. 2004 Jun.
16. Registered Nurses Association of Ontario (RNAO). Falls Prevention: Building the Foundations for Patient Safety. A Self Learning Package. Toronto: Registered Nurses Association of Ontario; 2007.
17. Amidei C, Sole ML. Physiological responses to passive exercise in adults receiving mechanical ventilation. American J Crit Care. 2013 Jul 1;22(4):337-48. Available from: <http://ajcc.aacnjournals.org/content/22/4/337.full.pdf+html>
18. Azevedo PM, Gomes BP. Efeitos da mobilização precoce na reabilitação funcional em doentes críticos: uma revisão sistemática. Referência. 2015 Jun. IV(5) 129-38. Available from: http://www.scielo.mec.pt/scielo.php?pid=S0874-02832015000200015&script=sci_arttext&tlng=em
19. TEAM Study Investigators. Early mobilization and recovery in mechanically ventilated patients in the ICU: a bi-national, multi-centre, prospective cohort study. Crit Care. 2015 Dec 1;19(1):81. Available from: <https://link.springer.com/article/10.1186/s13054-015-0765-4>.
20. Castro E, Turcinovic M, Platz J, Law I. Early mobilization: changing the mindset. Crit care nurs. 2015 Aug 1;35(4):e1-6. Available from: <http://ccn.aacnjournals.org/content/35/4/e1.full.pdf+html>.
21. Yosef-Brauner O, Adi N, Ben Shahr T, Yehezkel E, Carmeli E. Effect of physical therapy on muscle strength, respiratory muscles and functional parameters in patients with intensive care unit-acquired weakness. The Clinical Respiratory Journal [serial on the Internet]. (2015, Jan), [cited September 18, 2018]; 9(1): 1-6. Available from: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/crj.12091>
22. Clark DE, Lowman JD, Griffin RL, Matthews HM, Reiff DA. Effectiveness of an early mobilization protocol in a trauma and burns intensive care unit: a retrospective cohort study. Physical therapy. 2013 Feb 1;93(2):186-96. Available from: <https://academic.oup.com/ptj/article/93/2/186/2735509>
23. McWilliams D, Weblin J, Atkins G, Bion J, Williams J, Elliott C, Whitehouse T, Snelson C. Enhancing rehabilitation of mechanically ventilated patients in the intensive care unit: a quality improvement project. J Crit Care. 2015 Feb 1;30(1):13-8. Available from: <https://www.sciencedirect.com/science/article/pii/S0883944114004018>
24. Clini EM, Crisafulli E, Degli Antoni F, Beneventi C, Trianni L, Costi S, Fabbri LM, Nava S. Functional recovery following physical training in tracheotomized and chronically ventilated patients. Respiratory care. 2011 Mar 1;56(3):306-13. Available from: <http://rc.rcjournal.com/content/respcare/56/3/306.full.pdf>
25. Toccolini BF, Osaku EF, de Macedo Costa CR, Teixeira SN, Costa NL, Cândia MF, Leite MA, de Albuquerque CE, Jorge AC, Duarte PA. Passive orthostatism (tilt table) in critical patients: Clinicophysiology evaluation. J Crit Care. 2015 Jun 1;30(3):655-e1. Available from: <https://www.sciencedirect.com/science/article/pii/S0883944114005085>
26. Amidei C, Sole ML. Physiological responses to passive exercise in adults receiving mechanical ventilation. American J Crit Care. 2013 Jul 1;22(4):337-48. Available from: <http://ajcc.aacnjournals.org/content/22/4/337.full.pdf+html>
27. Azevedo PM, Gomes BP. Efeitos da mobilização precoce na reabilitação funcional em doentes críticos: uma revisão sistemática. Referência. 2015 Jun. IV(5) 129-38. Available from: http://www.scielo.mec.pt/scielo.php?pid=S0874-02832015000200015&script=sci_arttext&tlng=em
28. Rocha AM, Martinez BP, da Silva VM, Junior LF. Early mobilization: Why, what for and how?. Med intensiva. 2017 Oct 1;41(7):429-36. Available from: <http://ipametodista.edu.br/pos-graduacao/stricto-sensu/processo-seletivo/early-mobilization-2017.pdf>

O TREINO DE EXERCÍCIO EM PESSOAS COM DOENÇA RESPIRATÓRIA CRÔNICA ESTABILIZADA : UMA SCOPING REVIEW

ENTRENAMIENTO MUSCULAR EN PERSONAS CON ENFERMEDAD RESPIRATORIA CRÓNICA ESTABILIZADA: UNA SCOPING REVIEW

EXERCISE TRAINING IN PEOPLE WITH A STABILIZED CHRONIC RESPIRATORY DISEASE: A SCOPING REVIEW

DOI 10.33194/rper.2019.v2.n1.08.4567 | Submitted 14.03.2019 | Approved 22.06.2019

 Luis Gaspar¹; Dulce Ferreira²; Francisco Vieira³; Paulo Machado³;  Miguel Padilha³

1 - Centro Hospitalar e Universitário São João; 2 - ECCI Torres Vedras; 3 - Escola Superior de Enfermagem do Porto

RESUMO

Introdução: A Reabilitação Respiratória (RR) integra a componente não farmacológica das principais guidelines clínicas para o controlo e tratamento das doenças respiratórias crónicas.

O Enfermeiro de Reabilitação (ER), integrado numa equipa multidisciplinar, concebe, implementa e monitoriza programas de RR onde se inclui o treino do exercício.

Sendo o conhecimento disciplinar de enfermagem um dos pilares da decisão clínica e a garantia da qualidade e segurança dos cuidados de enfermagem torna-se relevante conhecer o impacte destes programas, conduzidos por ER, de forma a melhorar a prática clínica.

Objetivo: Conhecer o impacte dos programas de RR, conduzidos por enfermeiros, nas pessoas com doença respiratória crónica.

Metodologia: Scoping review com metodologia do Joanna Briggs Institute® com recurso a dois revisores independentes.

Resultados: incluímos 10 estudos que revelaram que programas de RR conduzidos por enfermeiros de reabilitação aumentam a tolerância ao exercício, a qualidade de vida, a independência funcional e reduzem a dispneia e a ansiedade.

Conclusão: A RR realizada por ER em pessoas com doença respiratória crónica é sobreponível à mais recente evidência.

Palavras-chave: Treino de exercício, Enfermagem de Reabilitação, Reabilitação Respiratória, Doença respiratória crónica

RESUMEN

Introducción: La Rehabilitación Pulmonar (RP) es el tratamiento no farmacológico que consta en los principales guías clínicas para el control y la realización de las tareas respiratorias crónicas.

El Enfermero de Rehabilitación (ER), constituido en una disciplina multidisciplinaria, concibe, implementa y monitorea programas de RP en que se incluye el entrenamiento del ejercicio.

Siendo el conocimiento disciplinario de enfermería uno de los pilares de la decisión clínica y el garante de la calidad y seguridad de los cuidados de enfermería, resulta relevante conocer el impacto de estos programas, conducidos por ER, para mejorar la práctica clínica.

Objetivo: conocer el impacto de los programas de RR, conducidos por enfermeros, en las personas con la enfermedad respiratoria crónica.

Metodología: Revisión de alcance con metodología del Instituto Joanna Briggs® con dos revisores independientes.

Resultados: incluimos 10 estudios que revelaron que los RR conducidos por enfermeros aumentaron la tolerancia al ejercicio, una calidad de vida, una autonomía funcional y una disnea y la ansiedad.

Conclusión: La RR realizada por ER en personas con enfermedad respiratoria es crónica es sobreponible a la más reciente evidencia.

Palabras clave: Ejercicio, Enfermería de Rehabilitación, Rehabilitación Respiratoria, Enfermedad respiratoria crónica

ABSTRACT

Introduction: Pulmonary Rehabilitation is (PR) integrates the non-pharmacological component of the clinical guidelines for the control and treatment of chronic respiratory diseases.

The Rehabilitation Nurse (RN), integrated into a multidisciplinary team, designs, implements and monitors PR programs that include exercise training.

Being the nursing disciplinary knowledge one of the pillars of clinical decision and the guarantor of the quality and safety of nursing care becomes relevant to know the impact of these programs, conducted by RN, in order to improve clinical practice.

Objective: To know the impact of PR programs, conducted by nurses, on people with chronic respiratory disease.

Methodology: Scoping review with Joanna Briggs Institute® methodology using two independent reviewers.

Results: We included 10 studies that showed that nurse-led PR programs increase exercise tolerance, quality of life, functional independence, and reduce dyspnea and anxiety.

Conclusion: The PR performed by RN in patients with chronic respiratory disease is overlapping with the latest evidence.

Key words: Exercise training, Rehabilitation Nursing, Respiratory Rehabilitation, Chronic Respiratory Disease

INTRODUCTION

Dyspnea, activity intolerance and reduced quality of life are frequent manifestations in people with chronic respiratory disease (CRD)⁽¹⁻⁴⁾. These manifestations are not only the result of loss of lung function, but result from peripheral muscle dysfunction. If that were the case, medication alone would be effective in increasing tolerance to the activity, which is not the case^(1-2, 5-6). Peripheral muscle dysfunction is characterized by the loss of strength and muscle mass, which leads to changes in the distribution of muscle fibers, which, together with alterations in gas exchanges, result in reduced exercise capacity in people with CRD.

This activity intolerance limits functional independence with a consequent negative impact on the capacity for self-care⁽⁹⁾, and on the increase in mortality^(1,10).

Clinically, it is translated by the person's inability to carry out their daily activities, in the intensity or duration normally tolerable for healthy and sedentary people⁽¹⁾. This adoption of a sedentary lifestyle (in order to avoid functional dyspnea) leads to muscle deconditioning, enhancing the loss of function^(1, 7, 10-11).

Muscle performance (strength and endurance) results from the physiological structure of the muscles, and the peripheral muscle dysfunction manifested by people with CRD results from an alteration in the distribution of muscle fibers, their size, capillary density and metabolic capacity^(2, 4-5,11).

In this context, the unavoidable importance of exercise training emerges, which in a respiratory rehabilitation program (RRP) contributes to the increase in exercise tolerance, decreasing oxygen consumption in the face of the same amount of exercise and reducing the manifestations of dyspnea^(1,5,8).

Exercise training in this context includes aerobic training, or endurance training and anaerobic or muscle strength training.

Aerobic training, or endurance training, uses large muscle groups with moderate to long duration and moderate to high intensity^(2,4,9,12). It requires repeated physical activity over a specific period of time and aims to increase and modulate endurance capacity and increase the number of type I fibers.

On the other hand, muscle strength training (anaerobic training component) designed to increase muscle strength and mass, essential for carrying out activities of daily living, uses small muscle groups at high intensity and for a short duration, thus reducing cardiorespiratory limitations characteristics of people with chronic respiratory disease in more advanced stages of the disease.

The best physiological response is obtained by joining the two training modalities, tending to be performed at high intensity.

This is why Respiratory Rehabilitation, which obligatorily includes exercise training, is the recommended non-pharmacological treatment for people with chronic respiratory disease in an outpatient setting.

In this sense, the role of the RN should not be solely related to respiratory kinesitherapy or the educational component, but should accompany the scientific evidence and also undergo exercise training, as is furthermore enshrined in the Regulation of Specific Competencies of the Specialist Nurse Rehabilitation Nursing, which describes the competence of the Rehabilitation Nurse - to design, implement, evaluate and reformulate motor and cardio-respiratory training programs.

Given the above, it is essential to know the exercise training programs included in the respiratory rehabilitation programs (RRP) carried out by rehabilitation nurses.

A previous search carried out in MEDLINE and CINAHL did not reveal any literature review on this topic, so it was decided to carry out a Scoping Review in order to map the use of exercise training in respiratory rehabilitation programs carried out by nurses for people with disease chronic respiratory in an outpatient setting.

The option for a scoping review was linked not only to the objective of mapping scientific evidence to support the clinical decision of rehabilitation nurses, but also to identify possible areas of interest for disciplinary investigation.

METHOD

The methodology used to carry out this scoping review followed the steps proposed by the Joanna Briggs Institute®, and intended to answer the following question: "What is the impact of exercise training programs, conducted by rehabilitation nurses, on people with chronic respiratory disease?"

Inclusion Criteria

Type of participants

People with chronic respiratory disease, without age limit and regardless of disease severity.

Concept

Regarding concepts, articles focused on respiratory rehabilitation programs defined as "comprehensive intervention, based on an extensive assessment of patients, followed by individualized treatments that include - but not limited to - physical exercise. Education and behavioral change, designed to improve the physical and emotional condition of people with chronic respiratory disease and to promote long-term adherence to health behaviors." ⁽¹⁻³⁾

The definition of exercise training includes a combination of aerobic and anaerobic training (with muscle strengthening of the upper and lower limbs) with a minimum duration of 8 weeks. ⁽¹⁻³⁾

Context

All articles were integrated regardless of the place of implementation (day hospital, primary care institutions or home).

Type of studies

This review included all types of studies, primary studies, literature reviews (in Portuguese, English and Spanish) and gray literature (in Portuguese) regardless of the year of publication.

Exclusion Criteria

Studies applied to areas of health other than nursing and those in which the methodology presents omissions in the research design were excluded from the review.

Research strategy

The survey, carried out in June 2018, was designed considering three main steps:

In the first stage, first and second level controlled terms were considered to define the research term, namely by collecting the main and additional descriptors and qualifiers present in the Medical Subject Headings (MeSH) and in the Headings of the Cumulative Index of Nursing and Allied Health Literature (CINAHL). In the second stage, keywords and terms used by the authors to define the categories

under analysis were added, constructing the following search term:

("Exercise training" OR "Pulmonary rehab*") AND ("Lung Disease*" OR "Pulmonary disease*" OR "COPD" OR "Bronchiectasis" OR "Cystic fibrosis" OR "Asthma" OR "Interstitial lung disease*") AND ("nurse led intervent*" OR "nurse-led clinic*" OR "Nurses practice pattern*") AND ("self-care" OR "functional independence" OR "exercise tolerance" OR "activity of daily living" OR "quality of life" OR "motor activity") NOT ("physical therapy*")

Therefore, reference databases were tracked, namely Scopus and Web of Science, and the EBSCO content aggregator, allowing coverage of the following databases and indexes *MEDLINE*, *Science Citation Index*, *Social Sciences Citation Index*, *Emerging Sources Citation Index*, *Book Citation Index*, *Conference Proceedings Citation Index*, *Korean Citation Index*, *Russian Science Citation Index*, *SciELO Citation Index*, *Directory of Open Access Journals*, *Directory of Open Access Scholarly Resources*, *Academic Search Complete*, *Business Source Complete*, *CINAHL Complete*, *ERIC*, *MedicLatina*, *Psychology and Behavioral Sciences Collection* and *SPORTDiscus database*. It also accesses the research in gray literature in the Scientific Repository of Open Access of Portugal.

In the third stage, the reference lists of the included studies were analyzed in order to build the citation map and potential references for inclusion.

The selection of studies was made according to the inclusion and exclusion criteria previously defined by two independent reviewers, based on the information mentioned in the title and abstract. The disagreement between the two reviewers implied the intervention of a third reviewer.

For the step of separating, summarizing and reporting the essential elements found in each study, a structured instrument was built that allowed for the synthesis, interpretation and analysis of data, the nature and distribution of the studies incorporated in the review. Items such as year of publication, methodology used, duration of exercise training programs, interventions and results obtained were grouped.

In the final phase, a framework was built in order to obtain an overview of the studies included in the review. (figure 2)

EXTRACTION OF RESULTS

Based on the applied search strategy, 34 potentially relevant articles were identified.

One was excluded because it was duplicated, four were excluded after title analysis and seventeen were excluded after abstract analysis.

The analysis of the full text of the remaining twelve articles led to the exclusion of two. Finally, ten articles were included in the review (figure 1).

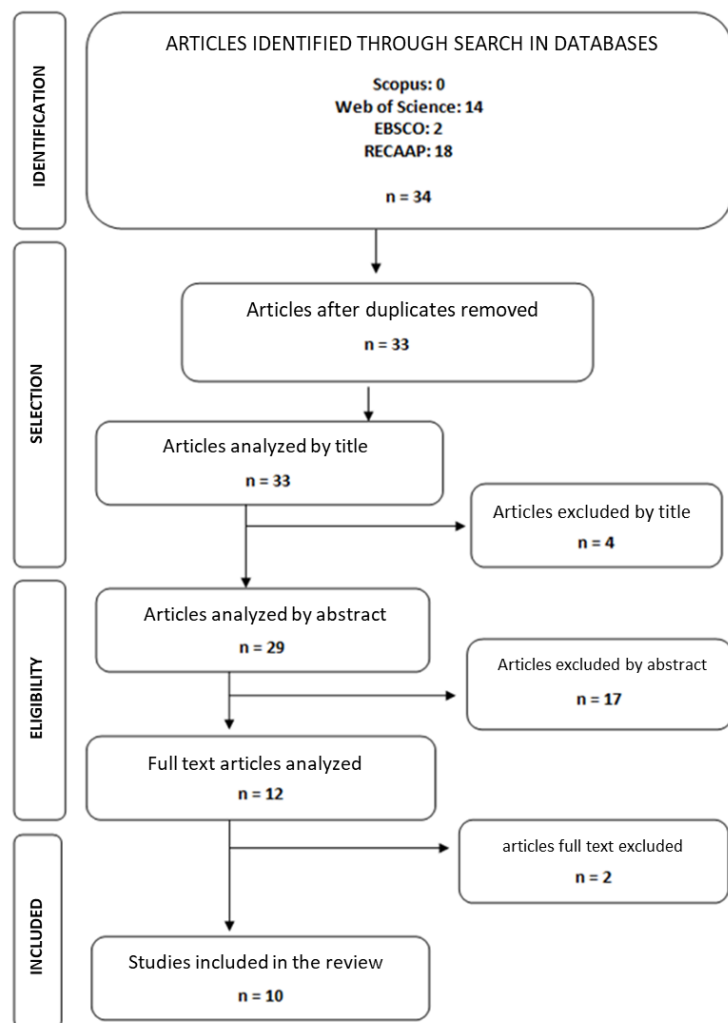


Figure 1 - PRISMA Flowchart of the Article Selection Process

All of the studies are Portuguese, eight resulting from master's dissertations and two from scientific articles published in a journal.

From a methodological point of view, all studies are quantitative, seven being quasi-experimental, two exploratory descriptive and one systematic literature review.

There was little scientific production on this topic considering the different contexts.

Six studies have respiratory kinesitherapy intervention that is not recommended in this context.

From the analysis of the articles, the following categories of information emerged: duration/frequency of the exercise training program, type of exercise training and results obtained.

Duration of exercise training programs

The duration of exercise and training programs found in the articles under review was quite diverse, ranging between 7 and 39 weeks, and in most articles found the duration of the programs is between 25 and 39 weeks.

Exercise training typology

The exercise training typology category comprises the type and characteristics of the training.

In all the selected articles, the exercise training programs included aerobic training of 30 minutes and anaerobic training, the latter being on upper and lower limbs.

Five articles include respiratory kinesitherapy as an intervention that is not recommended in this context.

Results obtained

Regarding the results obtained, three articles refer to a decrease in dyspnea, five to an increase in quality of life and tolerance in activities of daily living, two articles reveal the promotion of self-care, decrease in anxiety and increase in tolerance to exertion, and one article refers to improvement in the management of therapeutic regimen.

DISCUSSION

The results of this review allow us to identify that the exercise training programs designed, implemented and carried out by rehabilitation nurses contribute to the reduction of dyspnea, anxiety, increasing tolerance to effort and life activities, thus contributing to the improvement quality of life.

These results overlap with the scientific evidence clearly identified in the latest European Respiratory Society Guidelines published in 2013⁽³⁾ and confirmed in 2017 by Shioya et al⁽¹³⁾.

Recently, studies such as those by Robinson et al.⁽⁸⁾ and McNamara et al.⁽¹²⁾, both in 2018, confirmed the role of exercise training in improving dyspnea.

Gordon et al., 2019⁽¹⁴⁾ published a meta-analysis showing the impact of exercise training on depression and anxiety. Regarding the increase in exercise tolerance and its consequences on the ability to perform activities of daily living, the evidence is vast, as shown by the studies by Bisca et al., 2014⁽¹⁵⁾, Spruit et al, 2015⁽⁵⁾ and more recently in 2019 the study by Vaes⁽¹⁵⁾ showing the positive impact on these variables.

| Scope | Author | Date | N | Metodology | Assessment | Duration / frequency | Intervention | Results |
|--------------------|--------------|------|----|------------------------------|--|-----------------------|--|--|
| Master's degree | Ferreira, A. | 2013 | 8 | almost experimental | dyspnea Activities of daily living quality of life | 6 weeks 3xweek | strength training Endurance Training Respiratory Kinesitherapy | ↓ Dyspnea ↑ Activities of daily living = quality of life |
| Master's degree | Gaspar, L. | 2013 | 23 | almost experimental | quality of life anxiety respiratory function | 13 weeks 3x week | strength training Endurance Training Respiratory Kinesitherapy (SOS) | ↑ Quality of life ↓ Anxiety = Respiratory Function |
| Master's degree | Mendes, M. | 2014 | 11 | Systematic literature review | therapeutic regimen management promoting self-care | up to 28 sessions | strength training Endurance Training Respiratory Kinesitherapy | ↑ Therapeutic regimen ↑ Self-care promotion |
| Master's degree | Casado, S. | 2012 | 14 | almost experimental | Dyspnea, Activities of daily living quality of life respiratory function | 15 Sessions 2Xweek | strength training Endurance Training Respiratory Kinesitherapy | ↓ Dyspnea, ↑ Daily Living Activities ↑ Quality of Life ↑ Respiratory Function |
| Master's degree | Ferreira, D. | 2014 | 7 | Multicase study | Activities of daily living quality of life effort tolerance muscle strength | 7 Sessions | strength training and endurance, upper limbs | ↑ Activities of daily living = Quality of life ↑ Effort tolerance ↑ Muscle strength |
| Master's degree | Santos, C. | 2017 | 30 | almost experimental | dyspnea Activities of daily living quality of life | Max 30 sessions | strength training Endurance Training | ↓ Dyspnea ↑ Daily Living Activities ↑ Quality of Life |
| Master's degree | Rocha, S. | 2017 | 60 | almost experimental | Activities of daily living quality of life | 20 Sessions | strength training Endurance Training Respiratory Kinesitherapy | ↑ Activities of daily living = quality of life |
| Master's degree | Cardoso, V. | 2013 | 4 | almost experimental | quality of life | 8 weeks 3x:week | strength training Endurance Training | ↑ quality of life |
| Scientific article | Gaspar, L. | 2018 | 30 | Exploratory Prospect | quality of life anxiety respiratory function | 13 weeks 3x week | strength training Endurance Training | ↑ Quality of life ↓ Anxiety = Respiratory Function |
| Scientific article | Gaspar, L. | 2018 | 38 | almost experimental | Self Care: Hygiene Dressing / Undressing Walking | 13 weeks 3x week | strength training Endurance Training | ↑ Hygiene ↑ Dressing/Undressing ↑ Walk |

Figure 2: Summary of articles included in the review

The multisystemic character of chronic respiratory diseases (especially COPD) leads to a progressive functional decline, resulting from sarcopenia secondary to immobility, with important consequences, namely in terms of autonomy in carrying out activities of daily living and self-care^(9-10,13).

In this context, Respiratory Rehabilitation emerges as the non-pharmacological treatment indicated for people with chronic respiratory disease, fundamentally focused on an approach in which exercise training is, along with education, the main component^(1,4,6).

Respiratory rehabilitation programs increase activity tolerance and reduce dyspnea, aspects that translate into functional gains and the capacity for self-care^(2,9,15).

In addition to these effects, respiratory rehabilitation also reduces hospitalizations and mortality⁽¹⁶⁾.

There is no consensus about its duration and the most recent recommendation defines it as a minimum duration of 8 weeks with 3 sessions per week^(1,3,16). As most symptoms result from peripheral muscle dysfunction (which leads to increased oxygen consumption) it is clear that the objective of respiratory rehabilitation programs is to improve

activity tolerance and later exercise tolerance through improving strength and peripheral muscle resistance, thus contributing to improve quality of life^(1,3,5).

There is, in fact, a direct relationship between walking time and functional status⁽¹¹⁾, as well as between upper limb performance and performance in activities of daily living⁽¹⁷⁾.

All indicators show that the usual tendency of immobility in these people is not only respiratory, but also muscular, since the muscle morphological changes found in these people are important, namely the reduction of type I fibers, the loss of strength and capacity of resistance, especially of the lower limbs^(1-2,4,7).

When compared to healthy people, tolerance to exertion is lower, resulting in increased shortness of breath secondary to dynamic hyperinflation and immobility^(2,4,12).

This is the reason why it is concluded that the combination of aerobic and anaerobic training is more effective^(1,3,5).

The evidence related to the results of exercise training programs is quite vast. Studies show that there are health gains in practically all the indicators studied,

namely dyspnea and activity intolerance, with an important impact on the promotion of self-care and quality of life.

CONCLUSION

This study allowed us to identify two central aspects: the first is that exercise training programs conducted by nurses adhere to international guidelines; the second is that the results obtained (improved perception of dyspnea; decreased anxiety; increased tolerance to exertion and activities of daily living, as well as improved quality of life) are comparable to the best available scientific evidence.

This study demonstrates the positive impact of the action of rehabilitation nurses on the health condition of people with chronic respiratory disease who participate in exercise training programs.

Given the widely described importance of the benefits of exercise training in this context, more studies should be carried out and published on this topic.

BIBLIOGRAPHIC REFERENCES

1. Ferreira D, Teodoro A, Gaspar Lea. Guia Orientador de Boa Prática - Reabilitação Respiratória Lisboa: Ordem dos Enfermeiros; 2018.
2. Gaspar L. Treino aeróbico e de fortalecimento muscular no doente com patologia respiratória. Enfermeiro: Anuário 2017. 2017 Maio;.(Reabilitação Respiratória).
3. Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, Hill K, Holland AE, Lareau SC, Man WD, Pitta F. An official American Thoracic Society/European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. *Am J Respir Crit Care Med*. 2013 Oct 15;188(8):e13-64.
4. Andrianopoulos V, Klijn P, Franssen FM, Spruit MA. Exercise training in pulmonary rehabilitation *Clin Chest Med*. 2014 Jun 1;35(2):313-22..
5. Spruit MA, Pitta F, McAuley E, ZuWallack RL, Nici L. Pulmonary rehabilitation and physical activity in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2015 Oct 15;192(8):924-33..
6. Pitta F, Troosters T, Spruit MA, Probst VS, Decramer M, Gosselink R. Characteristics of physical activities in daily life in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2005 May 1;171(9):972-7.
7. Braidó F, Baiardini I, Menoni S, Bagnasco AM, Balbi F, Bocchibianchi S, Balestracci S, Piroddi MG, Canonica GW. Disability in COPD and its relationship to clinical and patient-reported outcomes. *Curr Med Res Opin*. 2011 May 1;27(5):981-6.
8. Robinson H, Williams V, Curtis F, Bridle C, Jones AW. Facilitators and barriers to physical activity following pulmonary rehabilitation in COPD: a systematic review of qualitative studies. *NPJ Prim Care Respir Med*. 2018 Jun 4;28(1):19.
9. Gaspar L, Martins P. Impacto de um programa de reabilitação respiratória nos autocuidados higiene, vestir-se/despir-se e andar avaliados pela escala London Chest Of Daily Living em pessoas com doença respiratória crônica. *Rev Port Enferm Reabil*. 2018; 1(1):13-17.
10. Lahaije AJ, Van Helvoort HA, Dekhuijzen PN, Heijdra YF. Physiologic limitations during daily life activities in COPD patients. *Respir Med*. 2010 Aug 1;104(8):1152-9.
11. Miravittles M, Cantoni J, Naberan K. Factors associated with a low level of physical activity in patients with chronic obstructive pulmonary disease. *Lung*. 2014 Apr 1;192(2):259-65..
12. McNamara RJ, Spencer L, Dale M, Leung RW, McKeough ZJ. Alternative Exercise and Breathing Interventions in Chronic Obstructive Pulmonary Disease: A Critical Review. *EMJ Respir*. 2018;6(1):117-27.
13. Bisca GW, Proença M, Salomão A, Hernandez NA, Pitta F. Minimal detectable change of the London chest activity of daily living scale in patients with COPD. *J Cardiopulm Rehabil Prev*. 2014 May 1;34(3):213-6..
14. Spruit MA, Pitta F, McAuley E, ZuWallack RL, Nici L. Pulmonary rehabilitation and physical activity in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2015 Oct 15;192(8):924-33..
15. Martins T, Araujo MF, Peixoto MJ, Machado PP. A pessoa dependente & o familiar cuidados Porto: Enfermagem.Porto; 2016.
16. McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane database of systematic reviews*. 2015(2). Disponível em: <https://doi.org/10.1002/14651858.CD003793.pub3>
17. Velloso M, Stella SG, Cendon S, Silva AC, Jardim JR. Metabolic and ventilatory parameters of four activities of daily living accomplished with arms in COPD patients. *Chest*. 2003 Apr 1;123(4):1047-53.
18. ICN. Classificação Internacional para a Prática de Enfermagem (CIPE) versão 1.0 Genebra; 2005.
19. Pitta F, Probst VS, Kovelis D, Segretti NO, Leoni AM, Garrod R, Brunetto AF. Validação da versão em português da escala London Chest Activity of Daily Living (LCADL) em doentes com doença pulmonar obstrutiva crônica. *Rev Port Pneumol*. 2008 Feb;14(1):27-47. .
20. Goto Y. Measurement of Activities of daily living in patients with chronic obstructive pulmonary disease. *Pulm Res Respir Med Open J*. 2017; SE(2): S23-S25. doi: 10.17140/PRRMOJ-SE-2-104
21. Garrod R, Paul EA, Wedzicha JA. An evaluation of the reliability and sensitivity of the London Chest Activity of Daily Living Scale (LCADL). *Respir Med*. 2002 Sep 1;96(9):725-30..
22. Jehn M, Schmidt-Trucksäss A, Meyer A, Schindler C, Tamm M, Stolz D. Association of daily physical activity volume and intensity with COPD severity. *Respir Med*. 2011 Dec 1;105(12):1846-52.
23. Carpes MF, Mayer AF, Simon KM, Jardim JR, Garrod R. Versão brasileira da escala London Chest Activity of Daily Living para uso em pacientes com doença pulmonar obstrutiva crônica. *J Bras Pneumol*. 2008 Mar;34(3):143-51.
24. Muller JP, Gonçalves PA, da Fontoura FF, Mattiello R, Florian J. Aplicabilidade da escala London Chest Activity of Daily Living em pacientes em lista de espera para transplante de pulmão. *J Bras Pneumol*. 2013;39(1):92-7..
25. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. *Am J Respir Crit Care Med*. 2002;166:111-7.
26. Agusti A, Decramer M, Celli BR. Pocket guide to COPD diagnosis, management and prevention. *Global Initiative for Chronic Obstructive Lung Disease*. 2017; 14:37-44.
27. Sciriha A, Moore K, Montefort S. Combining inspiratory muscle training and upper limb exercises. Does it improve outcomes in COPD patients?. *J ACPRC*. 2009; 41.
28. Zeng Y, Jiang F, Chen Y, Chen P, Cai S. Exercise assessments and trainings of pulmonary rehabilitation in COPD: a literature review. *Int J Chron Obstruct Pulmon Dis*. 2018;13:2013-23.
29. Shioya T, Iwakura M, Kawagoshi A. Recent advances in pulmonary rehabilitation for patients with COPD. *Pulm Res Respir Med Open J*. 2017:57-19.
30. Braidó F, Baiardini I, Menoni S, Bagnasco AM, Balbi F, Bocchibianchi S, Balestracci S, Piroddi MG, Canonica GW.

Disability in COPD and its relationship to clinical and patient-reported outcomes. *Curr Med Res Opin.* 2011 May 1;27(5):981-6.

31. Carpes MF, Mayer AF, Simon KM, Jardim JR, Garrod R. Versão brasileira da escala London Chest Activity of Daily Living para uso em pacientes com doença pulmonar obstrutiva crônica. *J Bras Pneumol.* 2008 Mar;34(3):143-51..
32. Jehn M, Schmidt-Trucksäss A, Meyer A, Schindler C, Tamm M, Stolz D. Association of daily physical activity volume and intensity with COPD severity. *Respir Med.* 2011 Dec 1;105(12):1846-52.

O TREINO PROPRIOCEATIVO E DE EQUILÍBRIO POSTURAL NO IDOSO PARA A PREVENÇÃO DE QUEDAS: SCOPING REVIEW

EL ENTRENAMIENTO PROPICIO Y DE EQUILIBRIO POSTURAL EN EL ANCIANO PARA LA PREVENCIÓN DE CAÍDAS: SCOPING REVIEW

THE PROPRIOCEPTIVE AND POSTURAL BALANCE TRAINING IN THE ELDERLY PEOPLE FOR THE PREVENTION OF FALLS: SCOPING REVIEW

DOI 10.33194/rper.2019.v2.n1.09.4573 | Submitted 10.05.2019 | Approved 26.06.2019

Catarina Correia¹; Liliana Barbosa²; Luís Rebelo³; Marco Alves⁴; Nuno Pinho⁵; Bruno Magalhães⁶

1 - EEER HFARP, Polo Porto; 2 - EEER CHU São João; 3 - EEER CHTS E.P.E.; 4 - EEER CHTS E.P.E.;
5 - EEER CHTS E.P.E.; 6 - Assistant Professor ESSM

RESUMO

A população mundial está cada vez mais envelhecida e o risco de queda está diretamente relacionado.

O objetivo do estudo é perceber qual o efeito do treino proprioceutivo e do equilíbrio postural no idoso para a prevenção de quedas.

Estudo baseado no modelo JBI. Os artigos foram extraídos das bases de dados CINAHL, MEDLINE e PEDro, redigidos em português e inglês, de janeiro de 2012 a julho de 2018, com população de 65 anos ou mais, sem condição patológica subjacente.

Incluíram-se 13 artigos que consideravam programas de treino e exercícios proprioceutivos e de equilíbrio postural, força muscular, resistência, treino de marcha e a implicação sobre o medo de cair.

Concluiu-se que, a implementação destes programas, têm um impacto positivo e significativo na prevenção de quedas. Considera-se fundamental a realização de mais estudos sem recurso a tecnologia que beneficiem o treino proprioceutivo e de equilíbrio postural preventivos de queda.

Palavras-Chave: Idoso, Proprioção e Equilíbrio Postural.

RESUMEN

La población mundial está cada vez más envejecida y el riesgo de caída está directamente relacionado.

El objetivo del estudio es percibir cuál es el efecto del entrenamiento propicio y del equilibrio postural en el anciano para la prevención de caídas.

Estudio basado en el modelo JBI. Los artículos fueron extraídos de las bases de datos MEDLINE, CINAHL y Pedro, escritos en portugués y en Inglés, a partir de enero 2012-julio 2018, con una población de 65 años o más, sin condición patológica subyacente.

Se incluyeron 13 artículos que consideraban programas de entrenamiento y ejercicios propios y de equilibrio postural, fuerza muscular, resistencia, entrenamiento de marcha y la implicación sobre el miedo a caer.

Se concluyó que, la aplicación de estos programas, tienen un impacto positivo y significativo en la prevención de caídas. Se considera fundamental la realización de más estudios sin recurso a la tecnología que beneficien el entrenamiento propicio y de equilibrio postural preventivo de caída.

Palabras Clave: Anciano, Propriocepción y Equilíbrio Postural.

ABSTRACT

The world population is increasingly aging and the risk of falling is directly related.

This study aim is to understand the effect of proprioceptive training and postural balance on the elderly people for the prevention of falls.

Study based on the JBI model. The articles were extracted from the CINAHL, MEDLINE and PEDro databases, written in Portuguese and English, from January 2012 to July 2018, with a population of 65 years-old and over, with no underlying pathological condition.

We included 13 articles that considered training programs and proprioceptive exercises and postural balance, muscular strength, resistance, gait training and the implication about the fear of falling.

It was concluded that the implementation of these programs has a positive and significant impact on falls prevention. It is considered fundamental to carry out further studies without using technology to benefit the proprioceptive training and postural balance as falls preventatives.

Keywords: Aged people, Proprioception and Postural Balance.

INTRODUCTION

The aging of the world population is a reality that imposes new challenges and requirements in health promotion and disease prevention⁽¹⁾. Increasing age, physical inactivity, associated with degenerative processes in the central nervous and muscle systems result in a decline in proprioception, balance and muscle strength, which consequently leads to an increased risk of falls in the elderly population.

From the literature it emerges that the risk of falling is present in about 30% of people aged 65 and over and who suffer at least one fall per year, about 10 to 15% of serious injuries⁽²⁾.

Proprioception is the a capacity that the body has to adapt to different postures, an unconscious consequence of feeling, interpreting and interacting with movement and position in space⁽³⁾. It is characterized by cumulative neural afferents that originate from mechanoreceptors.

Body balance is described as the ability to maintain the center of body mass within the base of support. The body must be able to acquire and control certain postures to achieve a goal, with the ability to move quickly and accurately, in a multidirectional way, with coordination, safety and in the face of external disturbances⁽⁴⁾.

Studies report that balance and proprioception training improved the person's physical condition, increasing muscle mass and strength, increasing physical endurance and improving body balance, which, in turn, enhance functional abilities, obtaining gains in mobility as well as in self-confidence. When intervening in the elderly population with appropriate training programs that can improve performance in activities of daily living that demand proprioception and balance, these become essential to reduce the risk of falling⁽⁵⁾.

A deficit in proprioception and body balance in the elderly person, associated with limited mobility and fear of falling, are conditioning factors for the reduced ability to perform daily activities and physical exercise, increasing the risk of falling. In this more fragile generation, serious injuries such as fractures or head traumas lead to prolonged hospitalizations, with an increase in the economic burden not only for the elderly and for the family, but also for the whole society⁽⁶⁾.

This association of factors can then culminate in an important commitment to the quality of life of the elderly population, in which the occurrence of a fall can be the precipitating factor for a health/disease transition, moving from autonomy to a situation of dependence.

Thus, rehabilitation, as a multidisciplinary specialty, comprises a body of specific knowledge and procedures that help people with acute, chronic or sequelae to

maximize their functional potential and independence. Its general objectives are to improve the function, promote the person's independence and maximum satisfaction and, in this way, preserve self-esteem⁽⁷⁾.

The Rehabilitation Nurse (RN) designs, implements and monitors differentiated rehabilitation nursing plans, based on people's real and potential problems. The high level of knowledge added to experience allows the RN to make decisions regarding health promotion, prevention of secondary complications, treatment and rehabilitation, maximizing the person's potential. Its intervention aims to promote early diagnosis and preventive actions in Rehabilitation Nursing, in order to ensure the maintenance of the necessary needs of clients, prevent complications and avoid disabilities, as well as provide therapeutic treatment aimed at improving residual functions, maintaining or recovering the independence⁽⁷⁾.

In this way, the RN has an interventional and preponderant action in the prevention of falls in the elderly, through the implementation of exercises and training programs that can be replicated in the home environment.

In this line of thought, the preparation of this *scoping review* comes from identifying the need to prevent falls in the elderly population and what can be done to minimize this risk whose impact on the person, family and society is so relevant?

Balance and proprioception training programs are useful and effective in preventing injuries, but what impact do they have on preventing falls in this population? Thus, we are directed to the question of what is the effect of proprioceptive training and postural balance in the elderly for the prevention of falls.

METHODOLOGY

In scientific research, different goals and issues can be identified using new approaches. *Scoping reviews* are a type of approach designed to synthesize in a more effective and rigorous way the evidence, the mapping of knowledge about a certain area of investigation⁽⁸⁾.

The option to carry out a *scoping review* is based on the fact that it is a type of review whose main objectives are: to map the existing evidence underlying a research area, to identify gaps in the existing evidence, to constitute a preliminary exercise that justifies and informs the realization of a systematic review of the literature. Thus, the use of this methodology, according to the objectives described above, is not to find the best evidence, but to map the existing scientific evidence⁽⁸⁾.

Studies that included balance and proprioception exercise training programs without the use of technologies and/or equipment were sought, with the objective of being able to be performed at home by elderly people without specific underlying pathological conditions.

The search was carried out through the databases, MEDLINE, CINAHL and PEDro. Primary studies, randomized controlled studies and systematic literature reviews were included. Using the participants, concept and context (PCC) strategy, the scoping review covered studies that: a) regarding the type of participants, elderly people aged 65 years-old or over; b) regarding the concept, the effect of proprioceptive training and postural balance; c) regarding the context, the prevention of falls.

Research strategy

The research strategy included studies published on three different databases CINAHL, MEDLINE and PEDro. Our search limits were articles from January 2012 to July 2018, with participants aged 65 years-old or over and studies in Portuguese and English. To carry out the investigation we use the following Boolean phrases for each database. In the PEDro database, we used search terms, using the search method available in that database (Table 1).

| |
|---|
| Database: CINAHL (via EBSCO) |
| Results: 415 |
| ((MM "Geriatrics") OR (MH "Aged+")) AND ((MM "Proprioception") OR (MM "Balance, Postural") OR (MM "Balance Training, Physical")) AND ((MM "Accidental Falls") OR (MM "Safety Behavior: Fall Prevention (Iowa NOC)") OR (MM "Fall Risk Assessment Tool") OR (MM "Hendrich Fall Risk Model") OR (MM "Morse Fall Scale") OR (MM "Fall Risk (Saba CCC)") OR (MM "Fall Prevention (Iowa NIC)") OR (MM "Safety Status: Falls Occurrence (Iowa NOC)")) |
| Database: MEDLINE (via EBSCO) |
| Results: 539 |
| ((MM "Geriatrics") OR (MH "Aged+")) AND ((MM "Proprioception+") OR (MM "Postural, Balance") OR (MM "Feedback, Sensory")) AND ((MM "Accidental Falls") OR (MM "Accident Prevention") OR (MM "Risk") OR (MM "Risk Assessment") OR (MM "Risk Factors") OR (MM "Risk Redution BEHAVIOR")) |
| Database: PEDro |
| Results: 27 |
| "Balance" AND "Education" AND "Frailty" AND "Gerontology" |
| clinical trial/practice guideline/systematic review |

Table 1: Research strategy applied by database

Articles selection

The relevance of the articles to the scoping review was analyzed by three independent investigators based on the information provided in the title and abstract. In case of discrepancy, they were resolved by two other investigators. The full article was retrieved for all

studies that met the inclusion criteria. The first three investigators independently examined the full text of the articles to see if they met the inclusion criteria. The differences that arose between the investigators were resolved through discussion.

Data extraction

The data were extracted by three independent investigators, using an instrument developed by them. A table was created that includes the author of the article, year, place, aim of the study and respective obtained results.

RESULTS

As shown in Figure 1, the initial search identified a total of 1924 articles in the three databases. After including the aforementioned limiters, we identified a total of 981 potentially relevant articles. Afterwards and once removed the 219 duplicate articles, the final sample consisted of 762 studies.

From this sample and according to the inclusion criteria, 44 studies were involved. After reading the articles in full, 5 were excluded for illegible language, 2 articles for being inaccessible, 3 addressed other intervention models for the prevention of falls, 16 articles for using technology and equipment and 5 for addressing only theoretical content about the fall in the elderly.

13 articles were included for this *scoping review*.

The studies were carried out by physiotherapists, occupational therapists, orthopedists, professors in the areas of geriatrics, sports science and sports medicine, and only one study was carried out by Portuguese RN. The articles are from Australia, Japan, South Korea, United Kingdom, Sweden, Germany, Spain and Portugal. The research included a systematic review and 12 primary studies.

The proprioception and postural balance training programs in the elderly showed variability in the number of training weeks, from 4 to 52 weeks, where the authors analyzed balance recovery, functional capacity, physical mobility, gait, proprioceptive vestibular system, muscle strength, physical endurance and fear of falling.

The general population refers to elderly people over 65 years-old, the object of study, inserted in the community and without associated pathological conditions. The average age was around 70-75, mostly female. Only 4 studies mention that the selected population had already experienced one or more falls.

The population, in general, was evaluated using questionnaires and application of performance tests. Among which, we highlight: *Mini Mental State Examination (MMSE)* according to the version of each country, *Geriatric Depression Scale*, *The Late Life Function and Disability Instrument*, *Physical Activity Scale (PASE)*, *Body Mass Index (BMI)*, *Freiburger Questionnaire of Physical Activity (FQoPA)* and *Health Related Quality of Life (HRQOL)*. With regard to gait, speed, gait cycle and uni and bipodal support were considered. The authors used some

assessment scales, such as 10 Meter Walk Test and Step Test. Muscle strength tests were determined using dynamometers.

The balance tests have excelled in variety. Among them we highlight: *Functional Range Test (TAF)*, *Romberg Test*, *Timed Up and Go Test (TUG)*, *Berg Balance Scale (BBS)*, *Fullerton Advanced Balance Scale (FAB)*, *5 Times Site to Stand (5XSST)*. *The Vestibular Stepping Test (VST)*, *Proprioception Test (PT)*, *Functional Reach Test (FRT)*. They were decisive to assess proprioception.

The risk of falling and the fear of falling were assessed by some researchers using the scales - Fall Risk Index (FRI), Fall Risk Assessment Tool (FRAT), Falls Efficacy Scale International (FES-I) and The CONFbal Scale.

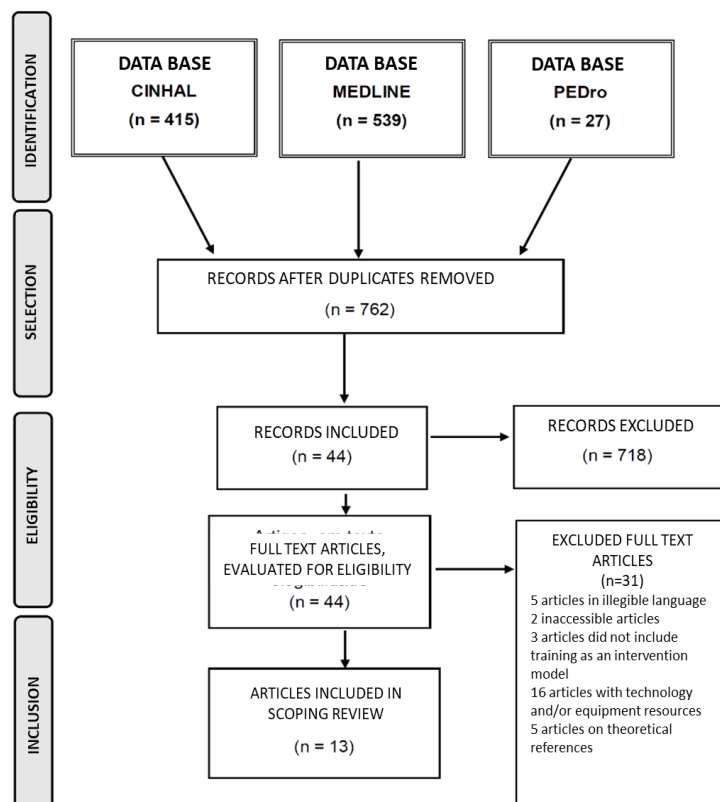


Figure1. PRISMA flowchart (adapted) of the selection process of studies.

| Author (year)/country | Type of study/population | Objectives | Results |
|--|--|---|---|
| 1. Sakamoto, K.; Endo, N.; Harada, A.; Sakada, T.; Tsushita, K.; Kita, K.; Hagino, H.; Sakai, A. et al. 2012 (Japan) (9) | Randomized controlled clinical trial. Seniors aged ≥ 75 years living in the community, dynamic group of flamingo exercises -DF (410 seniors): 86 ♂ and 324 ♀ group without exercise (455 seniors): 78 ♂ and 377 ♀. | To determine the effects of balance exercise in falls and prevention of fractures in elderly and poorly balanced people. | Group DF (6months): \uparrow time spent on one leg with eyes open (more significant than in the non-exercise group); improvement in independence in women's daily life, \downarrow Body weight, \uparrow time on one leg 3x.. No exercise group: 11 fractures (10 ♀ 1 ♂). Group DF: 4 fraturas (3 ♀ 1 ♂). |
| 2. Clemson, L.; Singh, M.; Bundy, A.; Cumming, R.; Manollaras, K.; O'Loughlin, P.; Black, D. 2012 (Australia) (10) | Randomized parallel trial. 70-year-old participants who suffered two or more falls or fall injuries in the past 12 months. | To determine whether an integrated lifestyle approach to balance and strength training is effective in reducing the rate of falls in community-dwelling older adults. | After 12 months, the overall incidence of falls in the LiFE group was 172 falls (1.66 per person/year), in the structured exercise group (SG) 193 falls (1.90 person/year) and in the control group (CG) 224 falls (2.28 person/year). Significant 31% reduction in the fall rate of the LiFE program compared to the CG (incidence rate 0.69 (95% confidence interval 0.48 to 0.99); the corresponding difference between the SG and CG was not significant (0.81 (0.56 to 1.17). LiFE group better in static balance, strength and function, the structured group had a significant and moderate improvement in dynamic balance, compared to CG. |

| | | | |
|--|---|---|---|
| 3. Yang, XJ.; Hill, K.; Moore, K.; Williams, S.; Dowson, L.; Borschmann, K.; Simpson, JÁ.; Dharmage, SC. 2012 (Australia) (11) | Randomized controlled study. The sample consisted of 225 men and women living in the community aged ≥ 65 years-old. After a comprehensive assessment of balance, those classified as having mild balance dysfunction (n = 165) were randomized. | To evaluate the effectiveness of a balance intervention at home and strength exercise in the elderly. | Intervention group (n=59) better than the control group (n=62) after 6 months of training: - Functional Range Test (mean difference 2.95 cm, 95% CI 1.75 to 4.15); - Step Test (2.10 steps / 15 seconds, 95% CI 1.17 to 3.02); - Hip abductor strength (0.02; 95% CI 0.01 to 0.03); - Walking step width (2.17 cm, 95% CI 1.23 to 3.11); After the exercise program, there was a better balance performance in the IG (n=14) 23.7% against 4.8% in the CG (n=3). |
| 4. Halvarsson, A.; Franzén, E.; Farén, E.; Olsson, E.; Oddsson, L.; Ståhle, A. 2013 (Sweden) (12) | Randomized controlled study. 59 community elders (age 67-93 years) were randomly allocated to the training group (TG) or control group (CG). | To evaluate the long-term effects of a specific, progressive program based on balance training in healthy elderly people at increased risk of falling. | Fast walking speed (p = 0.004), dual task performance (p = 0.006) and fear of falling (p = 0.001) were further improved in the TG at 9 months of follow-up. Self-perception of fear of falling remained significantly better (p = 0.012) at 15 months of follow-up. The fast gait speed: GT (1.49m/s) > GC (1.37m/s). |
| 5. Cadore, EL.; Rodríguez-Mañas, L.; Sinclair, A.; Izquierdo, M. 2013 (Spain) (13) | Systematic review 3543 elderly people in a total of 20 articles included (randomized controlled studies). | The objective of this review was to recommend training strategies that improve functional capacity in physically frail elderly people, based on the scientific literature, focusing especially on supervised exercise programs that improve muscle strength, fall risk, balance and gait ability. | 1. Resistance training programs should be performed 3x/week, with 3 sets of 8 to 12 repetitions at an intensity that starts at 20% - 30% and progresses to 80%; 2. To optimize functional capacity and endurance, training programs should include exercises that simulate daily activities such as sit-to-stand exercise; 3. Endurance training should include walking with changes in direction and pace, walking on treadmills, slopes, stair climbing and static pedals. They should start for 5-10min during the first weeks of training and progress to 15-30min in the rest of the program; 4. Balance training should include various exercise stimuli: tiptoeing, multidirectional weighting on tiptoes (lifts), walking on heels / tiptoes / over a line, standing on one leg and with weight transfers and modified Tai Chi exercises; 5. Multi-component training programs should include degrees in volume, intensity and complexity of exercises and with simultaneous performance of resistance and balance exercises. |
| 6. Freiburger, E.; Blank, WA.; Salb, J.; Geilhof, B. et al. 2013 (Germany) (14) | Set of randomized controlled trials 378 people ≥ 65 years old who have suffered a fall in the past 12 months. IG - intervention group GC- control group | To compare the effects of an exercise program with the physical and psychological component of fall risk, balance, strength, function, and fear of falling. | GI better than GR: - Improved Timed Up and Go - 1.5 seconds (equivalent to a small to moderate effect); - On balance: a relative improvement of 0.8 seconds; - Anxiety about falls: \square at 3.7 points. |
| 7. Kim, JI.; Park, SD.; Song, HS. 2014 (South Korea) (15) | Randomized controlled study 30 healthy elderly people, >65 years-old, equally randomly divided into a vision-blocked group - VB (eyes blinded) and a vision-impaired group - VP. | To investigate the effect of a complex exercise program on balance, walking, vestibular and proprioceptive senses when the visual sense is blocked, in elderly people who have experienced a fall. | The walking speed and balance of both groups improved because muscle strength was enhanced by walking, squatting, climbing and descending stairs. The VST training (vestibular stepping test) changed significantly after the intervention in the VB group and a significant difference was identified in the VST between the two groups after the intervention. The PT (proprioception test) changed significantly after the intervention in the VB group. |

| | | | |
|--|---|--|---|
| 8. Roaldsen, KS.; Halvarsson, A.; Sahlström, T.; Stähle, A. 2014 (Sweden) (16) | Prospective, controlled and randomized study. 59 healthy community-dwelling elderly (42 ♀ and 17 ♂) aged 67-93 years-old were randomized to the intervention group (IG=38) or the control group (CG=21). | To evaluate the effects of a 12-week balance training program on self-rated function and disability in healthy elderly people with self-perceived balance deficits and fear of falling. | The IG reported improvement in global function ($p = 0.016$), as well as in basic function ($p = 0.044$) and advanced lower limb function ($p = 0.025$) compared to the CG. The study showed no improvement in general disability or upper limb function. |
| 9. Cho, S.; Na, D. 2014 (South Korea) (17) | Randomized controlled study 55 elderly people over 75 years old who lived in the community. Balance exercise intervention group - INT 1; Elastic resistance exercise intervention group - INT 2; Control group - CON. | To investigate the effects of balance exercises and elastic resistance exercises on muscle strength and balance in the elderly to prevent falls in this population at risk, during an eight-week program. | INT 1: presentation statistically expressed improvement in muscle strength of 5 of the 7 muscle groups (except knee flexors and ankle plantar flexors); INT 2 was better in all 7 muscle groups. Comparing to the CON mean muscle transparencies, after balance exercises, INT 1 and INT 2 statistically significant improvements in muscle groups after the intervention; INT 1 and INT 2 with improved fall rate compared to CON; CON differences did not differ in the options of any muscle group nor in the fall rate after 8 weeks. |
| 10. Kim, WJ.; Duk-Hyun, MC. 2014 (South Korea) (18) | Randomized controlled study Ten participants over 65 years-old, healthy and living in the community. | To identify the effects of a fall prevention exercise program on the participation in the activity and static balance of the elderly. The exercise program was based on fitness and physical mobility (FaME). | After exercise, participation in activity and static balance showed significant differences ($p < 0.05$). Participation in the activity increased from 22.90 ± 5.55 to 32.35 ± 11.16 points, and the fall index decreased from $64.60 \pm 27.0051.40 \pm 22.84$ points. However, there were no significant differences in any category for participation in activities before and after the intervention. |
| 11. Gouveia, BR.; Jardim, HG.; Martins, MM.; Gouveia, ER.; Freitas, DL.; Maia, JÁ.; Rose, DJ. 2015 (Portugal) (19) | Randomized controlled study. 52 seniors (65 - 85 years-old); control group (CG): 25 elderly; group submitted to the training program (TG): 27 elderly people. | To evaluate the effectiveness of the ProBalance program in the balance and risk of falling in a group of elderly people | Twelve weeks after the program, both groups were evaluated in relation to balance and the group submitted to the program obtained significantly better results. |
| 12. Gawler, S., Skelton, DA., Dinan-Young, S., Masud, T., Morris, RW., Griffin, M., Kendrick, D. 2016 (The United Kingdom) (20) | Controlled and randomized clinical trial. 1256 elderly people over 65 years-old (persons with a history of more than three falls in the past year or unstable medical conditions were excluded). | To evaluate the effectiveness of the Otago and FoME exercise programs in reducing falls and associated injuries. | FaME Group: ↓ Harmful falls compared to the incidence rate (IRR) 0.55, 95% CI 0.31, 0.96; $p = 0.04$). After 12 months = (IRR 0.73, 95% CI 0.54, 0.99; $p = 0.05$); □ incidence of all falls (harmful and non-harmful) compared with usual care (IRR 0.74, 95% CI 0.55, 0.99; $p = 0.04$) within 12 months of cessation of intervention. OEP Group: ↓ It is not significant in the incidence of all falls (harmful and non-harmful) compared to usual care (IRR 0.76, 95% CI 0.53, 1.09; $p = 0.14$) in the 12 months following cessation of the intervention; the effects on falls did not persist through the 24 months of evaluation in any exercise group. Active FaME group (it reached 150 min/week of MVPA in the 2nd post-intervention period): ↓ significant in the incidence of falls (IRR = 0.49; 95%CI 0.30; 0.79; $p = 0.004$) inactive FaME group. |

| | | | |
|---|---|--|--|
| 13. Lacroix, A.; Kressig, RW.; Muehlbauer, T.; Gschwind, YJ.; Pfenninger, B.; Bruegger, O.; Granacher, U. 2016 (Germany) (21) | Randomized controlled study. 66 elderly people with a mean age of 73 years-old (3 groups: control group, unsupervised training group and supervised training group). | To assess the impact of a 12-week balance and strength training (BST) program, followed by 12 weeks of inactivity, with and without supervision. | In the supervised group, at the end of the 12 weeks of training, there was an improvement in the balance tests as well as after the inactivity period (improvements related to the Romberg Test, stride speed, Timed Up and Go Test and Chair Stand Test, in favor of the group unsupervised). |
|---|---|--|--|

Table 2: Constituent studies of the bibliographic sample.

DISCUSSION

The aim of this scoping review was to analyze and map articles that addressed the effect of proprioceptive training and postural balance in the elderly people for the falls prevention.

The various articles included address isolated exercise and exercise programs and contribute to minimizing the risk of falling and the fear of falling in the elderly people.

Article number 2⁽¹⁰⁾ addresses an exercise program called LiFE, which consists of the practice of balance and muscle strength exercises to be performed at home, based on activities of daily living.

Elderly people who have already experienced falls were selected and followed for 12 months. Of the three study groups, the LiFE group had the best results with the fewest falls/year (172 falls), the overall incidence of falls in the LiFE program was 1.66 per person/year, compared to 1, 90 (193 falls) in the structured exercise group (SG) and 2.28 (249 falls) in the control group (CG). There was a significant 31% reduction in the rate of falls in the LiFE group compared to the CG (incidence rate 0.69), (95% confidence interval 0.48 to 0.99). between SG and CG was not significant=0.81 (0.56 to 1.17).

Static balance, muscle strength, ankle function and participation were significantly better in the LiFE group than in the CG. The LiFE and SG group had a significant impact on improving dynamic balance compared to the CG.

The authors of this article concluded that this type of exercise program had a significant impact and a moderate improvement in dynamic balance in the population studied.

Thus, LiFE program offers an alternative to traditional exercise to consider for fall prevention with an intervention focus on functional exercise.

Article number 3⁽⁴⁾ refers to the OTAGO program. This training program was specifically designed to prevent falls. It consists of a set of exercises for muscle strengthening of the lower limbs and balance training with progressive difficulty - home exercise program. The exercises last 30 minutes, participants must exercise three times a week and walk at least twice a week.

This study evaluated the effectiveness of a home balance and strength exercise intervention in the

elderly population, being systematically evaluated as having mild balance dysfunction.

The 83 intervention group (IG) participants received a six-month home strength and balance exercise program (prescribed by a physical therapist based on the OTAGO Exercise Program and Visual Health Information Balance and Vestibular Exercise Kit). The 82 CG participants continued with their usual activities.

After six months of study, the IG significantly improved compared to the CG for: the Functional Range Test (mean difference 2.95 cm, 95% confidence interval [CI] 1.75 to 4.15), in the Test of Step (2.10 steps / 15 seconds, 95% CI 1.17 to 3.02), hip abductor strength (0.02; 95% CI 0.01 to 0.03) and in the gait step width (2.17 cm, 95% CI 1.23 to 3.11).

The authors conclude that the prescription of a home exercise program such as OTAGO, aimed at balance and muscle strength, was effective in improving balance and reducing falls in elderly people with compromised body balance.

FaME (Falls Management Exercise) is a physical exercise training program that was studied in article number 10⁽¹⁷⁾, based on the fitness and mobility of physical exercise. This program, known since 2006 in Canada, aims to increase balance and muscle strength in seniors, as they are the class most predisposed to the risk of falling.

It consists of specific, individualized training aimed at dynamic balance, muscle strength, endurance, flexibility, gait and functional abilities to avoid falling. The exercise was performed three times a week for one hour, in which one session was held in a group and the rest at home, under the supervision of a physiotherapist and/or an occupational therapist, for three months.

Static balance improved as well as activity participation (22.90 ± 5.55 to 32.35 ± 11.16 points) and the fall index decreased from 64.60 ± 27.00 to 51.40 ± 22.84 points. However, there were no significant differences in any category for participation before and after the intervention. Nevertheless, these investigators report that other fall prevention exercise programs are as effective as the FaME program.

Reflecting on these three exercise training programs for the prevention of falls mentioned above, they are described by researchers that provide evidence for the promotion of balance, muscle strengthening and increased participation of the elderly population in the practice of physical exercise. We can admit that a home

exercise program for the prevention of falls can have a positive effect on participation in activities of daily living and on balance in seniors.

The ProAct65+, discussed in article number 12⁽¹⁹⁾, is a clinical trial in which the effectiveness of a home exercise program (OTAGO) and a physical exercise program (FaME) was investigated, in comparison with the usual care to increase moderate to vigorous physical activity (MVA), in reducing falls and associated injuries.

The FaME group experienced a significant reduction in harmful falls compared to the incidence rate (IRR) 0.55, 95% CI 0.31, 0.96; $p = 0.04$) and this continued through the 12 months after the end of the intervention (IRR 0.73, 95% CI 0.54, 0.99; $p = 0.05$).

There was also a significant reduction in the incidence of all falls (harmful and non-harmful) in the FaME group compared to usual care (IRR 0.74, 95% CI 0.55, 0.99; $p = 0.04$) in the period of 12 months after the termination of the intervention. In the OTAGO group, the reduction was not significant in the incidence of all falls compared to usual care (IRR 0.76, 95% CI 0.53, 1.09; $p = 0.14$) in the 12 months following cessation of the intervention.

After 24 months, the effects of training programs on fall prevention did not persist in any exercise group. However, a sample from the FaME group that continued to perform 150 minutes of MVA per week post-intervention showed a significant reduction in the incidence of falls (IRR = 0.49; 95%CI 0.30; 0.79; $p = 0.004$) compared to those who did not maintain their regular physical activity.

The researchers found that the elderly undergoing the FaME program did not fall during the training program. After 12 months they had fallen less and had fewer injuries associated with falls. However, 24 months after the program, the benefits of the intervention ended, except for those who maintained moderate physical activity. The OTAGO program was less effective in preventing falls.

It emphasizes here the importance and benefit of continuing regular physical exercise to prevent falls in the elderly population.

Article number 13⁽²⁰⁾ assesses the impact of a strength and balance training program, the Balance and Strength Training (BST) for 12 weeks, followed by the same period of inactivity time, with and without professional supervision.

The exercise program was performed three times a week, which included progressive exercises, with different levels of intensity. The program protocol consisted of static balance exercises, dynamic balance (walking) and strength/power exercises for the lower limbs and trunk muscles (squats, plank, among others). The participant's body weight and small equipment such as towels, bottles and balls were used as resources.

The supervised elderly group performed training three times a week, with one training session being held without supervision at home. The unsupervised group

performed the same exercises at home three times a week.

The results revealed that there was an improvement in the balance tests, improvements in the Romberg Test, in the step speed, in the Timed Up and Go Test and in the Chair Stand Test, even after the inactivity period, in favor of the supervised group.

The investigators in this article conclude that there have been improvements in strength and balance in the elderly when these exercises are performed under the supervision of a professional.

ProBalance is a rehabilitation program carried out by Portuguese RN that includes various types of exercise: balance, coordination, functional task training, gait training, strengthening and flexibility exercises, inspired by the FallProof balance and mobility program.

The ProBalance program takes a multifactorial approach to balance and mobility in independent elderly people with balance deficits.

In article number 11⁽¹⁸⁾, its effectiveness in improving balance and reducing the risk of falling in this age group is highlighted.

Each training session included six key exercise components: multisensory training (visual, somatosensory, and vestibular system); center of gravity control training; proactive and reactive postural strategy training, gait training, strengthening and resistance exercises and flexibility training for 12 weeks.

After the program, the two groups (intervention and control) were evaluated, in relation to balance, and the group submitted to the program obtained significantly better results: 5.15 (2.81) for the intervention group and ± 1.45 (2.80) for the control group on the Fullerton Advanced Balance scale (FAB). The authors also report that after a period of inactivity, the loss of balance is more evident.

This study demonstrated that the rehabilitation nursing program based on an exercise program for the prevention of falls is effective in improving balance and reducing risk in groups of elderly people with impaired balance.

Article number 7⁽¹⁴⁾ has investigated the effect of a complex exercise program on balance, gait, vestibular and proprioceptive senses when the visual sense is blocked, aimed at elderly people who have already suffered a fall. The group of participants was divided into blocked view group and allowed view group. The participants started the training with muscle warm-up exercises (about 10 minutes of stretching and 20 minutes of walking). After a three-minute rest, they started an obstacle course, proprioceptive training, for 10 minutes, with the help of an assistant.

There were significant improvements in the 10 meter walking test (10MWT), vestibular test (VST) and proprioceptive test (PT) performed by the vision-blocked group after the intervention ($p < 0.05$) compared to the vision-allowed group. No significant difference was identified in the stair up/down

test(SUDT) and in the Berg Balance Scale (BBS) within each group between before and after the intervention.

The authors of the article conclude that the exercise program applied to the group with blocked vision contributed to a significant improvement in balance and gait capacity and improved the vestibular sense of the elderly people's intervening.

The complex program of vestibular and proprioceptive training exercises for the elderly helped to improve the balance and gait capacity, as well as improved the participants' vestibular sense. When the visual senses are blocked, the muscular response is mainly organized and postural control is accomplished more quickly, because the maintenance of vestibular and proprioceptive function increases the capacities of postural control.

This is an exercise program for the prevention of falls that is useful to improve the balance and walking ability of elderly people who have already experienced a fall.

In view of the aforementioned studies, it is evident and recommended that in the prescription of an exercise program for the falls prevention, the continuity of physical practice by the elderly population is essential, as a decline in balance is verified after a period of physical inactivity, as well as the respective supervision of the professional to reduce falls and associated injuries.

Some articles in our research refer to specific balance exercises.

The study number 1⁽⁹⁾ addresses the Flamingo's Dynamic exercise. This exercise consists of standing in an orthostatic position on one leg with eyes open for one minute, three times a day for six months. The aim of this study was to determine the effects of balance exercise in preventing falls and fractures in elderly people with impaired balance.

In the intervention group, significant differences were observed in increased time spent on one leg with eyes open (was increased approximately 3 times), body weight decreased; there was an improvement in independence in women's daily lives.

A greater number of fractures occurred in the non-exercise group (10 women and 1 man) than the exercised group (3 women and 1 man). The number was higher in the group without exercise, but there was no significant difference, according to the authors of this study. The number of fractures was not significantly different for men or women.

Dynamic flamingo exercise leads to gains in increased standing, on one leg and in decreased body weight, but no significant difference in fracture prevention has been demonstrated in elderly women with impaired balance.

In article number 9⁽¹⁶⁾, the physiotherapists analyzed the effects of balance exercises and elastic resistance exercises on muscle strength and balance in the elderly over 75 years, over a eight-week program, with the objective of preventing falls. The elderly people were divided into three groups, intervention 1 (INT 1), intervention 2 (INT 2) and control group (CON). The INT

1 group performed balance exercises and the INT 2 group performed elastic resistance exercises and the CON group performed the exercises after eight weeks, as the intervention period had already ended.

Sessions consisted of one hour, five times a week for eight weeks, for a total of 40 sessions. The elderly performed the exercises in groups, under supervision, twice a week. On the remaining days, they performed the exercises at home, alone. The one-hour training sessions consisted of 10 minutes of warm-up and stretching, 40 minutes of core exercise, and 10 minutes of final stretch. The exercises were performed in three sets, with 10 repetitions per set, and there was a rest period of 30 seconds between each set and a period of three to five minutes of rest between each exercise. The balance exercises consisted of six types of exercise: stepping, tiptoeing, backwards walking, walk in cuicuits of eight, one-legged position with arms crossed anteriorly, and application of an external disturbance. The eight resistance exercises consisted of: squat, heel lift, hip flexion and extension, knee flexion and extension, and ankle dorsiflexion and plantar flexion.

The INT 1 group showed a statistically significant improvement in the muscle strength in five of the seven muscle groups, but not at the level of the knee flexors and ankle plantar flexors, being better in the INT 2 group, which improved in all seven muscle groups.

Both the INT 1 and INT 2 groups showed improvements in the fall index, obtaining better results compared to CON group, as well as the latter showed no differences in the strengths of any muscle group after eight weeks.

The INT 1 and INT 2 groups showed significant improvements after the intervention, which proves that both balance and resistance exercises are effective in improving balance. Although elastic resistance exercises were shown to be more effective than balance exercises in strengthening the ankle plantar flexors, there was not a large difference in the effectiveness of the two types of exercises.

The authors concluded that both types of exercise (balance and elastic resistance) showed statistically significant improvements in muscle groups after the intervention, as well as an improvement in the fall index, thus being acceptable as fall prevention exercises for the elderly population.

In 2013, a systematic review was carried out (article number 5)⁽¹²⁾, on the effects of different interventions of exercise, walking ability and balance in seniors in preventing the risk of falling.

The aim of this review was to recommend training strategies that optimize functional capacity in physically frail older adults, focusing especially on supervised exercise programs that improve muscle strength, balance and gait ability, reducing the risk of falling. Researchers argue that exercise intervention programs (strength, endurance and balance training) will be the best strategy to improve all of these components, as well as decrease the rate of falls in the elderly. Most of the studies included in the systematic review⁽¹²⁾ describe improvements in gait, balance and

risk of falling after applying a multi-component physical training program.

However, studies in which systematic resistance training was performed (alone or as part of multiple physical exercise components) revealed greater strength gains in elderly people with physical frailty or severe functional decline.

The absence of changes in strength and functional outcomes that have been measured in some of the investigations indicates that exercise prescription must be carefully adapted and provide sufficient stimulus to improve the capacity of frail subjects. In addition, this review focused only on the domains of physical function, the concepts of frailty and physical frailty. Thus, this systematic review is only able to recommend strategies to improve the function of physically frail individuals.

Based on recent evidence, exercise strategies to improve cardiovascular parameters and functional performance in frail older adults should include the following:

1. Resistance training programs should be performed three times a week, with three sets of 8 to 12 repetitions at an intensity that starts at 20%-30% and progresses to 80%:
2. To optimize individuals' functional capacity, endurance, training programs should include exercises that simulate daily activities such as sit-to-stand exercise.
3. Endurance training should include walking with changes in pace and direction, treadmill walking, step-ups, stair climbing and static bicycle. Resistance exercise can start in 5-10 minutes during the first few weeks of training and progress to 15-30 minutes for the remainder of the program. The perceived exertion rate scale is an alternative method for prescribing exercise intensity, and an intensity of 12-14 on the Borg scale appears to be well tolerated.
4. Balance training should include various exercise stimuli such as tiptoeing, multidirectional weight lifting on tiptoes, heel/toe walking, line walking, standing on one leg, weight transfers (from one leg to the other) and modified Tai Chi exercises.
5. Multi-component training programs should include gradual increases in exercise volume, intensity and complexity, along with simultaneous performance of resistance and balance exercises.

In all the studies selected in this *scoping review*, in a global way and described by the authors in the conclusions of their studies, proprioceptive and balance training are of greater value for health promotion and fall prevention in the elderly people.

In addition to proprioceptive and balance training, three studies address the fear of falling.

In article number 4⁽¹¹⁾, the long-term effects of a progressive and specific program based on balance training in healthy elderly people with increased risk of falling were addressed, establishing the relationship between fear of falling and balance training. This type

of progressive and specific program described by the authors, based on balance training with dual and multiple tasks for elderly people at risk of falling, provided important short-term positive benefits for gait, balance function and fear of falling.

Fast walking speed, dual task performance and fear of falling were improved in the training group at nine months of follow-up. Only the self-perceived fear of falling remained significantly better at 15 months of follow-up. Although brisk walking speed decreased to baseline in the training group (1.49 m/s) it remained significantly higher than in the control group (1.37 m/s) at the end of the study.

This new, progressive and specific program, based on balance groups, with dual and multiple tasks for older adults at risk of falling, provided important short-term positive benefits for gait, balance function and fear of falling. These benefits diminished over time, suggesting that periodic participation in balance training should be encouraged.

In article number 8⁽¹⁵⁾ the fear of falling in elderly people with deficits in self-perception of balance was analyzed. The objective was to assess the effects of a 12-week balance training program on self-rated function and disability in healthy community-dwelling older adults with balance deficits and fear of falling.

The intervention group reported improvement in global function ($p = 0.016$), as well as in basic function ($p = 0.044$) and advanced lower limb function ($p = 0.025$) compared with the control group. The study showed no improvement in upper limb function.

In this study, the authors conclude that a balance training program based on static and dynamic balance exercises, using gait disturbances, improves the elderly's self-perception of balance deficits and fear of falling.

Article number 6⁽¹³⁾ compares the effects of an exercise program with the physical and psychological component of the risk of falling, addressing balance, strength, function and fear of falling. The Timed Up and Go test, the five-repetition chair test and the modified Romberg test were used for physical assessment of the risk of falling. For psychological results, the German version of the Falls Efficacy Scale - International (FES-I) was used.

The elderly who participated in the intervention group showed an improvement in the Timed-Up-and-Go (TUG) test: 1.5 seconds greater than that shown by the control group, equivalent to a small to moderate effect. For balance, a relative improvement of 0.8 seconds was achieved, and anxiety about falling was reduced by 3.7 points on the Falls Efficacy Scale-International (FES-I) in the intervention group compared to the control group.

The authors of this study concluded that intervention with complex exercises to prevent falling effectively improved balance, physical condition and led to a reduction in fear of falling in the elderly population studied.

In the articles published by Yang et al.; Marques, L; and Peters et al.^(4,6,8), the respective conclusions

emphasize that balance training should be encouraged and maintained to minimize the elderly person's fear of falling.

A stable balance, greater muscle strength and elastic resistance lead to a considerable improvement in gait and a reduction in the fear of falling, which consequently contributes to a reduction in the falls risk.

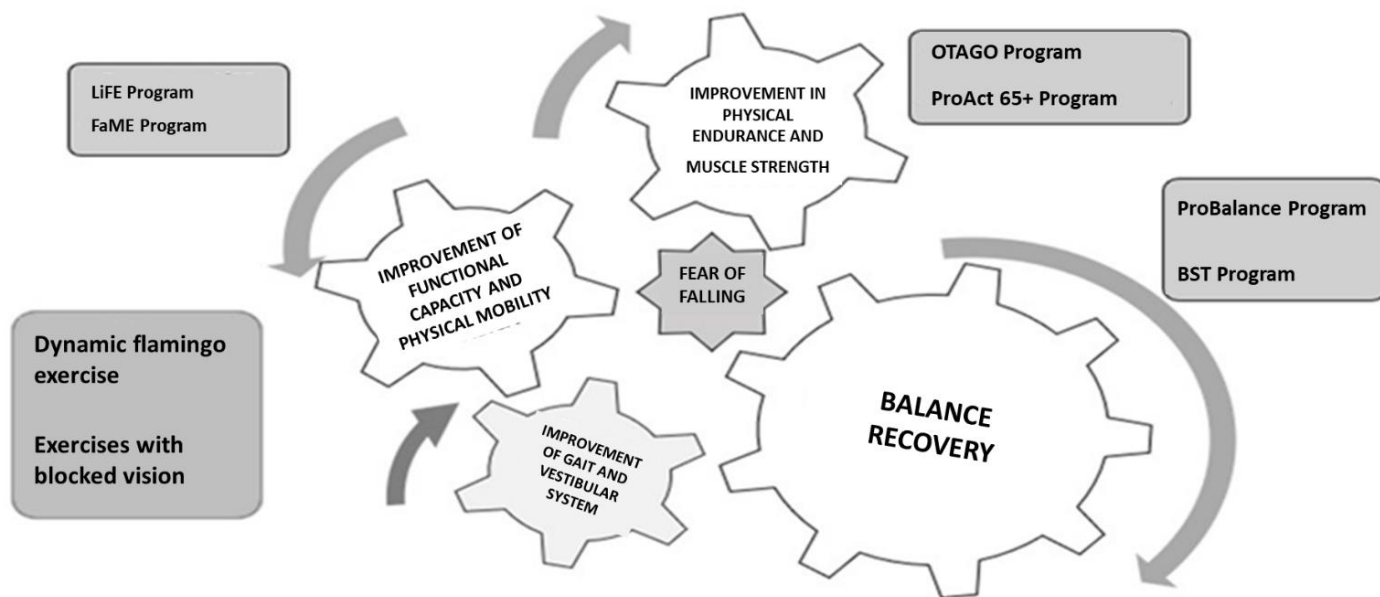


Figure 2 – Representative scheme of the types of training present in the selected studies

CONCLUSION

After a detailed analysis of the selected articles, it appears that, for the most part, training programs or specific exercises for the recovery of balance and muscle strength in the prevention of falls in the elderly are addressed. Other articles address training programs with intervention in the improvement of functional capacity and physical mobility, through the implementation of more specific programs. Unique exercise programs to increase muscle strength and balance are also described, some of which intervene in improving gait and the vestibular system, and others focus on balance and resistance exercises.

Generally speaking, they all consider that the implementation of training programs of this nature has a positive and significant impact on the importance of proprioceptive training and postural balance in the elderly, playing a significant role in the falls prevention.

There are several authors who defend the continuity of physical exercise, balance and proprioception training programs, because in their absence, the risk of falling in the elderly people increases substantially.

In short, the prescription of an exercise training program for the prevention of falls in the elderly population must take into account the individuality of each person and the type of exercise (balance, strength, resistance). The fear of falling, in this more fragile population, is always present, and the supervision and presence of a health professional is essential, not only to prevent falls due to the safety transmitted, but also to encourage the continuation of physical exercise.

Limitation of studies

The limitations for this study are considered to be the small number of articles with training exercises without the use of technology and/or technological equipment, since one of the objectives would be to transfer these trainings to the home environment, as well as only one article carried out by Specialist Nurses in Rehabilitation Nursing.

Implications for the investigation

Given the importance described on the benefits of proprioceptive training and postural balance in preventing falls in the elderly population, further studies are considered, particularly by RN, in the daily context of the interveners (home context) and without the use of technology to reinforce the benefit of implementing these same programs.

BIBLIOGRAPHIC REFERENCES

1. OMS. Relatório Mundial de Envelhecimento e Saúde. Suíça: OMS; 2015.
2. Marques-Vieira, C. e Sousa, L. Cuidados de enfermagem de reabilitação à pessoa ao longo da vida. 1ª Edição. Loures: Lusodidata, 2017.
3. Lelard T, Ahmadi S. Effects of physical training on age-related balance and postural control. Clin Neurophysiol. 2015 Nov 1;45(4-5):357-69.
4. Yang XJ, Hill K, Moore K, Williams S, Dowson L, Borschmann K et al. Effectiveness of a targeted exercise intervention in reversing older people's mild balance dysfunction: a randomized controlled trial. Phys Ther. 2012 Jan 1;92(1):24-37.
5. Montoito, A. Fiabilidade de Testes de Proprioceptividade em Pessoas Idosas. Dissertação de Mestrado em Exercício e Saúde. Escola de Ciência e Tecnologia. Universidade de Évora. 2016.

6. Marques, L. Quedas são a principal causa de morte acidental dos idosos. [ed.] Jornal de Notícias. 15 de Novembro de 2017.
7. República, Diário da. Regulamento n.º 392/2019. Regulamento das competências específicas do enfermeiro especialista em Enfermagem de Reabilitação. 2ª série, 3 de Maio de 2019, 85.
8. Peters, M., Godfrey, C., Mclnerney, P., Baldini Soares, C., Khalil, H., & Parker, D. Methodology for JBI scoping reviews. Adelaide : The Joanna Briggs Insitute, 2015.
9. Sakamoto K, Endo N, Harada A, Sakada T, Tsushita K, Kita K, Hagino H, Sakai A, Yamamoto N, Okamoto T, Liu M. Why not use your own body weight to prevent falls? A randomized, controlled trial of balance therapy to prevent falls and fractures for elderly people who can stand on one leg for ≤ 15 s. J Orthop Sci. 2013 Jan 1;18(1):110-20.
10. Clemson L, Singh MA, Bundy A, Cumming RG, Manollaras K, O'Loughlin P, et al. Integration of balance and strength training into daily life activity to reduce rate of falls in older people (the LiFE study): randomised parallel trial. Bmj. 2012 Aug 7;345:e4547.
11. Halvarsson A, Franzén E, Farén E, Olsson E, Oddsson L, Ståhle A. Long-term effects of new progressive group balance training for elderly people with increased risk of falling-a randomized controlled trial. Clin Rehabil. 2013 May;27(5):450-8.
12. Cadore EL, Rodríguez-Mañas L, Sinclair A, Izquierdo M. Effects of different exercise interventions on risk of falls, gait ability, and balance in physically frail older adults: a systematic review. Rejuvenation Res. 2013 Apr 1;16(2):105-14..
13. Freiburger E, Blank WA, Salb J, Geilhof B, Hentschke C, Landendoerfer P, Halle M, Siegrist M. Effects of a complex intervention on fall risk in the general practitioner setting: a cluster randomized controlled trial. Clin Interv Aging. 2013;8:1079-88.
14. Kim JY, Park SD, Song HS. The effects of a complex exercise program with the visual block on the walking and balance abilities of elderly people. J Phys Ther Sci. 2014;26(12):2007-9..
15. Roaldsen KS, Halvarsson A, Sahlström T, Ståhle A. Task-specific balance training improves self-assessed function in community-dwelling older adults with balance deficits and fear of falling: a randomized controlled trial. Clin Rehabil. 2014 Dec;28(12):1189-97.
16. Cho SI, An DH. Effects of a fall prevention exercise program on muscle strength and balance of the old-old elderly. J Phys Ther Sci. 2014;26(11):1771-4.
17. Kim WJ, Chang M, An DH. Effects of a community-based fall prevention exercise program on activity participation. J Phys Ther Sci. 2014;26(5):651-3..
18. Gouveia BR, Jardim HG, Martins MM, Gouveia ÉR, de Freitas DL, Maia JA, Rose DJ. An evaluation of a nurse-led rehabilitation programme (the ProBalance Programme) to improve balance and reduce fall risk of community-dwelling older people: A randomised controlled trial. Int J Nurs Stud. 2016 Apr 1;56:1-8.
19. Gawler S, Skelton DA, Dinan-Young S, Masud T, Morris RW, Griffin M, Kendrick D, Iliffe S. Reducing falls among older people in general practice: The ProAct65+ exercise intervention trial. Arch Gerontol Geriatr. 2016 Nov 1;67:46-54..
20. Lacroix A, Kressig RW, Muehlbauer T, Gschwind YJ, Pfenninger B, Bruegger O, Granacher U. Effects of a supervised versus an unsupervised combined balance and strength training program on balance and muscle power in healthy older adults: a randomized controlled trial. Gerontol. 2016;62(3):275-88.

PREVENÇÃO DAS CONSEQUÊNCIAS DA IMOBILIDADE NA PESSOA EM SITUAÇÃO CRÍTICA

PREVENCIÓN DE LAS CONSECUENCIAS DE LA INMOVILIDAD EN ENFERMO CRÍTICO

PREVENTION OF THE IMOBILITY CONSEQUENCES IN CRITICALLY ILL PATIENTS

DOI 10.33194/rper.2019.v2.n1.10.4574 | Submitted 12.05.2019 | Approved 27.06.2019

Ana Vanessa Barroso Cerqueira¹;  Eugénia Nunes Grilo²

1 - Centro Hospitalar Universitário - Algarve; 2 - Escola Superior de Saúde Dr. Lopes Dias, Instituto Politécnico de Castelo Branco

RESUMO

Este artigo resultou de um projeto de intervenção que teve como objetivo prevenir as consequências da imobilidade na pessoa em situação crítica. A revisão da literatura salienta que programas de reabilitação precoce minimizam as repercussões da imobilidade com grandes benefícios na funcionalidade e qualidade de vida das pessoas. Para estudar e descrever este problema foi utilizada metodologia de estudo de casos.

Participaram quatro pessoas, internadas numa unidade de cuidados intensivos, a quem foi implementado um projeto de intervenção que incluía um conjunto sistematizado de cuidados no âmbito da prevenção de úlceras por pressão e da reabilitação motora e respiratória. A avaliação dos resultados permitiu concluir que as pessoas que integraram o projeto mantiveram ou melhoraram a amplitude do movimento; não desenvolveram úlceras por pressão nem complicações respiratórias. Conclui-se que um planeamento adequado e individualizado de cuidados de enfermagem de reabilitação previne as consequências da imobilidade nos doentes em estado crítico.

Descritores: Enfermagem em Reabilitação; pessoas acamadas; estado crítico

RESUMEN

Este artículo resultó de un proyecto de intervención cuyo objetivo fue prevenir las consecuencias de la inmovilidad en enfermos críticos. La revisión de la literatura subraya que los programas de rehabilitación precoz minimizan las repercusiones de la inmovilidad con grandes beneficios en la funcionalidad y calidad de vida de las personas. Para estudiar y describir este problema se utilizó la metodología de estudio de casos.

Cuatro personas, hospitalizadas en una unidad de cuidados intensivos, participaron del proyecto de intervención que incluía un conjunto sistematizado de cuidados del ámbito de la prevención de úlceras por presión y de la rehabilitación motora y respiratoria. La evaluación de los resultados permitió concluir que las personas que integraron el proyecto mantuvieron o mejoraron la amplitud del movimiento; no desarrollaron úlceras por presión ni complicaciones respiratorias. Se concluye que una planificación adecuada e individualizada de cuidados de enfermería de rehabilitación previene las consecuencias de la inmovilidad en enfermos críticos.

Palabras Clave: Enfermería en Rehabilitación; personas encamadas; enfermedad crítica

ABSTRACT

This article resulted from an intervention project that aimed to prevent the immobility consequences in critically ill patients. The literature review emphasizes that early rehabilitation programs minimize the immobility repercussions with great benefits in people's functionality and quality of life. To study and describe this problem was used the case study methodology.

Four hospitalized persons in an intensive care unit participated on an intervention project that included a systematized nursing care in the scope of pressure ulcers prevention and motor and respiratory rehabilitation. The results evaluation allowed to conclude that people who participated in the project maintained or improved the range of motion and did not develop pressure ulcers or respiratory complications. It is concluded that adequate and individualized rehabilitation nursing care planning prevents immobility consequences in critically ill patients.

Keywords: Rehabilitation Nursing; bedridden persons; critical illness

INTRODUCTION

In the Intensive Care Units (ICU), prolonged bed rest is used as a therapeutic measure necessary for the clinical stabilization of hospitalized patients. However, the deleterious effects of immobility can be more serious than the clinical situation that generates them, transforming a temporary functional capacity reduction into incapacity⁽¹⁾ recognizing that immobility compromises people's quality of life⁽²⁾. Furthermore, there is currently an increase in the number of survivors of critical illness with sequelae of neuromuscular dysfunction and physical disability, related to their hospitalization in the ICU^(3,4).

The harmful effects of prolonged immobility in people in critical condition lead to, among others, severe dysfunctions in the osteomyoarticular system⁽⁵⁾, such as the development of joint contractures⁽⁶⁾. Another study⁽⁷⁾ stated that generalized muscle weakness is a common consequence in people who are immobilized and particularly in those who need invasive ventilatory support. In these people, muscle weakness associated with the ineffectiveness of the ciliary lining reduces the effectiveness of coughing, which contributes to an increment of secretions and increase risk of respiratory infections¹. Ventilation and pulmonary perfusion are also affected, which translates into episodes of hypoxemia, reduced ventilatory reserve capacity, increased dyspnea and greater difficulty in the ventilatory weaning process⁽⁸⁾. Another problem associated with immobility is the appearance of pressure ulcers, which represent a serious health problem, with repercussions on the person, in terms of mortality and morbidity, and their prevalence values tend to increase in populations at risk, particularly people in a state critical⁽¹⁾.

These are some of the reasons that justify the investment in preventing the consequences of immobility and it is essential to find evidence that address effective nursing interventions in preventing and reducing the problem⁽⁹⁾.

In this sense rehabilitation nurses (RNs), who work in the ICU, play a key role in the development and implementation of rehabilitation programs aimed at minimizing the consequences of immobility. The prevention of complications, in order to avoid or minimize disabilities, is one of the key aspects of RNs performance⁽¹⁰⁾, which gains greater importance in the ICU environment, as one of the purposes of providing Rehabilitation Nursing care for people in critical condition is to avoid and reduce complications resulting from immobility in bed⁽¹¹⁾, namely respiratory, motor and functional complications⁽¹²⁾. It is emphasized that one of the essential contributions to prevent the consequences of immobility is the adequate planning of Rehabilitation Nursing care, which includes interventions that promote mobility and subsequent self-care⁽¹⁾. Other authors⁽¹³⁾ reinforce the importance of rehabilitation and early mobilization programs, aimed at people in critical condition, with an early start, that is, immediately after the stabilization of vital functions, usually in the first two to five days of hospitalization of people in ICU.

In addition, promoting the safety of people is an important objective in the practice of Rehabilitation Nursing⁽¹⁴⁾ and the provision of Rehabilitation Nursing care in preventing the consequences of immobility of people in critical situations allows avoiding situations and adverse effects that compromise their safety.

Hospitalization in ICU and the resulting consequences, such as immobility, are events that trigger various transitions in people, more specifically, health/disease and situational transitions⁽¹⁵⁾. As nurses play a leading role in facilitating transitions, this role takes on a particular meaning in the health/disease transition processes and in these, it is essential that nurses adopt a posture of listening and acceptance of the other, education and guidance, promoting the self-care and comfort¹⁶, and may also intervene in anticipatory periods, preparation for changing roles, preventing the negative effects of the disease on people¹⁷, as is the case with the consequences of immobility.

Through the literature review, it was found that the studies carried out by nurses in the area of preventing the consequences of immobility in people in critical situations are scarce, compared to studies carried out by other professionals in the field of rehabilitation.

In order to be able to contribute to the prevention of the consequences of immobility, and to describe these contributions, an early intervention project in Rehabilitation Nursing was developed focusing on people in critical situations affected by immobility, hospitalized in ICU, to whom were provided organized and systematized Rehabilitation Nursing care.

The focus is, by definition of the International Classification of Nursing Practice (ICNP®), an area of intervention that is relevant for nursing⁽¹⁸⁾ and in the context of this project, the focuses identified as relevant were airway cleaning, ventilation, joint stiffness and pressure ulcers, associated with the respiratory, joint and integumentary system consequences of immobility.

The intervention project has as a general objective, to prevent the consequences of immobility of people hospitalized in ICU and as specific objectives, to carry out an initial assessment of people that includes the assessment of ventilatory function and airway cleaning mechanisms, assessment of skin integrity as well as the risk of compromise and the assessment of joint range, through direct observation and the application of assessment instruments adapted to the Portuguese population; to identify the risk of developing respiratory, integumentary, and musculoskeletal changes and to formulate associated diagnoses; to implement a respiratory and motor rehabilitation nursing intervention program; to describe the contributions of the intervention program through the reassessment of the person, including ventilatory function and airway clearance mechanisms, skin integrity and joint range.

METHOD

For the elaboration of the intervention project, the methodology of case studies was adopted, since this research strategy is mainly intended to describe, to understand and to explain⁽¹⁹⁾, allowing the study of a phenomenon (in this case the consequences of immobility in people in critical situations) in a holistic perspective and in a real context, with different sources of evidence, obtaining a wealth of descriptive information, also allowing reflection and the search for alternatives to solve the problem⁽²⁰⁾. Despite presenting as a limitation the impossibility of generalizing the results obtained in nursing, it makes it possible to know in depth the aspects of the phenomenon under study⁽²¹⁾.

This project describes the cases of people hospitalized in ICU of a Hospital Center in Lisbon, who presented a potential risk of developing integumentary, musculoskeletal and respiratory alterations, associated with immobility, a selection criterion for participation in the intervention project. It took place from October to November 2018, after approval by the Ethics Committee for Health and authorization by the Board of Directors of the aforementioned Hospital Center.

The importance of nursing as a theoretical-practical science must be sensitive to multiple focuses of interest and intervene in the transition process and this practical intervention will be based on facilitating the transitions of patients and families where health and well-being are perceived as results^(16,17). Therefore, the intervention project was based on the methodology of the nursing process.

Based on the four defined nursing focuses and criteria supported by the Documentary Standard of Nursing Care of the Rehabilitation Nursing Specialty⁽²²⁾ and others considered relevant and described in the literature, the initial assessment of people included the assessment of vital parameters, monitoring of skin integrity, pulmonary auscultation and assessment of the cough reflex and breathing pattern through direct observation; the assessment of the state of consciousness through the application of the Glasgow Coma Scale (GCS)⁽²³⁾; assessment of the risk of developing pressure ulcers, with the application of the Braden scale⁽²⁴⁾. The range of motion (ROM) of the joints at the level of the shoulders, elbows, knees and ankles was also evaluated through goniometry. The use of standardized assessment instruments allows for the documentation of specialized care, its continuity and also the development of research projects that can be assumed as good practices and replicated⁽²⁵⁾.

After identifying the real and potential problems from the data collected in the initial assessment, Rehabilitation Nursing diagnoses related to each nursing focus were elaborated, using the ICNP® language, and interventions based on scientific evidence and explained in the Documentary Pattern were stratified. of Nursing Care of the Rehabilitation Nursing Specialty, within the scope of Functional Motor Reeducation (FMR), prevention of pressure ulcers and Functional Respiratory Reeducation (FRR).

It was defined that the assessment of nursing focuses on airway cleaning and ventilation would be carried out

at the beginning and at the end of each FRR session, since the interventions performed in each session are expected to promote, in principle, an immediate improvement. Regarding the assessment of the nursing focuses of joint stiffness and pressure ulcers, it was defined that it would be carried out in three moments of the intervention plan - initial, intermediate and final - since the visibility of the results occurs over a longer period, in contrast with the previous focuses.

To ensure the integrity of the investigation, all phases of this project are based on ethical principles defended by nursing, respecting and safeguarding confidentiality and anonymity, both of the institution where the project took place, and of the participants, having been represented by letters. All necessary steps were also taken to obtain an informed, expressed and free consent.

RESULTS

The information obtained was subjected to descriptive analysis procedures, which make it possible to describe the characteristics of the cases studied and the values obtained by measuring the variables⁽²⁶⁾.

Description of Cases

The description of each case is carried out, safeguarding that during the FMR sessions it was found that all participants maintained hemodynamic stability, ensuring the safety of the interventions carried out on people. Before each FRR session, the participants' chest X-rays were viewed in order to detect possible changes that could compromise their respiratory function.

Case of person A

A 44 year-old male, married who was admitted to ICU with a diagnosis of traumatic brain injury (diffuse cerebral edema with thin layer of right frontal subdural hematoma); fracture of C2 and D9; right pneumothorax; fracture of the metacarpals of the left hand. During hospitalization, patient had several clinical problems, such as deep venous thrombosis of the left lower limb. This problem was still not resolved at the time of the initial assessment, which took place on the 30th day of hospitalization (Table1), so it was decided not to assess the ROM of the left lower limb at that time, due to the risk of worsening the situation.

| | |
|--|---|
| State of consciousness (GCS score) | 11T score (spontaneous eye opening-4; absent verbal response due to the presence of the endotracheal tube (ETT)-1, and obey orders-6) |
| Skin Integrity | Absent - Stage 3 pressure ulcer in the occipital region, associated with the permanent use of the cervical collar; - Stage 3 pressure ulcer in the sacral region. |
| Pressure ulcer risk (Braden scale score) | High risk of pressure ulcers (13 points) |
| Joint movement assessment | - Maintained prolonged bed rest. - ROM was passively evaluated in the upper limbs and right lower limb with reduced joint and muscle movement. - In flexion of the left elbow, he presented pain at the end of the movement. |
| Ventilation | - Spontaneous ventilation, with T-piece oxygen therapy with an inspired oxygen fraction (FiO ₂) of 28%. - Regular, superficial breathing pattern, predominantly abdominal (with minimal chest expansion), thoracic symmetry maintained and without the use of accessory muscles. No respiratory effort. - Pulmonary auscultation with adventitious sounds |
| Airway Cleaning Mechanisms (Cough reflex) | Decreased cough reflex; it mobilizes secretions to the ETT. Aspiration of frequent secretions. |

Table 1 - Initial assessment of person A Source: own elaboration.

Following the initial assessment performed, the following nursing diagnoses were established:

- Diagnosis 1 - Risk of joint stiffness;
- Diagnosis 2 - Risk of high-grade pressure ulcer;
- Diagnosis 3 - Ineffective airway clearance;
- Diagnosis 4 - Impaired ventilation.

Throughout the intervention period, the person A maintained the same state of consciousness. There were 7 sessions of FMR, passive mobilizations was performed, with an increase in the number of

repetitions per movement from the 5th session. For safety reasons, the passive mobilization exercises of the left lower limb were only introduced in the 4th session, when the ROM of the left lower limb was evaluated.

In the first sessions, patient presented pain facies during the external rotation of the left shoulder, flexion of the left elbow and in the supination of the left forearm, so that movements of lesser amplitude were performed. Analgesic therapy was suggested and administered. In the remaining sessions, there was no pain during the mobilizations. It should be noted that, as there was a longer time of contact with person A, three moments of ROM evaluation were performed, while the remaining participants were submitted to two evaluation moments. Thus, the intermediate assessment of the ROM occurred in the 3rd session and at the end of the 7th session the ROM was reassessed.

Out of the joints evaluated in the three periods, it was found that there was a linear increase in ROM at the level of right shoulder abduction, right elbow flexion and right knee flexion. The ROM of left shoulder abduction and right ankle dorsiflexion increased from the initial to the intermediate assessment and was maintained in the final assessment.

There was a difference in the ROM of the lower limbs, in which the joints of the right lower limb have greater amplitude, which is understandable since the left lower limb was immobilized for longer, however it showed an increase in ROM at the level of knee flexion and ankle dorsiflexion.

In shoulder flexion and right ankle plantar flexion, there was a decrease in ROM from the intermediate to the final evaluation. There was also a decrease in ROM at the level of plantar flexion of the left ankle between the two assessments performed. Left elbow flexion ROM showed a linear decrease since the first assessment. It should be noted that during the first sessions it was one of the movements where person A presented pain.

As for pressure ulcer preventive measures, in addition to the application of moisturizing cream and maintenance of dry skin, the change in decubitus was reinforced, with total help, and the removal of the cervical collar once a day (at least), to inspect and clean the skin; to prevent pressure ulcers on the chin, due to the cervical collar, skin care was performed and a silicone pressure-reducing compress was applied, covering the chin region up to the supraclavicular region.

In the three assessments carried out, person A maintained the same score on the Braden scale, which translates into a high risk of pressure ulcers, however, he did not develop any more pressure ulcers.

Within the scope of the FRR, 6 sessions were held. From the 2nd session onwards, the number of repetitions in the lower costal re-education was increased, by decreasing the vesicular murmur at the lung bases, and in the 3rd session, the number of repetitions of the remaining breathing exercises was increased.

It should be noted that during the period in which the intervention project took place, person A was extubated endotracheally (one day before the 3rd session), however, due to respiratory decompensation, a new endotracheal re-intubation was performed (before the 4th session) and in the 6th session, the ETT has been removed in the previous shift.

Before and after each session, vital parameters were evaluated. The values of heart rate and mean arterial pressure showed slight variations, verifying that in the 3rd session there was an increase in mean arterial pressure after the FRR session, however it did not compromise the person's hemodynamic stability.

In the 3rd and 4th sessions, an increase in respiratory rate was observed, however its values were limited to the reference interval of the respiratory rate. Furthermore, the increase in respiratory rate was associated with an increase in the amplitude of the respiratory rate waveform, with an improvement in the breathing pattern.

Throughout all the FRR sessions, ventilation and the presence of respiratory effort were evaluated, verifying that person A did not present signs of respiratory effort, with improvement in the amplitude and type of breathing. We emphasize that in session 4 there was a setback in terms of the breathing pattern that may be associated with the period of previous decompensation and which culminated in the person's re-intubation. Despite this, and from that session onwards, the evolution was favorable.

Oxygen saturation (SpO₂) values increased in the first three sessions, remained constant in the 4th and 6th session and in the 5th session it slightly decreased from 100% to 96%. It is noteworthy that during the sessions the oxygen flow fluctuated, according to the oxygen therapy needs of person A.

Pulmonary auscultation was performed before and after all sessions, verifying that person A did not present adventitious sounds (AS) at the end of the sessions and the vesicular murmur (VM) in the lung bases, despite remaining reduced, became more audible.

Although in the 1st session he presented an episode of vigorous coughing, when disconnected from the oxygen source, having been able to expel secretions by ETT, in all the sessions, while patient was endotracheally intubated and presented a decreased cough reflex, mobilizing secretions up to the ETT, requiring the aspiration of secretions.

In the 3rd session and in the last session, he was extubated, with a diminished cough reflex; however, after carrying out the planned FRR techniques, he was able to expel the secretions. When encouraged to cough, he became drowsier and had to aspirate secretions.

Case of person B

60-year-old divorced man who lives alone and was admitted to ICU due to right cerebellar ischemic stroke.

The initial assessment was carried out on the 7th day of hospitalization (Table 2).

| | |
|---|---|
| State of consciousness (GCS score) | 10T score (eye opening to sound-3; verbal response absent due to the presence of ETT -1 and obeying orders- 6) |
| Skin Integrity | Present |
| Pressure ulcer risk (Braden scale score) | High risk of pressure ulcers (12 points) |
| Joint movement assessment | - Maintained bed rest. -ROM passively evaluated in the upper and lower limbs with reduced joint and muscle movement. - Absent pain in joint movement |
| Ventilation | -Under invasive mechanical ventilation, in controlled pressure ventilation mode. -Superficial respiratory pattern, mixed, with maintained chest symmetry; without their own respiratory cycles, performing those previously set on the ventilator. - Pulmonary auscultation with AS |
| Airway Cleaning Mechanisms (Cough reflex) | Decreased cough reflex; it does not mobilize secretions up to the ETT. Aspiration of frequent secretions. |

Table 2 – Initial Assessment of Person B, Source: own elaboration.

According to the initial assessment, the following nursing diagnoses were elaborated:

- Diagnosis 1 - Risk of joint stiffness;
- Diagnosis 2 - Risk of high-stage pressure ulcer;
- Diagnosis 3 - Ineffective airway clearance;
- Diagnosis 4 - Impaired ventilation.

Person B showed an improvement in consciousness throughout the intervention project, with an GCS score of 14 on the last day (spontaneous eye opening, confused speech, following orders).

There were 4 sessions of FMR, with passive mobilizations in a first phase. From the 3rd session onwards, the patient was more awake and when

encouraged, started the movement spontaneously, so assisted active mobilization exercises were started.

In the first two sessions, participant presented pain facies at the mobilization of the cervical region, so the mobilization of the same was suspended in the remaining sessions without pain complaints. At the end of the 4th session, the ROM was passively reassessed to compare the results obtained with those of the initial assessment.

Overall, ROM was maintained or increased, with a decrease in ROM at the level of right shoulder abduction, right elbow flexion and plantar flexion of both ankles.

During the intervention project, person B maintained cutaneous integrity; however, due to friction (constantly sliding down in bed) patient presented redness in the sacred region. Moisturizing cream was applied and the preferred positions were the semi-dorsal and lateral decubitus. In the shift prior to the last session, Mr. B had carried out the first uprising which was uneventful. In the last session, person B had the skin of the sacred region intact. Despite maintaining a high risk of pressure ulcers, patient increased the Braden Scale score from 12 to 15 points.

There were 5 sessions of FRR. In the 1st session, person B was under invasive mechanical ventilation and was extubated at the end of that day. In the remaining sessions, patient remained under spontaneous ventilation, however there was a need to increase oxygen, and remained since the 3rd session, including a venturi mask with a FiO₂ of 50%, which coincided with the time when chest X-rays were observed with image suggestive of right pleural effusion.

In order to improve ventilation and to prevent bronchial secretions stasis, the teachings of respiratory control with dissociation of respiratory times and coughing technique were reinforced. Once there was a suspicion of right pleural effusion, the therapeutic positions that would promote drainage of this area were reinforced.

At the beginning and end of each session, vital parameters were evaluated. Person B maintained hemodynamic stability during the FRR sessions.

Overall, respiratory rates decreased after the session, evidencing session N^o. 3 in which the respiratory rate prior to the session was higher than the maximum reference value of the respiratory rate. As for the values of SpO₂ either remained the same (greater than 90%) or increased.

Ventilation and the presence of respiratory effort at the beginning and at the end of all FRR sessions were evaluated, noting that person B in the 2nd session had an altered breathing pattern and in the 3rd session respiratory effort to small work and altered breathing pattern with nasal flutter and draft breathing, it was not possible to modify the breathing pattern; however it was possible to reduce the respiratory rate with the implemented interventions. In the 4th and 5th sessions, there was an improvement in the amplitude and type of breathing, after encouragement of respiratory control with dissociation of breathing times.

It was found that, at the level of pulmonary auscultation, before the sessions, it presented AS, which were absent at the end of the sessions.

During the FRR sessions, person B maintained a decreased cough reflex. From the 2nd session onwards, he was endotracheally extubated, with difficulty in expelling secretions. Despite teaching directed cough, he maintained the need for aspiration of secretions, since he presented moderate to large amount of secretions.

Case of person C

A 50 year-old male, married, who had arterial hypertension as a personal history and was admitted to Polyvalent ICU (PICU) due to ruptured anterior communicating artery aneurysm. The initial assessment was carried out on the 1st day of hospitalization (Table 2).

| | |
|---|---|
| State of consciousness (GCS score) | Score of 15 |
| Skin Integrity | Present |
| Pressure ulcer risk (Braden scale score) | Low risk of pressure ulcers (17 points) |
| Joint movement assessment | <ul style="list-style-type: none"> - Therapeutic indication to maintain bed rest. -The ROM was actively evaluated in the upper and lower limbs with reduced joint and muscle movement. - Absent pain in joint movement - it does not perform muscle and joint exercise techniques |
| Ventilation | <ul style="list-style-type: none"> -Spontaneous ventilation, with oxygen therapy by binasal probe at 3 L/min - Regular, medium-range, mixed, symmetrical breathing pattern, without the use of accessory muscles -Easily tired on moderate exertion, with increased respiratory rate, change in breathing pattern and difficulty in controlling breathing - Pulmonary auscultation with VM present and without AS |

| | |
|--|-------------|
| Airway Cleaning Mechanisms (Cough reflex) | No coughing |
|--|-------------|

Table 3 – Initial assessment of person C, Source: own elaboration.

Based on the initial assessment, the following nursing diagnoses were outlined:

- Diagnosis 1: Risk of joint stiffness;
- Diagnosis 2: Potential to improve ability to perform muscle and joint exercise techniques;
- Diagnosis 3: Potential to improve knowledge about self-control of the breathing pattern;
- Diagnosis 4: Potential to improve knowledge about breathing technique;
- Diagnosis 5: Potential to improve capacity for self-control of breathing pattern;
- Diagnosis 6: Potential to improve ability to use breathing techniques.

Throughout the intervention project, he was aware and guided. During the 4 sessions of FMR, person C did not report pain.

In the 1st session, through passive mobilizations, the polysegmental movements that could be performed to maintain or improve ROM were demonstrated. Person C was able to assimilate and execute the techniques demonstrated independently, performing them several times throughout the day. From the 2nd session onwards, person C was transferred to a chair, twice a day, with full load, which was uneventful. In the 3rd session, active-resisted muscle and joint exercises were introduced at the level of the upper and lower limbs, using elastic bands, with good assimilation by person C, who performed them independently. At the end of the 4th session, the ROM was reassessed, with an increase in the ROM previously assessed. It is considered that the fact that person C had a more active role in his rehabilitation process may have contributed to the gains obtained in terms of ROM.

In the context of the FRR (one session held), person C had no knowledge about self-control of the breathing pattern and the breathing techniques used to optimize ventilation (relaxation technique; rest positions; dissociation of breathing times; abdominodiaphragmatic breathing), due to that, teachings have been done regarding them. Person C was receptive to the information provided, being able to describe the importance and advantages of self-control of the breathing pattern and breathing techniques.

Furthermore, after instruction in the technique of self-control of the breathing pattern and other breathing techniques, person C was able to assimilate and perform them independently, namely during exercises. Person C reported that the use of these techniques helped to better tolerate more intense exercises, which required more effort.

Case of person D

A 49 year-old female, married who was admitted to the PICU in the postoperative period of urgent decompressive craniectomy due to cerebral edema with deviation of midline structures, associated with an ischemic infarction in the territory of the left middle cerebral artery. The initial assessment took place on the 3rd day of hospitalization (Table 4).

| | |
|--|---|
| State of consciousness (GCS score) | 9T score (eye opening at sound - 3; absent verbal response, due to the presence of ETT -1 and localization of pain -5) |
| Skin Integrity | Present |
| Pressure ulcer risk (Braden scale score) | High risk of pressure ulcers (10 points) |
| Joint movement assessment | - Maintained bed rest. -ADM passively evaluated in the upper and lower limbs with reduced joint and muscle movement. - Absent pain in joint movement. |
| Ventilation | -Spontaneous ventilation performing oxygen therapy at 0.5 L/min per T-piece. - Regular, superficial and predominantly abdominal breathing pattern, with reduced but symmetrical chest expansion, without the use of accessory muscles. - Pulmonary auscultation with AS |
| Airway Cleaning Mechanisms (Cough reflex) | Decreased cough reflex, difficulty in mobilizing secretions; aspiration of frequent secretions |

Table 4 – Initial assessment of person D Source: own elaboration.

From the initial assessment, the following nursing diagnoses were formulated:

- Diagnosis 1 - Risk of high-stage pressure ulcer;
- Diagnosis 2 - Risk of joint stiffness;
- Diagnosis 3 - Ineffective airway clearance;
- Diagnosis 4 - Impaired ventilation.

During the implementation of the intervention project, person D improved his state of consciousness, showing an increase in the GCS score from 9 to 11T (spontaneously eyes opening and following simple orders).

During the 5 FMR sessions, person D did not manifest pain, and passive mobilization exercises were always performed. At the end of the 5th session, the ROM was re-evaluated. In general, ROM remained or increased; however there was a decrease in ROM in terms of shoulder flexion and right elbow flexion.

Regarding the instituted preventive measures against pressure ulcers, the change in decubitus was reinforced, with full help, the application of moisturizing cream and the maintenance of dry skin, and in the 4th session, the transfer to the chair without load (using a hoist) was performed. At the end of the 5th session, person D maintained a high risk of pressure ulcers; however patient went from 10 to 12 points on the Braden Scale. During the intervention project, the patient kept his skin intact.

The intervention project included 5 sessions of FRR, verifying that the person maintained hemodynamic stability. FRR interventions allowed decreasing respiratory rates, which can translate into greater control of breathing. SpO2 values were always constant, remaining at the maximum possible value (100%), with person D undergoing oxygen therapy per T-piece at 1 L/min.

Throughout all FRR sessions, ventilation and the presence of respiratory effort were evaluated. Person D before the sessions had a regular, superficial and predominantly abdominal breathing pattern, with reduced chest expansion. After the sessions, and from the 3rd session, there was an improvement in the breath amplitude and after the 5th session, patient presented mixed breathing. Regarding respiratory effort, it was only observed in the 1st session after moderate efforts (associated with selective costal opening).

Regarding pulmonary auscultation, it was performed before and after all sessions, verifying that the presence of AS was eliminated with the FRR interventions performed. The VM that was initially reduced in the lung bases in the first three sessions, after the 3rd session of FRR, it was maintained in all lung fields.

During the sessions, person D presented a reduced cough reflex, requiring aspiration of secretions in the oropharynx and through the ETT. The characteristics of secretions, either in the oropharynx or through the ETT, varied from session to session; however, at the end of the 4th session, they were presented in a smaller amount.

DISCUSSION

After the initial assessment of the four people participating in the project, the Rehabilitation Nursing diagnoses were formulated, and the interventions that best adapted to each person's situation were carried

out, taking into account the literature review carried out. It was found that the diagnoses of Risk for pressure ulcer in a high stage; Ineffective airway clearance and impaired ventilation were present in participants A, B and D. The diagnosis of Risk for joint stiffness was common to all four participants in this project.

In total, 37 sessions were carried out, 17 under the FRR and 20 under the FMR as a result of identifying the diagnoses. At the same time, a plan of care for the prevention of pressure ulcers was established for people at high risk.

Regarding the risk of joint stiffness, in person C, the instituted nursing interventions contributed to achieving the expected result, that is, the maintenance or improvement of ROM at the level of the shoulder, elbow, knee and ankle joints. In people A, B and D, it was found that the ROM was maintained or improved in some of the joint movements evaluated.

These results are in line with similar cases described in the literature, namely the study by Modragon-Barrera⁽²⁷⁾, whose participants were inpatients in the ICU and where it was also found that after a joint mobilization program was carried out, there was an increase in ROM at the level of shoulder abduction and flexion, hip abduction and ankle dorsiflexion, proving what has been advocated for some time by other authors⁽²⁸⁾ on the benefits of performing passive mobilization exercises, active-assisted in people in critical situations.

However, the result in person A was different from what was expected, since this patient presented a decrease in ROM in terms of shoulder flexion, elbow flexion and ankle plantar flexion; person B showed a decrease in ROM at the level of right shoulder abduction, right elbow flexion and ankle plantar flexion, and person D also decreased ROM at the level of shoulder flexion and right elbow flexion. The difference between the expected results and those obtained in the Rehabilitation Nursing programs can be explained by multiple factors, including the fact that the elbow, ankle and shoulder joints have a greater predisposition to the development of contractures⁽⁶⁾, and that the study of Nepomuceno Júnior, Martinez, Neto⁽²⁹⁾ also proved it with a program of exercises for joint mobilization in these joints. In general, in people who were part of the intervention project, joint ranges were maintained or improved, attesting to the importance of range of motion exercises and therapeutic positioning, in people in critical situations, as these interventions contribute to the prevention of harmful effects of prolonged immobility and for the maintenance or improvement of people's motor functionality^(28,30,31).

With regard to the risk of pressure ulcers, during the period in which the intervention project took place, people B and D decreased their risk (assessed with the Braden scale) and person A remained constant. Anticipatory interventions that include the systematic assessment of skin integrity and risk assessment, the repositioning and use of support surfaces and appropriate therapeutic dressings, together with the promotion of skin hydration and the reduction of

moisture in the skin have proven effective because, despite of maintaining a high risk of pressure ulcers none of the people developed this consequence of immobility. These results are in line with others already described⁽³²⁻³⁵⁾, proving that the systematic monitoring of this problem preceded by the awareness of it by the entire nursing team and its valorization, especially by the RN, allowed individual intervention in the people and prevent the emergence of new pressure ulcers, confirming as recommended by the National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance⁽³⁶⁾ that the structured approach to risk assessment, which includes an assessment of activity/mobility and the condition of the skin, which has strength of Evidence B, should be strongly recommended.

Overall, after the FRR sessions, people A, B and D improved their breathing pattern, with an increase in respiratory amplitude and chest expansion, noting that in the final sessions they presented a regular, medium-range and mixed breathing pattern. We also found that the episodes of respiratory effort evident in some sessions (a session of person B and a session of person D), were resolved, not being visible in subsequent sessions. Although participants A and B had occasionally (at the end of one or several sessions) an increase in respiratory rate, we observed that in most sessions, respiratory rates decreased in all people, after the FRR interventions. These results demonstrate that the intended objectives with the nursing intervention in the field of FRR were achieved, as asynergy and ventilatory deficiencies were corrected and prevented, which may have contributed to an improvement in respiratory function, as explained by several authors^(28, 37-39).

With regard to the SpO₂ parameter, the percentages in participants A, B, and D remained constant after the FRR interventions, or increased slightly. Although the project participants are not ventilated, the results obtained are consistent with those described in the literature, verifying that the implementation of an intervention plan within the scope of FRR in people in critical condition promotes more effective ventilation, with this effect being visible through the increase in SpO₂^(40,44).

Throughout all the FRR sessions, people kept their cough reflex reduced; it is a situation that may be associated with the presence of an artificial airway (ETT)⁽⁴⁵⁾, or with a decrease in muscle strength due to their critical condition and immobility⁽⁷⁾. It was also found that at the beginning of the sessions, people had the presence of AS (snoring) on pulmonary auscultation, indicative of the presence of secretions⁴⁶. Thus, the association of several bronchial hygiene maneuvers contributed to the expected results being achieved, as evidenced by the absence of AR at the end of the sessions. It can be seen that a care plan that combines different techniques for mobilizing and eliminating secretions promotes greater cleaning of the airways, as was also observed in the studies carried out by Avena, Duarte, Cravo, Sologuren, Gastaldi⁽⁴⁰⁾ and Naue, Forgiarini Junior, Dias, Vieira⁽⁴⁷⁾, minimizing secretion stasis and consequently the episodes of bronchial obstruction that precipitate atelectasis⁽⁴⁸⁾.

The person designated by C, unlike the other people, was aware and oriented, showing the ability to assimilate the information and instruction of the techniques implemented in the intervention plan. In addition, participant also demonstrated to be motivated to acquire new knowledge that would make it possible to prevent the complications arising from immobility and maximize the capabilities in terms of motor and respiratory functions, which was essential for our intervention to be successful. Potential nursing diagnoses to improve ability to perform muscle and joint exercise techniques; potential to improve knowledge about self-control of the breathing pattern; potential to improve knowledge about respiratory technique; potential to improve ability to self-control breathing pattern and potential to improve ability to use breathing techniques were only identified in this person. Thus, throughout the intervention project, person C assimilated the transmitted knowledge and the instructed techniques, being able to independently perform the range of motion exercises and adequately employ the respiratory techniques taught, confirming what Habel⁽⁴⁹⁾ refers, who RN, by investing in people's education, promote their empowerment, since they are provided with the knowledge and skills necessary to manage their own care and control their lives, that is, to be as independent as possible.

The results of this intervention project also allowed us to verify that the early planning of the provision of adequate and individualized rehabilitation nursing care, in the areas of Motor Functional Reeducation, pressure ulcer prevention and Respiratory Functional Reeducation, can contribute to prevention of the motor, integumentary and respiratory consequences of immobility in people in critical condition. Rehabilitation Nursing has a crucial role in promoting preventive practices within the multidisciplinary team. These patient safety-oriented practices meet the first specific competence of the RN, which is to be able to care for people with special needs in all contexts of practice and care⁽²²⁾ and who are unable to perform basic activities independently, identifying the needs for specialized intervention, implementing and evaluating programs aimed at reducing risks. And their ways of intervening are the execution, teaching and demonstration of techniques that promote self-care.

In summary, the results obtained in this intervention project prove the importance of anticipatory care⁽¹⁷⁾, since planning and an early RNs intervention prevent the occurrence of negative events, in this case the consequences of immobility, which can compromise a successful health/disease transition, experienced by people in critical situations, which is somewhat in line with what is defended by Ludin, Arbon, Parker⁽¹⁵⁾, who state that people in critical situations need a more comprehensive transition planning, which implies a greater focus on its anticipation and its effects.

CONCLUSION

The results obtained in this intervention project allowed us to verify that the participants maintained or

improved range of motion, and despite the high risk, they did not develop pressure ulcers, having also improved their respiratory condition. Although the results cannot be generalized, due to methodological limitations, the expected results derived from the planned interventions implemented, with the collaboration of the other elements of the nursing team, and were achieved.

The time limitation for project implementation was also a limitation. It is considered that in a future replication of this project it would be pertinent to extend its implementation time, allowing for a greater number of cases.

Despite its limitations, this intervention project can be a contribution to the development of knowledge in Rehabilitation Nursing and a propellant for other studies to be created, as it also demonstrates the importance of the RN intervention aimed at people admitted to ICU.

BIBLIOGRAPHIC REFERENCES

1. Ordem dos Enfermeiros. Guia Orientador de Boas Práticas - Cuidados à pessoa com alterações da mobilidade - posicionamentos, transferências e treino de deambulação. Lisboa: Ordem dos Enfermeiros; 2013 [citado em 2019 21 março]. Disponível na Internet: https://www.ordemenfermeiros.pt/arquivo/publicacoes/Documentos/GOBP_Mobilidade_VF_site.pdf
2. Nascimento GIF, Silva ECB, Oliveira YSB, Pereira TMF, Cabral RMC. Atuação da fisioterapia na síndrome do imobilismo no idoso: uma revisão de literatura [Apresentação no 1º Congresso Nacional do Envelhecimento Humano; 2016 nov 23-25; Natal- RN, Brasil]. Disponível na Internet: http://www.editorarealize.com.br/revistas/cneh/trabalhos/trabalho_ev054_md4_sa5_id1824_07102016203957.pdf
3. Hashem MD, Parker AM, Needham DM. Early mobilization and rehabilitation of patients who are critically ill. *Chest* [revista em linha]. 2016 [citado em 2019 mar 21]; 150(3):722-31. Disponível na Internet: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6026260/pdf/main.pdf>
4. Denehy L, Lanphere J, Needham DM. Ten reasons why ICU patients should be mobilized early. *Intensive Care Med* [revista em linha]. 2017 [citado em 2019 mar 21]; 43(1): 86-90. Disponível na Internet: <https://eds.a.ebscohost.com/eds/pdfviewer/pdfviewer?vid=1&sid=7f43a33f-83f1-4145-8df2-24754352d0dc%40sdc-v-sessmgr06>
5. Rodrigues GS, Gonzaga DB, Modesto ES, Santos FDO, Silva BB, Bastos VPD. Mobilização precoce para pacientes internados em unidade de terapia intensiva: revisão integrativa. *Rev Inspirar Mov Saude* [revista em linha]. 2017 [citado em 2019 mar 21]; 13(2): 27-31. Disponível na Internet: <https://www.inspirar.com.br/revista/mobilizacao-precoce-para-pacientes-internados-em-unidade-de-terapia-intensiva-revisao-integrativa/>
6. Clavet H, Hébert PC, Fergusson D, Doucette S, Trudel G. Joint contracture following prolonged stay in the intensive care unit. *CMAJ* [revista em linha]. 2008 [citado em 2019 mar 21]; 178(6): 691-697. Disponível na Internet: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2263098/pdf/20080311s00017p691.pdf>
7. Silva APP, Maynard K, Cruz MR. Efeitos da fisioterapia motora em pacientes críticos: revisão de literatura. *Rev Bras Ter Intensiva* [revista em linha]. 2010 [citado em 2019 mar 21]; 22(1): 85-91. Disponível na Internet: <http://www.scielo.br/pdf/rbti/v22n1/a14v22n1.pdf>
8. Winkelmann C. Bed rest in health and critical illness: A body systems approach. *AACN Adv Crit Care* [revista em linha]. 2009 [citado em 2019 mar 21]; 20(3):254-66. Disponível na Internet: https://www.researchgate.net/publication/26701683_Bed_Rest_in_Health_and_Critical_Illness
9. Azevedo PMS, Gomes BP. Efeitos da mobilização precoce na reabilitação funcional em doentes críticos: uma revisão sistemática. Referência. [revista em linha]. 2015 [citado em 2019 mar 21]; ser IV (5): 129-138. Disponível na Internet: <http://www.scielo.mec.pt/pdf/ref/vserIVn5/serIVn5a15.pdf>
10. Ordem dos Enfermeiros. Regulamento dos padrões de qualidade dos cuidados especializados em enfermagem de reabilitação. [publicação online]; 2011 [consult. Em 19 mar 2019]. Disponível na Internet: <https://www.ordemenfermeiros.pt/arquivo/colegios/Documentos/PQCEEReabilitacao.pdf>
11. Santos A, Oliveira I, Silveira T. Mobilização precoce em UCI. *Salutis Scientia* [revista em linha]. 2010 [citado em 2019 mar 21]; (2):19 -24. Disponível na Internet: <http://docplayer.com.br/46526065-Mobilizacao-precoce-em-uci-early-mobilization-in-icu.html>
12. Severino S. Enfermagem de Reabilitação à Pessoa Submetida a Ventilação Mecânica. In: Marques-Vieira C, Sousa L, coordenadores. Cuidados de Enfermagem de Reabilitação à pessoa ao longo da vida. 1ª ed. Loures: Lusodidacta; 2016. p. 365-380
13. Mejía ASC, Martínez NGM, Nieto ORP, Camacho MAM, Tomas ED, Martínez BP. Movilización temprana como prevención y tratamiento para la debilidad adquirida en la unidad de cuidados intensivos en pacientes en ventilación mecánica. Experiencia en un hospital de segundo nivel. *ESJ* [revista em linha]. 2018 [citado em 2019 Mar 21]; 21(14): 19-30. Disponível na Internet: https://www.researchgate.net/publication/326808245_Movilizacion_Temprana_Como_Prevenccion_Y_Tratamiento_Para_La_Debilidad_Adquirida_En_La_Unidad_De_Cuidados_Intensivos_En_Pacientes_En_Ventilacion_Mecanica_Experiencia_En_Un_Hospital_De_Segundo_Nivel
14. Nelson A. Segurança para Doentes com Incapacidades. In: Hoeman S, editor. Enfermagem de reabilitação: Prevenção, intervenção e resultados esperados. 4ª ed. Loures: Lusodidacta; 2011. p. 169-176
15. Ludin SM, Arbon P, Parker S. Patients' transition in the Intensive Care Units: Concept analysis. *Intensive Crit Care Nurs* [revista em linha]. 2013 [citado em 2019 mar 21]; 29: 187-192. Disponível na Internet: <http://dx.doi.org/10.1016/j.iccn.2013.02.001>
16. Santos E, Marcelino L, Abrantes L, Marques C, Correia R, Coutinho E, Azevedo I. O Cuidado Humano Transicional Como Foco da Enfermagem: Contributos das Competências Especializadas e Linguagem Classificada CIPE®. *Millenium* [revista em linha]. 2015 [citado em 2019 mar 21]; 49: 153-171. Disponível na Internet: <http://www.ipv.pt/millennium/Millennium49/9.pdf>
17. Zagonel IPS. O cuidado humano transicional na trajetória de enfermagem. *Rev.latino-am. enfermagem* [revista em linha]. 1999 [citado em 2019 mar 21]; 7 (3): 25-32. Disponível na Internet: <http://www.scielo.br/pdf/rlae/v7n3/13473.pdf>
18. International Council of Nurses. CIPE versão 2015: Classificação Internacional para a Prática de Enfermagem. Lisboa: Ordem dos Enfermeiros; 2015 [citado em 2019 22 março]. Disponível na Internet: https://futurosenf.files.wordpress.com/2017/04/cipe_2015.pdf
19. Grilo EN, Mendes F. O estudo de caso como estratégia de investigação em enfermagem. Poster apresentado em: Congresso de Investigação Ibero-Americano de Países de Língua Oficial Portuguesa, 3ª edição, 2012 jun 12-15, Coimbra. Disponível na Internet: Disponível em <http://hdl.handle.net/10400.11/1744>
20. Gautério-Abreu DP, Ávila JA, Santos SSC, Ilha S, Silva BT. Contribuições do estudo de caso para o cuidado de enfermagem: um relato de experiência. *Rev enferm UFPE on line* [revista em linha]. 2016 [citado em 2019 mar 21]; 10(3): 1149-1154. Disponível na Internet: <https://doi.org/10.5205/1981-8963-v10i3a11070p1149-1154-2016>
21. Silva LAGP, Mercês NNA. Estudo de casos múltiplos aplicado na pesquisa de enfermagem: relato de experiência. *Rev Bras Enferm* [revista em linha]. 2018 [citado em 2019 mar 21]; 71(3): 1194-1197. Disponível na Internet: <http://dx.doi.org/10.1590/0034-7167-2017-0066>
22. Ordem dos Enfermeiros. Padrão Documental dos Cuidados de

- Enfermagem da Especialidade de Enfermagem de Reabilitação. [publicação online]; 2015 [consult. em 19 mar 2019]. Disponível na Internet: https://www.ordemenfermeiros.pt/arquivo/colegios/Documents/2015/MCEER_Assembleia/PadraoDocumental_EER.pdf
23. Teasdale G. Recording the Glasgow Coma Scale. [publicação online]; 2014 [consult. em 19 mar 2019]. Disponível na Internet: <http://www.glasgowcomascale.org/recording-gcs/>
24. Direção Geral da Saúde. Orientação da Direção-Geral da Saúde, Escala de Braden: Versão Adulto e Pediátrica (Braden Q). Orientação nº 17/2011 de 19/05/2011[publicação online]; 2014 [consult. em 19 mar 2019]. Disponível na Internet: https://www.dgs.pt/departamento-da-qualidade-na-saude/ficheiros-anexos/orientacao_ulceraspdf-pdf.aspx.
25. Ordem dos Enfermeiros. Enfermagem de Reabilitação, Instrumentos de recolha de dados para a documentação dos Cuidados especializados em Enfermagem de Reabilitação. [publicação online]; 2016 [consult. em 19 mar 2019]. Disponível na Internet: http://www.ordemenfermeiros.pt/publicacoes/Documents/InstRecolhaDadosDocumentacaoCuidEnfReabilitacao_Final_2017.pdf
26. Fortin MF. O processo de investigação: da concepção à realização. 2ª ed. Loures: Lusociência; 1999
27. Mondragón-Barrera MA. Condición física y capacidad funcional en el paciente críticamente enfermo: efectos de las modalidades cinéticas. Rev CES Med [revista em linha]. 2103 [citado em 2019 mar 21]; 27(1): 53-66. Disponível na Internet: <http://www.scielo.org.co/pdf/cesm/v27n1/v27n1a06.pdf>
28. Gosselink R, Bott J, Johnson M, Dean E, Nava S, Norrenberg M et al. Physiotherapy for adult patients with critical illness: recommendations of the European Respiratory Society and European Society of Intensive Care Medicine Task Force on Physiotherapy for Critically Ill Patients. *Intensive Care Med*. [revista em linha]. 2008 [citado em 2019 mar 21]; 34(7):1188-99. Disponível na Internet: <https://eds.a.ebscohost.com/eds/pdfviewer/pdfviewer?vid=8&sid=428da056-0222-4ea8-b756-0d8164b11f7a%40sessionmgr4006>
29. Nepomuceno Júnior BV, Martinez BP, Gomes Neto M. Impacto do internamento em unidade de cuidados intensivos na amplitude de movimento de pacientes graves: estudo piloto. Rev. bras. ter. intensiva [revista em linha]. 2014 [citado em 2019 mar 21]; 26(1): 65-70. Disponível na Internet: <http://www.scielo.br/pdf/rbti/v26n1/0103-507X-rbti-26-01-0065.pdf>
30. Dantas CM, Silva PFS, Siqueira FHT, Pinto RMF, Matias S, Maciel C et al. Influência da mobilização precoce na força muscular periférica e respiratória em pacientes críticos. Rev. bras. ter. intensiva [revista em linha]. 2012 [citado em 2019 mar 21]; 24(2): 173-178. Disponível na Internet: <http://www.scielo.br/pdf/rbti/v24n2/13.pdf>
31. França EET, Ferrari F, Fernandes P, Cavalcanti R, Duarte A, Martinez BP et al. Fisioterapia em pacientes críticos adultos: recomendações do Departamento de Fisioterapia da Associação de Medicina Intensiva Brasileira. Rev. bras. ter. intensiva [revista em linha]. 2012 [citado em 2019 mar 21]; 24(1): 6-22. Disponível na Internet: <http://www.scielo.br/pdf/rbti/v24n1/03.pdf>
32. Gill EC. Reducing hospital acquired pressure ulcers in intensive care. *BMJ Qual Improv Rep*. [revista em linha]. 2015 [citado em 2019 mar 21]; 4(2): u205599.w3015. Disponível na Internet: <https://bmjopenquality.bmj.com/content/bmjqr/4/1/u205599.w3015.full.pdf> [DOI: 10.1136/bmjquality.u205599.w3015]
33. Rios BL, Oliveira JSF, Torres MT, Souza NO, Marques PF, Reis UOP. Prevenção de úlceras por pressão em unidade de terapia intensiva: um relato de experiência. Rev enferm UFPE on line [revista em linha]. 2016 [citado em 2019 mar 21]; 10(6): 4959-4964. Disponível na Internet: <https://periodicos.ufpe.br/revistas/revistaenfermagem/article/download/11278/12923>
34. Swafford K, Culpepper R, Dunn C. Use of a Comprehensive Program to Reduce the Incidence of Hospital-Acquired Pressure Ulcers in an Intensive Care Unit. *Am J Crit Care* [revista em linha]. 2016 [citado em 2019 mar 21]; 25(2): 152-155. Disponível na Internet: <http://ajcc.aacnjournals.org/content/25/2/152.full.pdf+html>
35. Thorpe E. Prophylactic use of dressings for pressure ulcer prevention in the critical care unit. *Br J Nurs*. [revista em linha]. 2016 [citado em 2019 mar 21];25(12): S6-S12. Disponível na Internet: <https://doi.org/10.12968/bjon.2016.25.12.S6>
36. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Quick Reference Guide. Osborne Park, Australia: Cambridge Media; 2014 [citado em 2019 21 março]. Disponível na Internet: <https://www.npuap.org/wp-content/uploads/2014/08/Updated-10-16-14-Quick-Reference-Guide-DIGITAL-NPUAP-EPUAP-PPPIA-16Oct2014.pdf>
37. Branco PS, Barata S, Barbosa J, Cantista M, Lima A, Maia J. Temas de Reabilitação - Reabilitação Respiratória. Porto: Medesign; 2012 [citado em 2019 21 março]. Disponível na Internet: http://repositorio.chlc.minsau.de/bitstream/10400.17765/1/Temas%20Reabilita%C3%A7%C3%A3o_Reab%20Respirat%C3%B3ria.pdf
38. Cordeiro MC, Menoita EC. Reeducação Funcional Respiratória In: Cordeiro MC, Menoita EC, editores. Manual de Boas Práticas na Reabilitação Respiratória: Conceitos, Princípios e Técnicas.1ª ed. Loures: Lusociência; 2012. p. 61-115
39. Spapen HD, De Regt J, Honoré PM. Chest physiotherapy in mechanically ventilated patients without pneumonia-a narrative review. *J Thorac Dis*. [revista em linha]. 2017 [citado em 2019 mar 21]; 9(1): E44-E49. Disponível na Internet: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5303101/pdf/jtd-09-01-E44.pdf>
40. Avena KM, Duarte AM, Cravo SD, Sologuren MJ, Gastaldi AC. Efeitos da tosse manualmente assistida sobre a mecânica do sistema respiratório de pacientes em suporte ventilatório total. J. bras. pneumol [revista em linha]. 2009 [citado em 2019 mar 21]; 34(6): 380-386. Disponível na Internet: <http://www.scielo.br/pdf/jbpneu/v34n6/v34n6a08>
41. Fadaei A, Bagheri B, Pirsalehi A, Taherkhanchi B, Abbasi, MA. Effect of pulmonary rehabilitation program on patients admitted to ICU: a comparative cross sectional study. *JPS* [revista em linha]. 2015 [citado em 2019 mar 21]; 6(3): 18-21. Disponível na Internet: https://www.researchgate.net/publication/298272039_Effect_of_pulmonary_rehabilitation_program_on_patients_admitted_to_ICU_a_comparative_cross_sectional_study
42. Guimarães FS, Lopes AJ, Constantino SS, Lima JC, Canuto P, de Menezes SL. Expiratory Rib Cage Compression in Mechanically Ventilated Subjects: a Randomized Crossover Trial. *Respir Care* [revista em linha]. 2014 [citado em 2019 mar 21]; 59(5): 678-685. Disponível na Internet: <http://rc.rcjournal.com/content/resp/59/5/678.full.pdf>
43. Moreira FC, Teixeira C, Savi A, Xavier R. Alterações da mecânica ventilatória durante a fisioterapia respiratória em pacientes ventilados mecanicamente. Rev. bras. ter. intensiva [revista em linha]. 2015 [citado em 2019 mar 21]; 27(2): 155-160. Disponível na Internet: <http://www.scielo.br/pdf/rbti/v27n2/0103-507X-rbti-27-02-0155.pdf>
44. Santos FA, Schneider Júnior LC, Forgiarini Junior LA, Veronezi J. Efeitos da compressão torácica manual versus a manobra de PEEP-ZEEP na complacência do sistema respiratório e na oxigenação de pacientes submetidos à ventilação mecânica invasiva. Rev. bras. ter. intensiva [revista em linha]. 2009 [citado em 2019 mar 21]; 21(2): 155-161. Disponível na Internet: <http://www.scielo.br/pdf/rbti/v21n2/07.pdf>
45. Araújo S, Machado MG. Aspição eotraqueal. In: Machado MG, coordenador. Bases da Fisioterapia Respiratória: Terapia Intensiva e Reabilitação. Rio de Janeiro: Guanabara Koogan; 2008. p. 66-77
46. Naue WS, Forgiarini Junior LA, Dias AS, Vieira SR. Compressão torácica com incremento da pressão em ventilação com pressão de suporte: efeitos na remoção de secreções, hemodinâmica e mecânica pulmonar em pacientes em ventilação mecânica. J. bras. pneumol [revista em linha]. 2014 [citado em 2019 mar 21]; 40(1): 55-60. Disponível na Internet: http://www.scielo.br/pdf/jbpneu/v40n1/pt_1806-3713-jbpneu-40-01-00055.pdf
47. Cordeiro MC, Menoita EC. Semiologia Clínica. In: Cordeiro MC, Menoita EC, editores. Manual de Boas Práticas na Reabilitação Respiratória: Conceitos, Princípios e Técnicas.1ª ed. Loures: Lusociência; 2012. p. 21-28
48. Ntoumenopoulos G, Hammond N, Watts NR, Thompson K, Hanlon G, Paratz JD, Thomas P (2018). Secretion clearance strategies in Australian and New Zealand Intensive Care Units. *Aust Crit Care*

[revista em linha] 2018 [citado em 2019 mar 21]; 31(4): 191 - 196.
Disponível na Internet:
<https://doi.org/10.1016/j.aucc.2017.06.002>

49. Habel M. Educação do doente e da família orientada para resultados. In: Hoeman S, editor. Enfermagem de reabilitação: Prevenção, intervenção e resultados esperados. 4^a ed. Loures: Lusodidacta; 2011.p. 61-72

INTERVENÇÃO DO ENFERMEIRO ESPECIALISTA EM REABILITAÇÃO NA MOBILIDADE DA PESSOA IDOSA INSTITUCIONALIZADA - PROGRAMA TEIA

INTERVENCIÓN DEL ENFERMERO ESPECIALISTA EN REHABILITACIÓN EN LA MOVILIDAD DE LA PERSONA IDOSA INSTITUCIONALIZADA - PROGRAMA TEIA

INTERVENTION OF THE SPECIALIST NURSE IN REHABILITATION ON THE MOBILITY OF THE INSTITUTIONALIZED ELDERLY PERSON - TEIA PROGRAM

DOI 10.33194/rper.2019.v2.n1.11.4557 | Submitted 31.01.2019 | Approved 25.06.2019

Rita Pires^{1,2};  Maria Manuela Martins^{3,4};  Bárbara Gomes^{3,4}; Clara Monteiro^{3,5};  Olga Ribeiro^{4,6}

1 - Curso Mestrado em Enfermagem de Reabilitação - ESEP; 2 - Instituto de Ação Social das Forças Armadas - CASP; 3 - Escola Superior de Enfermagem do Porto; 4 - Centro de Investigação em Tecnologias e Serviços de Saúde (CINTESIS); 5 - Centro Hospitalar Póvoa de Varzim/Vila do Conde, EPE; 6 - Escola Superior de Saúde de Santa Maria (ESSSM)

RESUMO

Introdução: O envelhecimento produz alterações fisiológicas, anatómicas, comportamentais, sociais e culturais. Indiscutivelmente, o enfermeiro especialista em reabilitação, assume cada vez mais um papel importante nos cuidados prestados durante o envelhecimento, através da elaboração de planos de cuidados especializados que maximizem a funcionalidade do idoso, capacitando-o para uma maior autonomia e independência no autocuidado, incrementando desta forma a sua qualidade de vida. Nesta perspetiva, apresentamos o programa TEIA que se foca no treino do equilíbrio, da continência urinária e a cognição em idosos ativos.

Objetivo: Avaliar o impacto do programa de 12 semanas, em idosos ativos institucionalizados, sobre o estado de equilíbrio, cognição, sintomatologia de incontinência urinária e qualidade de vida.

Método: Estudo quasi-experimental, antes-depois, com grupo de controlo. Amostra total de 30 idosos, 16 no grupo de programa e 14 no grupo de controlo. Foram aplicados vários instrumentos de avaliação funcional, na versão portuguesa, nomeadamente: Falls Efficacy Scale Internacional (FES I); Teste de Tinetti; Escala de Equilíbrio de Berg (EEB); Teste Timed Up and Go (TUG); International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF); Índice de Lawton-Brody; Escala Geriátrica de Depressão de 15 questões (GDS15); Teste de Declínio Cognitivo de 6 itens (6CIT); e Questionário de vida associado à saúde (SF-36).

Resultados: Os idosos do grupo de programa melhoraram no equilíbrio, estático e dinâmico, no medo cair e na execução da marcha (Tinetti, $Z=-3,126$; $p=0,002$; EEB, $Z=-3,304$; $p=0,001$; FES I, $Z=-3,059$; $p=0,002$ e TUG, $Z=-3,516$; $p=0,0001$). Trouxe-lhes benefícios no desempenho da cognição (6CIT, $Z=-3,088$; $p=0,002$) e na perceção da qualidade de vida associada à incontinência urinária (ICIQ-SF, $Z=-2,680$; $p=0,007$).

Conclusão: A implementação do Programa TEIA traduz-se em ganhos significativos para a saúde dos idosos, melhorando o equilíbrio, a competência dos músculos do assoalho pélvico e no desempenho da cognição potenciado a qualidade de vida dos participantes.

Descritores: Envelhecimento, Equilíbrio, Incontinência Urinária, Cognição, Enfermagem de Reabilitação

RESUMEN

Introducción: El envejecimiento produce alteraciones fisiológicas, anatómicas, comportamentales, sociales y culturales. Indiscutiblemente, el enfermero especialista en rehabilitación, asume cada vez más un papel importante en los cuidados prestados durante el envejecimiento, a través de la elaboración de planes de cuidados especializados que maximicen la funcionalidad del anciano, capacitándolo para una mayor autonomía e independencia en el autocuidado, incrementando de esta forma su calidad de vida. En esta perspectiva, presentamos el programa TEIA que se enfoca en el entrenamiento del equilibrio, de la continencia urinaria y la cognición en ancianos activos.

Objetivo: Evaluar el impacto del programa de 12 semanas, en ancianos activos institucionalizados, sobre el estado de equilibrio, cognición, sintomatología de incontinencia urinaria y calidad de vida.

Método: Estudio cuasi-experimental, antes-después, con grupo de control. Muestra total de 30 ancianos, 16 en el grupo de programa y 14 en el grupo de control. Varias herramientas de evaluación funcional se aplicaron en la versión portuguesa, a saber: Falls Efficacy Scale Internacional (FES I); Prueba de Tinetti; Escala de Equilibrio de Berg (EEB); Prueba Timed Up and Go (TUG); Internacional Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF); Índice de Lawton-Brody; Escala Geriátrica de Depresión de 15 preguntas (GDS15); Prueba de Declinación Cognitiva de 6 elementos (6CIT); y Cuestionario de vida asociado a la salud (SF-36).

Resultados: En el caso de los ancianos del grupo de programa mejoraron en el equilibrio, estático y dinámico, en el miedo a caer y en la ejecución de la marcha (Tinetti, $Z=-3,126$; $p=0,002$; EEB, $Z=3,304$; $p=0,001$; FES I, $Z=-3,059$;

$p=0,002$ e TUG, $Z=-3,516$; $p=0,0001$). Les traen beneficios en el desempeño de la cognición (6CIT, $Z=-3,088$; $p=0,002$) y en la percepción de la calidad de vida asociada a la incontinencia urinaria (ICIQ-SF, $Z=-2,680$; $p=0,007$).

Conclusión: La implementación del Programa TEIA se traduce en ganancias significativas para la salud de los ancianos, mejorando el equilibrio, la competencia de los músculos del piso pélvico y en el desempeño de la cognición potenciada la calidad de vida de los participantes.

Palabras clave: Envejecimiento, Equilibrio, Incontinencia Urinaria, Cognición, Enfermería de Rehabilitación

ABSTRACT

Introduction: Aging produces physiological, anatomical, behavioral, social and cultural changes. Arguably, the specialist nurse in rehabilitation, assumes an increasingly important role in the care provided during the aging process, through the elaboration of specialized care plans that maximize the functionality of the elderly, enabling them to have greater autonomy and independence in self-care, such that they can have a better quality of life. In this work, we present the TEIA program that focuses on the training of balance, urinary continence and cognition in active elderly.

Objective: To assess the impact of the 12-week program on institutionalized elderly individuals on the state of balance, cognition, symptoms of urinary incontinence and quality of life.

Method: Quasi-experimental study, before-after, with control group with a total sample of 30 elderly people, 16 in the program group and 14 in the control group. Several functional evaluation instruments were applied in the Portuguese version, namely: Falls Efficacy Scale International (FES I); Tinetti's test; Berg Balance Scale (BBS); Timed Up and Go Test (TUG); International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF); Lawton-Brody Index; Geriatric Depression Scale of 15 questions (GDS15); Cognitive Decline Test of 6 items (6CIT); and Health-related Life Questionnaire (SF-36).

Results: Seniors in the program group improved their static and dynamic balance, fear of falling and gait execution (Tinetti, $Z=-3,126$, $p=0,002$; BBS, $Z=-3,304$, $p=0,001$; FES I, $Z=-3,059$, $p=0,002$; and TUG, $Z=-3,516$, $p=0,0001$). Additionally, the program brought them benefits in the performance of cognition (6CIT, $Z=-3,088$, $p=0,002$) and in the perception of quality of life associated with urinary incontinence (ICIQ-SF, $Z=-2,680$, $p=0,007$).

Conclusion: The implementation of the TEIA Program led to significant gains on the health of the elderly population, improving the balance, competence of the pelvic floor muscles and the performance of cognition, resulting in enhanced the participants' quality of life.

Keywords: Aging, Balance, Urinary Incontinence, Cognition, Nursing Rehabilitation.

INTRODUCTION

Improving the quality of life in old age is one of the biggest challenges of our time. But aging with quality of life requires measures and interventions that allow the elderly to be integrated into society, family, institutions, with the means of subsistence and necessary support. It is noteworthy that health care and social support are as important as the active participation of the individual to achieve this goal^(1,2).

Given the demographic trend of the Portuguese population, characterized by an increase in human longevity and a decrease in birth rates^(3,4), it is necessary to adapt the care we provide throughout life, especially the specific care in old age where Rehabilitation nursing has a fundamental role, not only in the creation of scientific evidence to support the elaboration of specific and specialized care plans, but also in their execution.

To achieve this purpose, it is essential to understand that aging can lead to the deterioration of various physiological capacities (such as muscle strength, aerobic capacity, neuromuscular coordination, flexibility, among others) which in turn can lead to decline of physical and mental performance, with consequences for the quality of life, well-being and

self-care performance, activities of daily living and instrumental activities of daily living⁽⁵⁾.

Thus, the concept of functional capacity has attracted a growing concern to health professionals, especially rehabilitation nurses, permanently looking for strategies to improve and/or maintain the functional abilities of the elderly people.

Aging is part of the life cycle and as such, it is logical to value it, essentially because it is an opportunity for a enriched society. Aging is often related to the decline of physical and mental faculties, an aspect that associates it with a negative image, which should be avoided at all costs, similarly associated with diseases, loss of autonomy and independence and the consequent withdrawal from social roles⁽⁶⁾.

Aging cannot be seen as a process of only losses, being possible through the action of behavioral, social, economic and environmental interventions, people can actively age by living longer years with a better quality of life, reducing their dependence and enhancing their autonomy⁽⁷⁻⁹⁾.

The ability to preserve and/or enhance autonomy and independence, increasing the quality of life, in the elderly, is related to the surveillance of health status, the type of health care experienced, the environments

in which they live, as well as the adoption of lifestyles⁽¹⁰⁾.

In the last EVITA System report of *Doctor Ricardo Jorge National Health Institute* Instituto Nacional de Saúde Doutor Rivardo Jorge), the injury mechanisms that most contributed to the number of Domestic and Leisure Accidents (DLA) are falls (68.7%), standing out in a pronounced manner as the biggest cause of DLA. It is emphasized that the group with the highest occurrence of falls are female aged 75 years-old or over⁽¹¹⁾.

According to *Swift and Iliffe* (2014) there are some risk factors that may contribute to falls in the elderly people, namely: history of falls; postural instability; mobility problems; balance problems; continence problems; cognitive impairment; health problems; medication; syncope syndrome; and visual impairment⁽¹²⁾. It appears that changes in balance, urinary continence and cognition are determinant for the occurrence of falls in seniors.

There are several evidence that support the beneficial effects of balance training, such as: the reduction in fear of falling; the reduction in the number of falls; the improvement of balance performance; improving gait execution, resulting in increase of life quality⁽¹³⁻¹⁵⁾.

Associated with the advantages of balance training, training the pelvic floor muscles in situations of urinary incontinence is essential. Urinary incontinence can be a very limiting symptom. The fact that the elderly may have, for example, urge urinary incontinence, obliges them to have a quick physical response to reach the toilet before the loss of urine occurs. This type of situation can lead to loss of balance and consequently to falls⁽¹⁶⁻¹⁸⁾.

Cognition and motor control are closely related, body movement in general is not performed in the absence of intention, so cognitive processes are essential for motor control^(5,19), playing a vital role in daily life activities and in instrumental activities of daily living, as well as in the combination of various activities of daily living and instrumental activities of daily living in parallel⁽²⁰⁾.

The construction of the TEIA Program in active elderly people took into account these three variables, body balance, urinary continence and cognition. Considering the components that it integrates, this program is essential to strengthen the functionality of the elderly, enabling them to preserve their independence and autonomy. In this sense, this study aims to evaluate the impact of the implementation of the TEIA program on the state of balance, symptoms of urinary incontinence, cognition, and quality of life in active institutionalized elderly people.

METHOD

This was a quasi-experimental, before-after, control group study. Lasting 12 weeks, the program group had two weekly sessions of balance training and pelvic floor muscle training and one weekly session of cognitive stimulation interspersed (Figure 1) and the control group was not subjected to the intervention.

The sampling technique used was non-probabilistic, accidental. The inclusion criteria were: individuals over 65 years-old, with preserved gait and institutionalized. Exclusion criteria: individuals with: (i) mental illness that limited the understanding of the object of study, as well as the content of the program sessions; (ii) or with comorbidity that prevents physical exercise.

Authorization was obtained from the two institutions, the Armed Forces Social Action Institute (*Instituto de Ação Social das Forças Armadas - IASFA*) - Porto Social Support Center (*Centro de Apoio Social do Porto - CASP*) and the Santa Casa da Misericórdia do Porto - Home of Nossa Senhora da Misericórdia. In this study, all ethical and deontological requirements regarding scientific research were met and guaranteed.

A total of 32 institutionalized elderly people participated in this study, having been divided into a program group and a control group, 17 and 15, respectively. There was one dropout in the program group and one death in the control group. At the end of the study the program group had 16 participants and the control group had 14 participants (Figure 2).

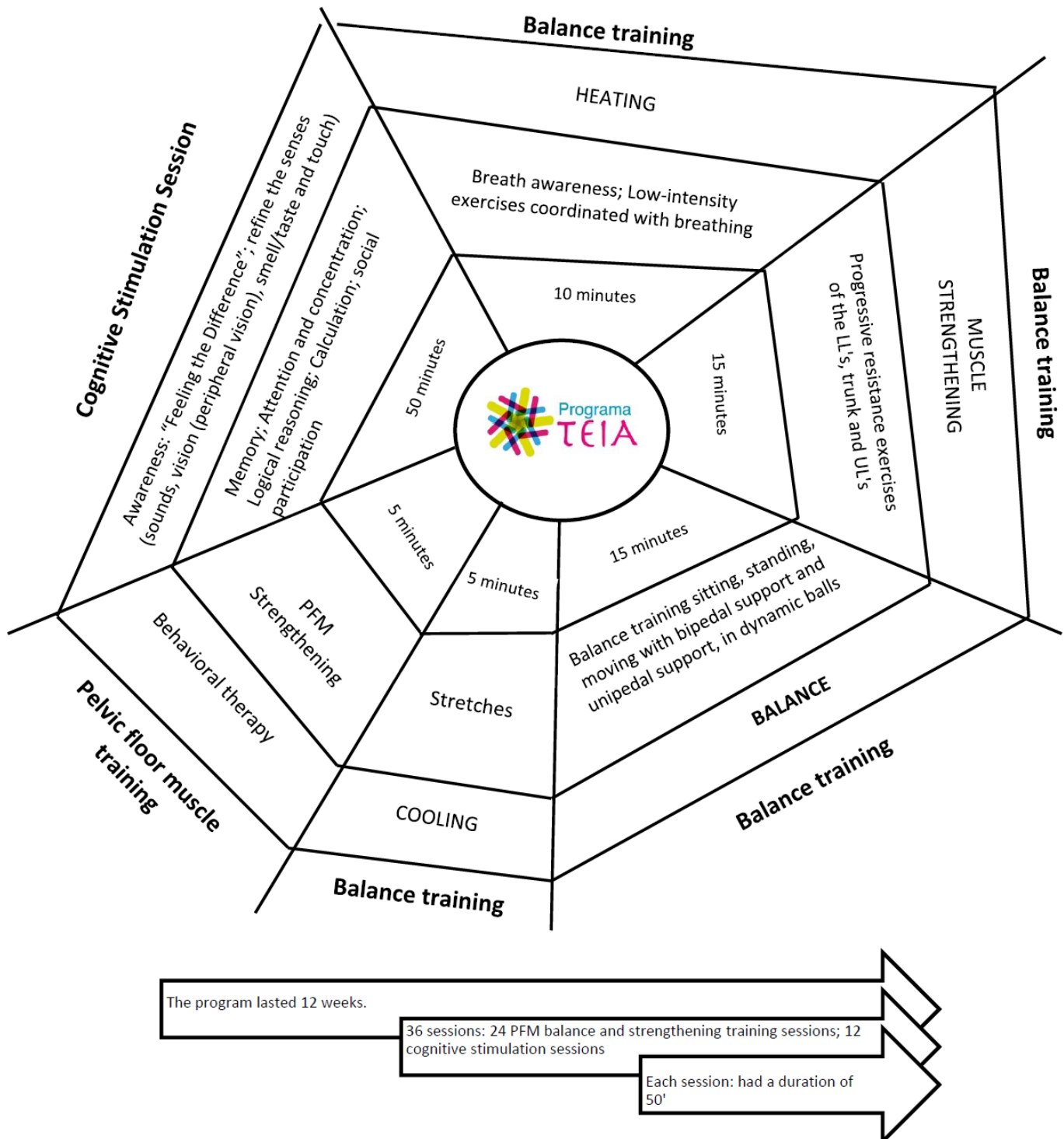


Figure 1 – TEIA Program Structure

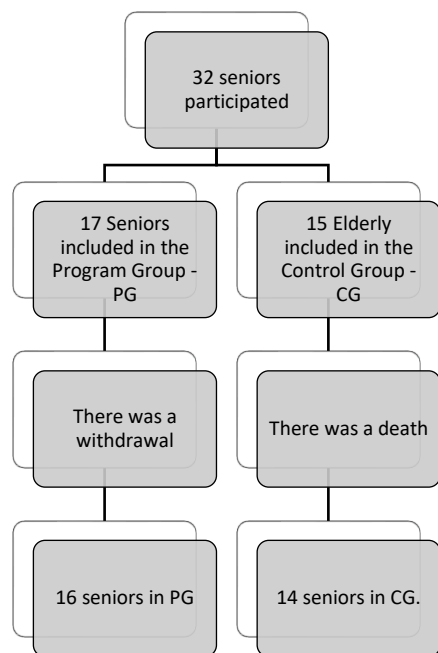


Figure 2 – Sample of study.

To assess the impact of the TEIA Program, a registration survey was constructed based on the variables operationalized in the table (Table 1).

| Variables | Dimensions |
|---|---|
| Sociodemographic | Age; sex; marital status; education. |
| Physiological measures | Blood Pressure (BP); Heart rate (HR); Anthropometric measurements (weight, height and BMI) |
| Clinical data | History of chronic disease(s) |
| Perception of quality of life associated with urinary incontinence. | International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF) ⁽²²⁾ |
| Fear of Falling Assessment. | Falls Efficacy Scale International (FES I) ⁽²³⁾ |
| Balance changes | Tinetti Test ⁽²⁴⁾ ; Berg Balance Scale (BBS) ⁽²⁵⁾ Time Up and Go Test (TUG) ⁽²⁶⁾ |
| Independence in IADL | Lawton- Brody's index ⁽²⁷⁾ |
| Depressive state | 15-question Geriatric Depression Scale (GDS15) ⁽²⁸⁾ |
| Cognition | 6-item Cognitive Decline Test (6CIT) ⁽²⁹⁾ |
| Perception of quality of life associated with health | Health Associated Life Questionnaire (SF-36) ⁽³⁰⁾ |

Table 1 - Harvesting Variables and Instruments

Descriptive and inferential statistical analysis was performed, using parametric tests, namely the Student t-test, for inter-subject assessment and the Paired Samples t-test for intra-subject analysis, and in certain cases, the respective non-parametric tests, the Mann-Whitney and the Wilcoxon test. The level of significance adopted was 0.05⁽²¹⁾. The software used for data

treatment and statistical analysis was IBM® SPSS® Statistics version 24.

RESULTS AND DISCUSSION

The total sample (n=30) was characterized by an average age of 83.3 years-old, the median of 84 years. Age ranged from 67 years-old to 93 years-old, with a standard deviation of 6.32 years, with an equal representation between gender, 50% men and 50% women, both in the sample and in the groups. Regarding marital status, the most representative groups are married and widowed, either in the sample (40% married and 43.3% widowed) or in the groups (program group - 43.8% married and 43.8% widowed; control group - 35.7% married and 42.9% widowed). Regarding educational qualifications, the one with the greatest representation in the sample was the 1st cycle (40.0%), followed by the 3rd cycle (30.0%). In the groups, the trend was the same (Table 2).

| Sociodemographic characteristics | | Program Group (PG) | | Control Group (CG) | | Total of sample | |
|----------------------------------|---------------------|--------------------|------|--------------------|------|-----------------|------|
| | | n | % | n | n | n | % |
| Participants | | 16 | 53.3 | 14 | 46.7 | 30 | 100 |
| Average Age (σ) | | 83 (5.56) | -- | 83 (7.32) | -- | 83 (6.33) | -- |
| Sex | Female | 8 | 50.0 | 7 | 50.0 | 15 | 50.0 |
| | Male | 8 | 50.0 | 7 | 50.0 | 15 | 50.0 |
| Marital status | Single | 0 | 0 | 2 | 14.3 | 2 | 6.7 |
| | Married | 7 | 43.8 | 5 | 35.7 | 12 | 40.0 |
| | Separated/ Divorced | 2 | 12.5 | 1 | 7.1 | 3 | 10.0 |
| | Widowed | 7 | 43.8 | 6 | 42.9 | 13 | 43.3 |
| Education | 1st Cycle | 5 | 31.3 | 7 | 50.0 | 12 | 40.0 |
| | 2nd Cycle | 4 | 25.0 | 1 | 7.1 | 5 | 16.7 |
| | 3rd Cycle | 5 | 31.3 | 4 | 28.6 | 9 | 30.0 |
| | Secondary | 1 | 6.3 | 0 | 0.0 | 1 | 3.3 |
| | Higher education | 1 | 6.3 | 2 | 14.3 | 3 | 10.0 |

Table 2 - Sample Characterization

Analysis of the implementation of the TEIA Program

Before the program

In the evaluation carried out before the program, it was found that in all variables, except the mean body mass index (BMI) and the perception of quality of life associated with health in the physical performance dimension, the p value had a value greater than 0.05, meaning that there were no statistically significant differences between the program and control groups, inferring the similarity of the groups.

After the program

About Physiological Measurements: in the program group, from the 1st to the 2nd assessment, the mean

systolic value of 139 mmHg changed to a value of 127 mmHg and the mean diastolic value went from 77 mmHg to 72mmHg. The average heart rate of 81 bpm increased to 74 bpm.

In the program and control group, there was an average weight of 73,069 kg and 68,585 kg, respectively, in the 1st evaluation. In the 2nd evaluation, the average weight changed to 72,025Kg in the program group; and 70,000Kg in the control group.

These differences in values were reflected in the BMI value. In the 1st evaluation, the program group had a value of 28.30 and in the 2nd evaluation a value of 27.93. The control group, in the 1st evaluation had a value of 25.39 and in the 2nd evaluation a value of 25.89.

These changes in weight and consequently in the value of BMI led to a repositioning regarding the categorization of BMI, there was a variation in the number of people in the program group, which changed from the obese grade I category to pre-obese, that is, in the 1st assessment 43.8% were pre-obese and 31.3% were obese class I. In the 2nd assessment, the percentage of pre-obese individuals rose to 56.3% and the percentage of class I obese individuals rose to 18.8%. In the control group, in the 1st assessment, 50% were pre-obese, 41.9% normal and 7.1% grade I obese and in the 2nd assessment 42.9% pre-obese, 35.7% normal and 21.9 % obese class I.

In the intra-subject analysis, in the program group, all physiological measures had a decrease, with statistically significant changes for blood pressure values, systolic value ($t(15) = 4.522$; $p=0.0001$) and diastolic value ($t(15) = 2.698$; $p=0.017$); heart rate ($t(15) = 3.335$; $p=0.005$); weight ($t(15) = 2.427$; $p=0.028$) and BMI ($t(15) = 2.318$; $p=0.035$). The same is not true in the control group, since in the variables blood

pressure (diastolic and systolic) and heart rate the p value is greater than 0.05, so there were no statistically significant changes in their values from the 1st to the 2nd assessment ($t(13) = -2.649$; $p=0.020$). In relation to the BMI ($t(13) = -2.370$; $p=0.034$), in this group, there were statistically significant changes, but with an opposite tendency to the program group. When the inter-subject evaluation was performed, it was found that there were no statistically significant changes.

On the perception of quality of life associated with urinary incontinence (ICIQ-SF): The average score of the 1st evaluation in the program group, compared to the 2nd evaluation, decreased significantly, from an average value of 4.19 points to a value of 2.44 points. In the control group, there was an increase in the mean value from 4.93 points to 6.50 points. In this variable, as the distribution is not normal, the Wilcoxon test was used and it was found that there were statistical differences from the 1st to the 2nd evaluation, either for the program group ($Z = -2.680$; $p=0.007$) or for the control group ($Z = -2.375$; $p=0.018$). When the inter-subject analysis was performed, it was found that there were statistically significant differences between the program group and the control group regarding the 2nd evaluation ($U=44,000$; $p=0.004$) (Table 3).

About Cognition (6CIT): The mean score in the program group went from 7 to 4 points, the maximum values from 19 to 14 points and the standard deviation from 6 to 5 points. In the control group, the average score went from 5 to 7 points, maintaining the maximum value and standard deviation. In the intra-subject evaluation, it was found that in the program group there were statistically significant differences ($Z = -3.088$; $p=0.002$) but in the control group there were no statistical differences ($Z = -1.901$; $p=0.57$). In the inter-subject evaluation, it was verified that there were no statistical differences ($U=72.500$; $p=0.101$) (Table 3).

| Variable | Outcomes | PG (n=16) | | | CG (n=14) | | | p value □ between groups |
|---|------------------------------|----------------------------|----------------------------|--|----------------------------|----------------------------|--|----------------------------------|
| | | 1 st evaluation | 2 nd evaluation | p value 1 st and 2 nd evaluation | 1 st evaluation | 2 nd evaluation | p value 1 st and 2 nd evaluation | |
| Perception of quality of life associated with urinary incontinence Average score (σ) | ICIQ-SF Max: 21 Min: 0 | 4.19 (5.09) | 2.44 (5.02) | 0.007 | 4.93 (5.48) | 6.50 (5.26) | 0.018 | 0.004 |
| Cognition Average score (σ) | 6CIT Max: 28 Min: 0 | 7 (6) | 3.56 (4.99) | 0.002 | 5 (7) | 6.79 (7.13) | 0.573 | 0.101 |

Table 3 - ICIQ-SF and 6 CIT score results.

About Fear of Falling (FES-I) and Balance (Tinetti Test, Berg Balance Scale, Timed Up and Go Test): With regard to the variable "fear of falling" analyzed using the FES-I scale, in the program group, the initial average score was 75 points and the final 85 points, and in the control group the average score increased from 82 points to 78

points. When performing the intra-subject analysis, it was found that in the program group there were statistical differences between the 1st evaluation and the 2nd evaluation ($Z = -3.059$; $p=0.002$), whereas in the control group there were no statistical differences ($Z = -2.366$; $p=0.18$). There were also no statistically

significant differences between groups after program implementation ($U=111,000$; $p=0.966$).

Regarding the balance assessment, as shown in table 4, in the program group in the 1st assessment the average score was 23 points, passing in the 2nd assessment to 26 points. In the control group, the average score was 24 points, rising to 23 points in the 2nd assessment. Analyzing the Tinetti Test score, in the intra-subject evaluation, taking into account its total value, it was found that there were significant differences between the 1st and 2nd evaluations, in the program group ($Z=-3.126$; $p=0.002$), but not in the control group ($Z=-2.271$; $p=0.23$). In the inter-subject evaluation, it was found that in the 1st evaluation there were no differences between the groups ($U=101,000$; $p=0.667$), but in the 2nd evaluation, there were statistically significant differences between the program group and the control group ($U=60,000$; $p=0.031$).

The Berg Balance Scale score in the program group went from an average of 44 points to an average of 49 points. The control group went from 42 points to 39 mean points. There was also a change in the mode of scores from the 1st to the 2nd assessment, in the program group it went from 50 to 52 points, in the control group it went from 49 to 42 points. Transposing to the intra-

subject assessment, it was found that there were statistically significant differences, both for the program group ($Z=-3.304$; $p=0.001$) and for the control group ($Z=-3.203$; $p=0.001$). In the inter-subject evaluation, it was found that there were also statistically significant differences in the 2nd evaluation, confirmed by the Mann-Whitney test ($U=36,000$; $p=0.001$) (table 4).

Regarding the time needed to perform the Timed Up and Go test, it was found that in the program group an average value of 20.16 sec., a maximum value of 44.17 sec. and a minimum value of 9.74 sec., the average value was 16.66 sec., a maximum value of 40.20 sec. and a minimum value of 7.71 sec. In the control group, it went from an average value of 20.66 sec. to 24.07 sec., the maximum value increased from 44.19 sec. for 45.20 sec. and the minimum value of 11.39 sec. to 12.27 sec. In the intra-subject evaluation, it was found that there were statistically significant differences from the 1st to the 2nd evaluation, either in the program group ($Z=-3.516$; $p=0.0001$) or in the control group ($Z=-3.296$; $p=0.001$). In the inter-subject evaluation, it was found that there were statistically significant changes in the 2nd evaluation ($U=55,000$; $p=0.017$) (Table 4).

| Variable | Outcomes | PG (n=16) | | | CG (n=14) | | | p value □ between the groups |
|---|--|-------------------------------|-------------------------------|--|-------------------------------|-------------------------------|--|--|
| | | 1 st evaluation | 2 nd evaluation | p value 1 st and 2 nd evaluation | 1 st evaluation | 2 nd evaluation | p value 1 st and 2 nd evaluation | |
| Balance Average score (σ) | Tinetti's test Max: 28 Min: 0 | 23 (4) | 25.88 (3.01) | 0.002 | 24 (4) | 23.07 (4.34) | 0.231 | 0.031 |
| | BBS Max: 56 Min: 0 | 44 (7) | 49.00 (6.46) | 0.001 | 42 (8) | 39.00 (8.73) | 0.001 | 0.001 |
| | TUG Test Seg. | 20,16 (9,93) | 16.67 (9.68) | 0.0001 | 20.60 (9,49) | 24.07 (11.31) | 0.001 | 0.017 |
| Fear of falling Average score (σ) | FES I Max: 100 Min: 0 | 75 (24) | 85.19 (14.76) | 0.002 | 82 (28) | 78.07 (32.15) | 0.018 | 0.984 |

Table 4- Results for the Tinetti Test, Berg Balance Scale, Timed Up and Go Test and FES-I.

In the analysis of Independence in instrumental activities of daily living (Lawton-Brody Index): For the Lawton-Brody Index score, the mean values remained from the 1st to the 2nd assessment in both groups. Analyzing each item of the scale, for the program group, it was found that, in the item "Taking care of the house", 37.5% "Taking care of the house without help" and maintained a score in the 2nd evaluation; in the answer "I do everything except heavy work", from 12.5% it went to 18.8%, and in the answer "I do light tasks", from 43.8% went to 37.5% in the 2nd evaluation. In the item "Preparing food", 50% went to 62.5% in the

answer "I plan, prepare and serve my meals without help" and 37.5% went to 25% in the answer "I prepare if you give the ingredients". In the item "Going shopping", 43.8% said they were "unable to go shopping" and in the 2nd evaluation it decreased to 37.5%; in the answer "do the shopping accompanied" from 18.8%, it went up to 25%. In the item "use of transport" it was found that 25% went to 18.8% in the answer "I need follow-up" and in the inverse proportion, from 18.8% went to 25% in the answer "I only take a taxi".

In this variable there were no statistically significant differences either in the intra-subject or inter-subject

assessment. This evidence is confirmed by the intra-subject analysis, where there were no statistically significant differences from the 1st to the 2nd evaluation, in the program group ($Z=-1.633$; $p=0.102$) and in the control group ($Z=-1.342$; $p=0.180$) and accordingly, in the inter-subject evaluation there were also no statistical differences between the 2nd evaluation ($U=99.500$; $p=0.608$).

On Depressive State (15-question Geriatric Depression Scale): The program group had an average of 4 points, either in the 1st or 2nd evaluation. Through the frequency of cumulative percentages, it was found that the number of participants within the cutoff points of 0-5 points, in this group, increased from 56.3% to 68.8%, from the 1st to the 2nd assessment. The control group had an average score of 5 points in the 1st assessment and increased to 6 points in the 2nd assessment. In this variable, in the intra-subject evaluation, according to the Wilcoxon test, there were no statistical differences in the program group ($Z=-1.121$; $p=0.262$), and in the control group there were statistical differences ($Z=-2.232$; $p=0.026$), since there was an increase in the 15-question Geriatric Depression Scale. In the inter-subject evaluation, it was found that there were no statistically significant differences between the groups in the 2nd evaluation ($U=71.500$; $p=0.091$).

From the analysis of the Perception of Health-Associated Quality of Life (SF-36 Health-Associated Life Questionnaire): When we grouped the dimensions of the SF-36 Health-Associated Life Questionnaire into physical component (physical function, physical performance, pain and health in general) and in the mental component (vitality, social function, emotional performance and mental health), it was found that in the sample, there was a variation from the 1st to the 2nd assessment. The average value of 54% went to 66% for the physical component, and in the mental component, it went from an average value of 68% to 78%. In the inter-subject evaluation, we can affirm that there were statistically significant differences, in the program group, either in the physical component ($Z=-3.077$; $p=0.002$), or in the mental component ($Z=-2.552$; $p=0.011$). In the control group there were no differences in the physical component ($Z=-1.454$; $p=0.146$), and in the mental component there were statistical differences, but in the opposite direction, that is, there were losses ($Z=-2.805$; $p=0.005$). In the inter-subject evaluation, it was verified that there were differences between the groups in the mental component in the 2nd evaluation ($U=62,000$; $p=0.038$) that did not exist in the 1st evaluation ($U=103,500$; $p=0.728$). In the physical component there were no statistically significant differences between the groups, neither in the 1st ($U=95.500$; $p=0.498$) nor in the 2nd assessment ($U=81,000$; $p=0.208$).

Inter-subject evaluation (1st evaluation)

With regard to the inter-subject evaluation in the 1st evaluation, it is important to point out some data.

Regarding the distribution of the gender variable, either in the total sample or in the two groups that constitute it, the distribution was equal and with a

representation of 50% for each of the genders, unlike most studies where there was a greater representation of the female gender^(34, 35), as well as, in the Portuguese population, between the age group 80-84 years-old, the average age in our study, where about 62% of the population is female⁽³⁾.

As for marital status, they are married and widowed with greater expression, followed by separate/divorced and single marital status in both study groups, analogous to the study by Possamai Menezes et al.⁽³⁶⁾. The distribution of educational qualifications showed that 50% or more of the participants in both groups had educational qualifications higher than the 1st cycle, coinciding with another study⁽³³⁾.

Regarding the other variables, in the inter-subject analyzes in the 1st assessment, confirmed with the respective statistical tests, it was found that the groups did not have statistically significant differences, except for the BMI value and the physical performance dimension of the life questionnaire associated with health SF-36. This allowed us to conclude that the groups before the implementation of the TEIA program were very equivalent, thus contributing to guarantee the internal validity of the study. Given that the more similar the program and control groups are in recruitment and the more these similarities are confirmed by the tests of the 1st assessment, the more effective this control will be⁽²¹⁾.

Intra-subject evaluation (program group)

There were several findings that met with the implementation of the program, namely: the reduction in blood pressure, the decrease in heart rate, the decrease in weight and consequently the BMI and repositioning in the BMI categories. As well as the change in the perception of quality of life associated with urinary incontinence; the decrease in fear of falling; better balance performance; improvement in cognitive aptitude and variation in the perception of health-related quality of life.

The systolic and diastolic value, in the program group, suffered a statistically significant decrease. Based on the norm on arterial hypertension defined by the General Directorate of Health, 2013, the systolic values changed from a high normal classification to a normal classification. The diastolic values, on the other hand, maintain an optimal classification⁽³⁷⁾. The value of heart rate at rest from the 1st to the 2nd evaluation decreased, this finding is in agreement with the relationship that exists between the effect of physical activity and the decrease in HR at rest⁽³⁸⁾.

Now approaching the assessment of weight and BMI, it was found that in the intra-subject assessment of the program group there was weight loss, on average of 1kg and consequently the BMI also decreased, leading to a repositioning of the BMI category. Although this average value maintains this sub-sample in the pre-obese category, it is noteworthy that there was a variation in the number of people who went from the obese grade I category to pre-obese. Once again, the relationship

between physical activity and the reduction in weight and BMI was proven⁽³⁹⁾.

The perception of quality of life associated with urinary incontinence was assessed through the International Consultation on Incontinence Questionnaire - Short Form; it was found that there was a decrease in the mean score of the questionnaire. Contributing to this score reduction was the tendency of score decrease in all the questions in the questionnaire that contribute to the final score. This variation in results can be attributed to the analysis that was carried out to question 6, in the first assessment, which in this way allowed us to understand which types of urinary incontinence were more frequent, in the sub-sample, and thus adapt to more effective strategies to reduce the frequency, the quantity and impact of urinary incontinence, proving the relationship between pelvic floor muscle training and behavioral therapy as predictors of improved quality of life associated with urinary incontinence^(40,41).

Analyzing now the Falls Efficacy Scale I score, it was found that there were differences between the 1st and 2nd assessment in the program group, with the average score increasing. Through these values, it was found that the fear of falling decreased, since the participants are more confident in performing the 10 tasks that the scale includes, thus enhancing the association between balance training and fear of falling^(35, 42).

The scores of the Tinetti test, Berg Balance Scale and Timed Up and Go test also changed from the 1st to the 2nd assessment. In the Tinetti Test and in the Berg Balance Scale, the average score increased and the mode of the scores was also in favor of the trend towards an increase in the score. The average time of the Timed Up and Go test decreased from the 1st to the 2nd assessment. Through these results, we can attest that program group participants improved mobility and consequently improved gait, balance, static and dynamic performance, which may be a predictor of decreased risk of falling in the elderly^(31,33,43).

When analyzing the performance of the participants in relation to the execution of instrumental activities of daily living, it was found that there were no statistically significant differences between the 1st and 2nd assessments, and the average score of the Lawton-Brody Index remained. However, in the analysis of the score variation for each item in the Index, it was found that there were statistical differences in the responses to the items "Taking care of the house", "Preparing food", "Going shopping" and "Use of transportation", or that is, the answers that confer greater independence had an increase from the 1st to the 2nd assessment. The above leads us to infer that the participants felt more confident in performing domestic tasks, such as taking care of the house and preparing food, as well as going abroad.

The relationship between fear of falling, quality of life and performing instrumental activities of daily living was established in the studies by Jahana and Diogo, 2007 and Fhon et al., 2012. Effectively, the TEIA Program contributed to reducing the fear of falling, but despite the fact that the average score did not change,

it was evident that in certain instrumental activities of daily living there was an improvement in the confidence to perform them, namely, in the instrumental activities mentioned above. Similar results have been obtained in other studies^(44,45).

Also, in the analysis of the 15-question Geriatric Depression Scale, it was found that there were no statistical changes in the intra-subject analysis. It was found that in the program group, the mean score of the participants remained in the cohort points suggestive of "no depressive symptoms". Allied to this data was the fact that there was an increase in the percentage of the number of participants, who moved to this classification.

The fear of falling and the frequency of falls can make the elderly person more anxious and more depressed, therefore it leads to social isolation, decreased physical activity, spending more time sitting or lying down, impairing mobility and independence in self-care. We have already verified with the implementation of the TEIA Program, the participants reduced their fear of falling and this factor can be reflected in depressive symptoms⁽⁴⁴⁻⁴⁶⁾.

The decay of cognitive function can lead to an increase in the number of falls in the elderly population, and for this reason, cognitive stimulation was included in the structure of the TEIA Program. The average score of the 6-item Cognitive Decline Test scale, from the 1st to the 2nd assessment in the program group, decreased, suggesting better cognitive performance, which means that the implementation of a cognitive stimulation program for the elderly population contributes to a better performance in cognitive functions⁽³²⁾.

Guszman et al., 2015 established the relationship between fear of falling and cognition, that is, when the first increases, the second is declining, with an intrinsic relationship between cognition and the level of physical activity, which can lead to limited mobility, meaning, mobility is affected by cognition if it limits physical activity⁽⁴⁷⁾. The TEIA Program was shown to improve confidence, mobility, gait performance and balance, leading to a reduction in fear of falling. It also improved the performance of cognition, soon the cognitive functions, namely those related to the fear of falling, prospered. The relationship between the training of cognition and the fear of falling was evidenced.

It was our intention to understand how the TEIA Program interfered with the quality of life associated with the health of the participants. Through the scores of the SF-36 Health Associated Life Questionnaire, in its various dimensions, it was found that in the intra-subject evaluation of the program group, there were statistically significant differences, both in the physical component (physical function, physical performance, pain and general health) or in the mental component (vitality, social function, emotional performance and mental health). The aforementioned, proves that the TEIA Program had a positive implications for the quality of life of the participants^(31,48).

Regarding the intra-subject evaluations of the program group, it was validated that the TEIA Program introduced statistically significant changes in the

quality of life associated with urinary incontinence, fear of falling, balance performance, whether static or dynamic, mobility, gait, in some instrumental activities of daily living, in depressive symptoms, cognitive function and health-related quality of life. In all these variables, there was an improvement in their performance, which translates into better physical and mental performance, as well as benefits in the perception of quality of life. Training allowed for secondary gains, such as the decrease in tension values, heart rate, weight and BMI.

Inter-subject evaluation 2nd assessment

With regard to the inter-subject assessment, after the implementation of the TEIA Program, it was found that in the perception of quality of life when it is associated with urinary incontinence, there were statistically significant differences, findings in agreement with the study by Berlezi et al., 2013⁽⁴⁹⁾ showing again the relation between pelvic floor muscle training and behavioral therapy, and the perception of quality of life associated with urinary incontinence.

Regarding the assessment of fear of falling, it was found that although there was a decrease in fear of falling after the implementation of the TEIA Program in the program group, there were no statistically significant differences between the program group and the control group, a very similar result to that found in other studies^(31,42), this fact may be related to the sample size.

When examining the scores of the Tinetti test, Berg Balance Scale and the running time of the Timed Up and Go test, it was found that there were statistically significant differences. We can conclude that the TEIA Program, in its balance training component, managed to improve static and dynamic balance, mobility, gait, stability in walking, which indirectly produced a decrease in the risk of falling in agreement with the findings of other studies^(13,33,42), contributing to the evidence of the relation between balance training and decreased risk of falls in the elderly people.

In the assessment of dependence on instrumental activities of daily living and depression, it was validated that there were no differences between groups. In a study on cognitive stimulation by Apóstolo et al., 2011 findings were the same, although they showed gains in the intra-subject evaluation in the program group, as happened after the implementation of the TEIA Program⁽¹¹⁾, attributing this data to the sample size.

In the cognition variable, despite the statistically significant differences, in the intra-subject evaluation in the program group, it was found that there were no statistically significant gains between the groups. We can infer that this analysis may be related to the fact that the sample is small to support this difference. No studies were found that used only the 6-item Cognitive Decline Test scale, in order to relate the results.

The statistically significant differences observed in the intra-subject assessment, regarding the perception of

quality of life associated with health, were not confirmed in the inter-subject assessment for the physical component. It's different evidence to what was found in the study by Kyrdalen et al., 2013, in which there were differences between groups in the physical component, but not in the mental component⁽³¹⁾.

In short, the 2nd evaluation showed intergroup differences in the perception of quality of life associated with urinary incontinence, in balance performance, in gait, in the perception of quality of life associated with health in the mental component. There were no statistically significant changes in the cognition variable, which may be related to the fact that the study sample was small.

CONCLUSION

Aging enriches the Human Being with life experiences, increased resilience and the capacity to face the vicissitudes that arise. But aging also brings about the maturation of organs and consequent physiological and anatomical changes in the body, which may or may not translate into dependence and/or loss of autonomy. These alterations can interfere with the gait behavior, the speed of postural changes, the ability to adopt compensatory mechanisms for maintaining balance, the balance performance, the competence of the pelvic floor muscles and the performance of cognition.

The TEIA Program was designed to contemplate several dimensions, from balance training, pelvic floor muscle training to cognitive stimulation. We found that these three dimensions, if worked together, produce positive effects on the life quality, correlating to a reduction in the falls risk, favoring independence, low levels of dependence and the autonomy in the elderly.

The implementation of this program, not only gave contribution to the elderly population, helping to raise their functional potential, but also to the nursing community, namely, to rehabilitation nurses. The rehabilitation nurse has a important role in adopting attitudes that promote active aging, as they optimize the functional potential, promote independence and autonomy, increasing elderlies quality of life, as strengthen physical and mental skills that make it possible to overcome the limitations of that aging produces, which makes it possible to rationalize human and financial resources.

Being TEIA Program a specific physical activity and behavioral program for the three dimensions already described, it was found that its implementation allowed for primary and secondary gains. As secondary gains, it was found that teaching and awareness of breathing times as the constituent part of balance training sessions, allowed to increase aerobic capacity and tolerance to cardiovascular effort, causing a decrease in the mean value of blood pressure and heart rate.

Another secondary gain was weight loss, probably related to the continued practice of physical activity. Participants in the program group lost an average of one

kilogram and consequently decreased their body mass index value. Another secondary factor is related to quality of life, which generally improved, as it was found that there were statistical differences in the perception of quality of life associated with health in the mental component.

As primary gains, the effectiveness of static and dynamic balance performance, improved mobility, improvement in gait ability, improved performance and muscle competence of the pelvic floor, which in association with behavioral therapy, potentiated the increased quality of life associated with urinary incontinence, as well as the performance of cognitive functions.

All these benefits made it possible to prove the importance of this type of exercise program in this type of population, with the TEIA Program being an asset for the elderly and for the professionals who take care of them.

A fundamental limitation of the study was the fact that the sample was small, which may have limited certain statistical findings. It was also considered a limitation the fact that there was not a 3rd evaluation to be carried out within a period after the completion of the program implementation to further highlight the need for frequent physical activity, aimed at training the dimensions, balance, urinary continence and cognition.

As a future work, it would be important to confirm the conclusions of this study with other studies with larger samples to corroborate the benefits of implementing this type of program. It would also be important to carry out a reassessment of the participants after a period without the activities inherent to the program, in order to verify the existence of complications intrinsic to the lack of training.

BIBLIOGRAPHIC REFERENCES

1. São José J. de, Teixeira A. Envelhecimento ativo: contributo para uma discussão crítica. análise social, Revista do Instituto de Ciências Sociais da Universidade de Lisboa. 2014;210. ISSN:0003-2573
2. Paúl M, Ribeiro O. Manual de envelhecimento ativo. 2nd ed. Lisboa: Lidel; 2018. ISBN:978-989-752-333-5
3. Instituto Nacional de Estatística. Instituto Nacional de Estatística - Statistics Portugal. [Web page] Lisboa: Instituto Nacional de Estatística, 2017. [Updated 2019; cited 2019 09 Janeiro] Available from: https://ine.pt/xportal/xmain?xpid=INE&xpgid=ine_bdc_tree&contexto=bd&selTab=tab2.
4. Eurostat. Estrutura populacional e envelhecimento. Eurostat Statistics Explained. [Web page]: Eurostat; 2018 [Updated 2018; cited 2019 09 Janeiro] Available from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_structure_and_ageing/pt#A_percentagem_de_idosos_continua_a_aumentar.
5. Kalsait, A., Lakshmiprabha, R., Iyyar, S. e Mehta, A. Correlation of Cognitive Impairment with functional Mobility & Risk of Fall in Elderly Individuals. Indian J Physiother Occup Ther. 2017; 11(2): pp7-11.
6. Schneider, R. e Irigaray, T. O envelhecimento na atualidade: aspetos cronológicos, biológicos, psicológicos e sociais. Campinas. Estud Psicol. 2008; 25(4): pp.585-593.
7. Sequeira, C. Cuidar de idosos com dependência física e mental. 1ed. Lisboa: Lidel; 2010. ISBN: 978-972-757-717-0.
8. Saúde, Organização Mundial de. Relatório Mundial de Envelhecimento e Saúde. 1ed. Genebra: World Health Organization; 2015.
9. Saúde, Direção Geral de. Estratégia Nacional para o Envelhecimento Ativo e Saudável 2017-2025, Proposta do Grupo de trabalho Interministerial (Despacho nº 12427/2016). Lisboa: DGS; 2017.
10. Firmino, H., Simões, M. e Cerejeira, J. Saúde Mental das Pessoas Mais Velhas. 1ed. Lisboa: Lidel; 2016. ISBN: 978-989-752-147-8.
11. Jorge, Instituto Nacional de Saúde Doutor Ricardo. EVITA-Epidemiologia e Vigilância dos Traumatismos e Acidentes: relatório 2009-2012. 1ed. Lisboa: INSA,IP; 2014. ISBN: 978-989-8794-00-0.
12. Swift CG, Iliffe S. Assessment and prevention of falls in older people-concise guidance. Clin Med. [Internet]. 2014 Dec 1 [cited 17 June 2019]; 14(6):658-62. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4954140/>
13. Gouveia BR, Jardim HG, Martins MM, Gouveia ÉR, de Freitas DL, Maia JA, Rose DJ. An evaluation of a nurse-led rehabilitation programme (the ProBalance Programme) to improve balance and reduce fall risk of community-dwelling older people: A randomised controlled trial. Int J Nurs Stud. 2016 Apr 1;56:1-8..
14. Barban F, Annicchiarico R, Melideo M, Federici A, Lombardi M, Giuli S, et al. Reducing fall risk with combined motor and cognitive training in elderly fallers. Brain Sci. 2017 Feb 10;7(2):19.
15. Marques EA, Figueiredo P, Harris TB, Wanderley FA, Carvalho J. Are resistance and aerobic exercise training equally effective at improving knee muscle strength and balance in older women?. Arch Gerontol Geriatr. 2017 Jan 1;68:106-12.
16. Madill SJ, Pontbriand-Drolet S, Tang A, Dumoulin C. Effects of PFM rehabilitation on PFM function and morphology in older women. Neurourol Urodyn. 2013 Nov;32(8):1086-95..
17. Abrams P, Andersson KE, Birdir L, Brubaker L, Cardozo L, Chapple C, et al. Fourth International Consultation on Incontinence Recommendations of the International Scientific Committee: Evaluation and treatment of urinary incontinence, pelvic organ prolapse, and fecal incontinence. Neurourol Urodyn. 2010 Jan;29(1):213-40.
18. Kim H, Yoshida H, Suzuki T. The effects of multidimensional exercise on functional decline, urinary incontinence, and fear of falling in community-dwelling elderly women with multiple symptoms of geriatric syndrome: a randomized controlled and 6-month follow-up trial. Arch Gerontol Geriatr. 2011 Jan 1;52(1):99-105.
19. Shumway-Cook, A. e Woollacott, M. Motor Control Translating research into clinical practice. 3 ed. Filadelfia: Lipincot Williams & Wilkins; 2007.
20. Apóstolo, J., Cardoso, D., Marta, L. e Amaral, T. Efeito da estimulação cognitiva em Idosos. Referência. 2011; III (5):193-201.
21. Fortin, M. F. Fundamentos e Etapas do Processo de Investigação. 1ed. Loures: Lusodidata; 2009. ISBN: 978-972-8383-10-7.
22. Orientações sobre Incontinência Urinária [Internet]. Apurologia.pt. 2019 [cited 22 May 2019]. Available from: <https://www.apurologia.pt/guidelines/Incont-Urinaria.pdf>
23. Melo CA. Adaptação cultural e validação da escala "Falls Efficacy Scale" de Tinetti. Ifisionline [Internet]. 2011 [cited 22 May 2019]; 1 (3): 33-43..
24. Petiz E. A atividade física, equilíbrio e quedas um estudo com idosos institucionalizados. Mestrado em Ciência do Desporto, na área de especialização de Atividade Física para a Terceira Idade, pela Faculdade de Ciências do Desporto e de Educação Física - Universidade do Porto (não publicado); 2002.
25. Santos AP, Ramos NC, Estevão PC, Lopes AM, Pascoalinho J. Instrumentos de medida úteis no contexto da avaliação em fisioterapia. Re (habilitar)[Internet]. 2005 [cited 22 May 2019];(1): 131-156.
26. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. J Am Geriatr Soc. 1991 Feb;39(2):142-8.
27. Sequeira C. Cuidar de idosos dependentes. Coimbra: Quarteto Editora; 2007.
28. Alves Apóstolo JL, Batista Cardoso DF, Gonçalves Marta LM, de Oliveira Amaral TI. Efeito da estimulação cognitiva em Idosos. Referência. 2011;II(5)..193-201.

29. Paiva DD, Apóstolo JL. Cognição e Envelhecimento: Estudo de Adaptação Transcultural e Validação do Six Item Cognitive Impairment Test (6-Cit). Escola Superior de Enfermagem de Coimbra, Coimbra. 2013.
30. Ferreira PL. Criação da versão portuguesa do MOS SF-36. Parte I - Adaptação cultural e linguística. *Acta Med Port.* 2000 Jan Abr; 13(1-2): 55-66.
31. Kyrdalen, Ingebjørg L. et al. The Otago Exercise Program Performed as Group Training Versus Home Training in Fall-prone Older People: A Randomized Controlled Trial. *Physiother Res Int.* 2013; 19(2):108-116.
32. Apóstolo JL, Cardoso DF, Rosa AI, Paúl C. The effect of cognitive stimulation on nursing home elders: A randomized controlled trial. *J Nurs Scholarsh.* 2014 May 1;46(3):157-66..
33. Mulasso A, Roppolo M, Liubicich ME, Settanni M, Rabaglietti E. A multicomponent exercise program for older adults living in residential care facilities: direct and indirect effects on physical functioning. *J Aging Phys Act.* 2015 Jul;23(3):409-16.
34. Zelinski EM, Spina LM, Yaffe K, Ruff R, Kennison RF, Mahncke HW, Smith GE. Improvement in memory with plasticity-based adaptive cognitive training: Results of the 3-month follow-up. *J Am Geriatr Soc.* 2011 Feb;59(2):258-65..
35. Gawler S, Skelton DA, Dinan-Young S, Masud T, Morris RW, Griffin M, Kendrick D, Iliffe S. Reducing falls among older people in general practice: The ProAct65+ exercise intervention trial. *Arch Gerontol Geriatr.* 2016 Nov 1;67:46-54.
36. Possamai Menezes, L., Stamm, B., Tambara Leite, M., Hildebrandt, L. e Kirchner, R. Cair faz parte da vida: Fatores de risco para quedas em idosos. *Rev Pesqui Cuid Fundam.* 2016; 8(4):5080
37. Saúde, Direção Geral de. Hipertensão Arterial: definição e classificação. 1ed. Lisboa: DGS; 2013.
38. Brum, P., Forfaz, C., Tinucci, T. e Negrão, C. Adaptações agudas e crônicas do exercício físico no sistema cardiovascular. *Rev Bras Educ Fis Esp.* 2004; 18:21-31.
39. Nelson, M., Rejeski, W., Blair, S., Duncan, P. e Judge, J. Physical Activity and Public Health in Older Adults: Recommendation From the American College of Sports Medicine and the American Heart Association. *Circulation.* 2007; 116(9):1094-1105.
40. Rosqvist, E., Aukee, P., Kallinen, M. e Rantanen, T. Feasibility and acceptability of the pelvic floor muscle and bladder training programme. *Int J Urol Nurs.* 2008; 2(3):113-118.
41. Pereira, V., Correia, G. e Driusso, P. Individual and group pelvic floor muscle training versus no treatment in female stress urinary incontinence: a randomized controlled pilot study. *Eur J Obstet Gynecol Reprod.* 2011; 159(2):465-471.
42. Kapan A, Luger E, Haider S, Titze S, Schindler K, Lackinger C, Dorner TE. Fear of falling reduced by a lay led home-based program in frail community-dwelling older adults: A randomised controlled trial. *Arch Gerontol Geriatr.* 2017; 68: pp.25-32.
43. Emilio EJ, Hita-Contreras F, Jiménez-Lara PM, Latorre-Román P, Martínez-Amat A. The association of flexibility, balance, and lumbar strength with balance ability: risk of falls in older adults. *J Sports Sci Med.* 2014 May;13(2):349-357.
44. Jahana KO, Diogo MJ. Quedas em idosos: principais causas e consequências. *Saúde Colet.* 2007; 4(17):148-153.
45. Fhon JR, Fabrício-Wehbe SC, Vendruscolo TR, Stackfleth R, Marques S, Rodrigues RA. Accidental falls in the elderly and their relation with functional capacity. *Rev Latino-Am Enferm.* 2012; 20(5):1-8.
46. Yardimci, B., Aran, S., Ozkaya, I., Aksoy, S., Demir, T., Tezcan, G. e Kaptanoglu, A. The role of geriatric assessment tests and anthropometric measurements in identifying the risk of falls in elderly nursing home residents. *Saudi Med J.* 2016; 37(10):1101-1108.
47. Guzman AB, Lacampuela PE, Lagunsad AP. Examining the structural relationship of physical activity, cognition, fear of falling, and mobility limitation of Filipino in nursing homes. *Educ Gerontol.* 2015; 41(7):527-542.
48. Riva N, Faccendini S, Lopez ID, Fratelli A, Velardo D, Quattrini A, et al. Balance exercise in patients with chronic sensory ataxic neuropathy: a pilot study. *Journal of the Peripheral Nervous System.* 2014; 19:145-151.
49. Berlezi EM, Martins M, Dreher DZ. Programa individualizado de exercícios para incontinência urinária executado no espaço domiciliar. *Sci Med.* 2013 Oct 1;23(4):232-238.

IMPACTO DE UM TREINO PROPRIOCEATIVO 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 proprioceativo 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 proprioceativo 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 propioceativo 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 \pm 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 $p \leq 0.05$.

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 | 0.002 | 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 | 0.002 | 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 | 0.002 | 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 | 0.002 | 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 | 0.002 | 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 | 0.002 | 4.92 ± 6.59 | 0.034 |
| | | After | 12 | 29.75 ± 21.75 | | 3.75 ± 3.86 | |
| | Tinetti index – Balance | Before | 12 | 14.08 ± 2.02 | 0.011 | 14.67 ± 2.38 | 0.046 |
| | | After | 12 | 15.67 ± 1.15 | | 14.33 ± 2.27 | |
| | Tinetti index – Gait | Before | 12 | 9.75 ± 1.13 | 0.003 | 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

1. 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>
2. 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>
3. 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.
4. 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/>
5. Silvestre MV, Lima WC de. Importância do treinamento proprioceptivo na reabilitação de entorse de tornozelo. *Fisioter Mov*. 2003;16(2):27-34.
6. 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).
7. 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.
8. Sanglard RCF, Pereira JS. A influência do isostretching nas alterações dos parâmetros da marcha em idosos. *Fisioter Bras*. 2005;6(4):255-60.
9. 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.
10. 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.
11. 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.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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 Desenv.* 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;

