

Case Study

Prevent the Loss of Muscle Strength in Community-Dwelling Elders: Interventions and Evidence

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Abstract

Objective: Identify interventions that promote muscle strength in community-dwelling elders and describe its impact in the elder's functionality.

Method: Integrative review of the literature, from available articles in many search engines and data bases. We defined inclusion and exclusion criteria. The descriptors used were “aged or aged, 80 and over”; “frail elderly”; “older people”; “community”; “community-dwelling”; “geriatric assessment”; “functional decline”; “nurs*”, “sarcopenia” e “muscle strength”, associated with the Boolean operators AND and OR.

Results: The seven primary studies that constituted the sample, allowed the answering of the investigation question: “Which interventions promote the muscle strength of community-dwelling elders?”. Physical exercise reduces fragility/weakness, especially in individuals with more risk of functional incapacity and decreases the sedentary behavior. The support of professionals, has impact in the elder's motivation and adhesion.

Conclusion: Formal programs of physical exercise, improve the functionality of the vulnerable elder, decrease the risk of dependency and have impact in self-care. This study allows suggestions to the clinical practice and research.

Keywords

Community; Community Dwelling; Frail Elderly; Functionally-Impaired Elderly

Introduction

Demographic ageing is accompanied by musculoskeletal changes, that interfere in elder's physical capacity and functionality.

Therefore, the researchers recommend the maintenance of physical activity as an important measure to the functional independence [1], denoting that the decrease in muscle strength, balance changes and the consequent decrease in functional independence are predictors of quality of life decrease, therefore increasing health costs [2].

The American Medical Association states that 40% of elders with 80 or more years are weak or fragile, including themselves in the definition of frailty, which can be considered an increased vulnerable state in response to health adverse outcome [3].

The studies consider that, half the physical incapacity of elders, develops due to acute episodes [3,4], as hospitalization, being that muscular weakness, decrease in balance/equilibrium and decrease in exercise tolerance are risk factors to physical incapacity. Hospitalization, besides that, causes a serious aggravation in dependency level, in various self-care domains [5], conditioning post-discharge functionality. The majority of hospitalized elders leave the hospital more dependent, relatively to the pre-hospitalization period.

The results of the studies indicate that after hospital discharge, between 30% and 60% of the elderly continue to lose muscular strength, balance, joint amplitude, which will affect walking capacity and independence [5].

This problematic gets worse, since 20% of the present population has 60 or more years, and its proportion has the tendency to increase between 22% to 32% in 2050 [2,6,7].

It's necessary to mention that the levels of physical activity recommended to persons with 65 years or more, should include walking [8]. Furthermore, and in order to improve cardiorespiratory and muscular capacity, elders should do, at least, 150 minutes of aerobic physical activity of moderate intensity, per week. Or, as an alternative, at least, 75 minutes of aerobic physical

activity of vigorous intensity [8]. However, many of the elderly considered more vulnerable, no longer have gait capacity or have balance changes, that hamper the maintenance of a regular physical activity.

At primary care prevention and in continuity of care, when elders move from the hospital to the community, nurses play a crucial role [5] in the evaluation of the risk of dependence and in the prescription of different types of exercise, according to the clinical condition of the elderly.

Against the above, the main goal of our integrative review is to identify studies that describe the type of physical activity that the elderly in the community should do to avoid the loss of muscle strength. To achieve the objectives of this study we aim to: a) Identify interventions that promote muscle strength in community-dwelling elders and b) describe its impact in the elder's functionality.

Method

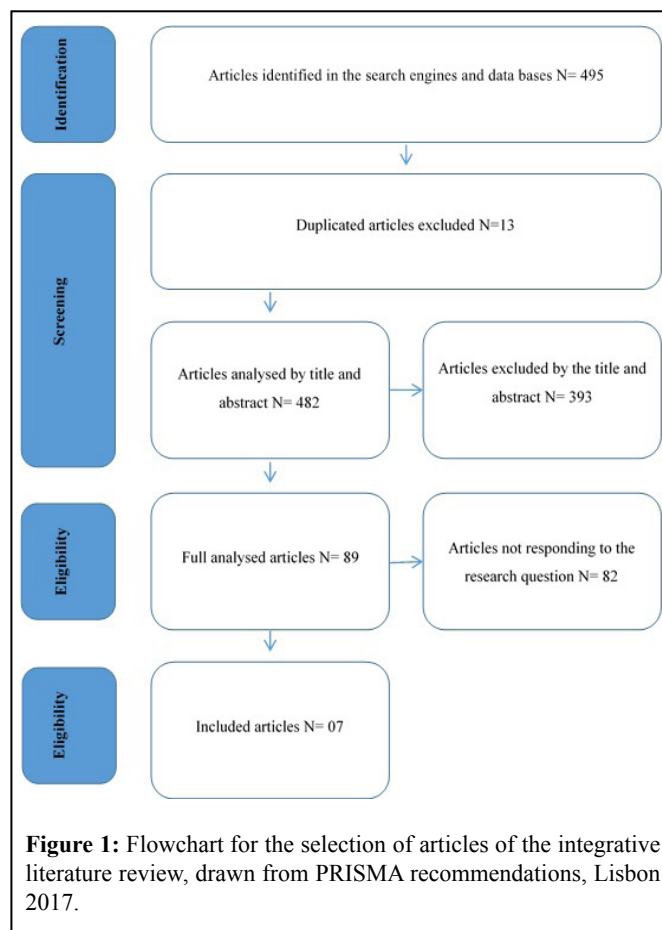
We conducted an Integrative Literature Review (ILR) about the topic in study. The option for this kind of secondary study it's due to the advantages of this method, that allows the search, critical evaluation and summary of the available evidences about the investigated topic. Regarding the systematic review, the integrative review allows the use of a broader set of literary resources [9] and the conjunction of empirical studies, theories and concepts [10], by the supply of a more broader investigation about a certain topic, as well as, by the possibility of drawing general conclusions, highlight issues not resolved and provide guidance for future research. To increase methodological rigor, we used a specific protocol, constituted by six steps [10] and two reviewers to increase reliability of data.

In the first step, it was defined the topic in research and, after a preliminary exploration of available publications, an investigation question was defined, using PICO [11] process: "Which interventions promote the muscle strength in community dwelling elders?"

In the second step, criteria of inclusion and exclusion of studies were defined (Table 1). Inclusion criteria defined included articles published in Portuguese, English or Spanish, articles whose fulltext was available in the selected data bases, articles that included only the age range that characterizes elderly population and articles within the year range of 2013-2016.

We used the following descriptors: "aged or aged, 80 and over"; "frail elderly"; "older people"; "community"; "community-dwelling"; "geriatric assessment"; "functional decline"; "nurs*"; "sarcopenia", "muscle strength", which were used in Portuguese and Spanish languages and in association (AND and OR). The selection of the descriptors was supported by the analysis of the literature gathered in the first step, which allowed the identification of the positioning as a nursing intervention to prevent falls, prevent pressure ulcers and to promote comfort.

The research was conducted between January 2016 and May 2016 in the following data bases PubMed, CINAHL, LILIACS, MEDLINE, B-On and Science Direct databases. We also conducted a manual research in newspapers and books. In (Figure 1), we describe the number of articles found and the number of articles analyzed.



We identified 495 studies. The reading of the titles and authors of all articles in the online search allowed the exclusion of 13 duplicated articles. Then the titles and abstracts were analyzed and the studies that didn't met the inclusion criteria were excluded. Articles that did not address the study object were excluded, mainly because they were not directed only to elderly person, didn't describe the intervention, or had not been developed in community.

e third step, we defined the data to be selected from the included articles (study categorization). A specific instrument was design to extract data from the bibliographic sample into a MS Excel sheet, with the following entries: title, author(s), publication year, article type, goal(s), methods (if applied), evidence level and main results/conclusions, according to the recommendations of the authors [10].

The fourth step was destined to the evaluation of the included sample of studies.

Inclusion Criteria	Exclusion Criteria
Primary studies about interventions with efficacy in the maintenance or increase of muscle strength. Publications of entities and/or experts on the subject. Elders (persons with 65 years old or more) Studies with community dwelling persons. Articles published in Portuguese, English and Spanish. Articles in fulltext.	Studies with children and/or adults. Studies in nursing homes. Studies with hospitalized elders.

Table 1: Document eligibility criteria, Lisbon 2017.

In the fifth step, we interpreted and summarized the results. For last, we did the wording of the final report with the presentation of the review (sixth step). Due to the diversity and heterogeneity of the sources consulted, we opted for the “Narrative Summary”, for the presentation of the results.

Results and Discussion

We included 7 studies in this ILR, which had inclusion and exclusion criteria and validity criteria that were pre-established (Table 2).

The results allowed to answer to the research question. However, they present different evidence levels. The study heterogeneity doesn't permit the meta-analysis and hinders the comparison between the primary studies included in this ILR, since they aren't homogeneous in terms of sample, data collection instrument and used concepts.

Of the 7 articles that integrate the sample, six were published in 2015 [2,12-16] and one in 2016 [17]. About the country of origins, four are from the Unites Stated of America [2,12,13,15], one from the United Kingdom [17], one from Australia [16] and one from Italy [14].

Of the 7 primary studies (S), 3 used qualitative methods, with semi-structured interviews, 3 are random clinical trials and 1 is a longitudinal study.

The samples in the primary studies fluctuate between 19 [17] and 424 [15] community dwelling elders.

With the increase of longevity, one of the main causes of activity restriction in elders is imputed to the musculoskeletal system, which results mobility changes, seriously compromising the performing of activities of daily living and, consequently, quality of life [18].

Of the set of selfcare activities, gait is the one that most influences the others, that is, one that has gait capacity compromised, has an increase of dependency level related to the capacity to transfer oneself, and also in mobilizations, dressing and undressing, and in the use of the bathroom [19]. An IRL, performed

with the general goal of identifying the defining characteristics and related factors of the nursing diagnose “impaired mobility”, states that 72% of the elders have an active “impaired mobility” diagnose [18].

Regular practice of physical exercise, benefits one's health, not only in terms of mobility, but it has been pointed as one of the main preventive measures, relating to the development of certain chronic diseases, namely hypertension [20].

In S1, the investigators implemented a program that included walking, flexibility increase exercises, resistance and muscle strengthening exercises, and concluded that the program reduced fragility, specially in individuals with greater risk to functional, incapacity [15]. Gait is a physical activity modality and ensures independency. Frequently, gait is recommended by nurses as an effective, economic and practical way to do physical exercise [18]. The sooner the elder regains gait capacity, faster he will become independent to other living activities [21].

In S6, the program, with a six-month duration, included warm and equilibrium exercises and a personalized walking program, with professional aid, and resulted in a 25% increase in equilibrium/balance. Gait changes, with shorter steps, modifies the base of support and decreases balance, therefore increasing the very fear of falling [19]. In S2, the intervention program allowed an increase in muscle strength between 22% and 51% and also improved balance.

In S5, researchers [14] implemented a program with the purpose to increase resistance and concluded that aerobic resistance positively affects lower limb strength. These outcomes are important, if we consider that decrease of muscle strength in lower limbs decreases, not only gait capacity, but also compromises elder safety, increasing fall risk [19].

In S4, researchers concluded that after 10 weeks of physical activity (resistance, strength, balance and flexibility exercises), TUGT performance improved in 11%. This data stresses gait importance as a predictor of functionality evolution and elder safety. The one who performs TUGT in more than 12 seconds, has a higher risk of falling, comparing to those who perform it in lesser time [22].

Study	Intervention	Main Results
Study 1 [2]	BioDensity (Bd): Three exercises in the sitting position (“chest press”, “leg press” and “crunch”/ abdominals). Once a week, for 12 weeks with activity, for 20 seconds. PowerPlate (PP): two weekly sessions of 5 minutes each. Bd + PP: two weekly sessions, with a session after Bd. That consists of a static position, in which the person squats, while resting on a horizontal bar. Lift one foot, and then the other, for 60 seconds, after which it rests for 60 seconds. Repeat for three minutes in all five of the exercise.	Increase in muscle strength between 22% and 51%. Improvement of balance
Study 2 [12]	The stakeholders primarily represented Texercise Classic, a relatively unstructured 12-week program designed to encourage individuals to adopt healthy lifestyle habits, such as physical activity and good nutrition. Texercise Classic has a set of resource materials including a handbook that provides: (1) motivational information about why exercise is important; (2) educational information about recommended dietary and physical activity practices; (3) examples of practical exercises for improving strength, endurance, balance and flexibility; and (4) strategies for setting, tracking and maintaining goals. Two weeks of the 12-week Texercise Select are dedicated to participant recruitment activities; the remaining 10 weeks are comprised of 1,5-hour sessions held twice weekly. Each session incorporates an educational component (interactive discussions and activities about exercise and nutrition) and 30-40 min of active participation in PA.	Greater participation in the programs.
Study 3 [13]	Twelve weeks of duration. Exercise twice a week, duration of an hour and a half, in a total of twenty sessions. The sessions exercise resistance, strength, balance and flexibility. Thirty minutes of guided exercise, maximized for forty-five minutes, in progression until the sixth session. Forty-five minutes include: fifteen minutes of strength and strength, ten minutes of balance and five minutes of flexibility.	11% reduction in the Timed Up-and-Go test.
Study 4 [14]	The aerobic endurance and lower body strength testes were from the Senior Fitness Teste (SFT) battery, which measures the underlying physical parameters associated with functional ability and reflects usual age-related changes in physical performance. Aerobic endurance and lower body strength tests were performed in the morning on the same day, with 1 hour of rest between the tests. Aerobic endurance was assessed with: 6-min walking test (maximum distance that a person can walk in 6 min) Lower body strength was assessed with the 30-s chair stand test.	
Study 5 [15]	150 minutes of walking each week, accompanied by a series of flexibility exercises. After each walk, perform 10 minutes of muscle strengthening exercise, centred on the lower limbs. Endurance activities (stationary bicycle), preceded by a brief warm-up.	Reduced fragility. Decrease in sedentary behaviour.
Study 6 [16]	Five to eight warm-up exercises, balance and a personalized walking program. The program includes professional visits at the beginning, after four weeks and after ten weeks. Perform the exercises five days a week, 20-30 minutes, for six months.	25% of the participants recovered their balance.
Study 7 [17]	Uptake of exercise class primarily revolved around older adults’ attitudes. Barriers to exercise uptake were discussed within four subthemes: identity, choice, cost and venue. Older adults had to be motivated by their own reasons to attend. Solutions to barriers to uptake were discussed within four subthemes: provision and language to match identity; offering an opportunity to regain control; a personal touch; and encouraging social support. Focus on offering something different to mainstream exercise opportunities. Offering exercise classes as an alternative to gym. Careful use of language, focusing on function and movement rather than ‘exercise’. It is important to have a personal touch when promoting classes. Peer promotion and word of mouth were the main ways in which instructors said that they recruited new class participants. Instructors fostered commitment by staying in touch with participants, making them feel missed when they were not there, and helping them to return to class. Instructors believe class participants adhere long-term because of outcomes achieved.	Greater participation, motivation and adhesion of the elderly.

Table 2: Bibliographic sample, Lisbon 2017.

Research shows that, to minimize outcomes such as “selfcare dependency”, defining criteria of “functional capacity” need to exist [22], which implies the objective evaluation of muscular atrophy development risk.

Loss of muscle mass prevention in elders, it’s a complex process [23], that implies motivation and adhesion of elders to programs. Adhesion to physical activity isn’t easy, although its innumerable benefits to health and population’s quality of life [24].

In S3, researchers applied a 12-week program, whose main focus is auto-efficacy, through professional support and motivation. And, despite S7 mention that one of the main barriers to adhesion is unrealistic expectations and social influence, S3 researchers concluded that peer interaction and familiarity are enhancers of group activities. Therefore, social interaction is an “added value”, so that elders keep physical exercise and muscle strength increase.

In S7, researchers named four barriers that prevent elders to get close to physical activity programs: identity, choice, cost and venue. Researchers give solutions for all of the barriers mentioned, except for one - provision and language to match identity; offering an opportunity to regain control; a personal touch; and encouraging social support. S3 responds to the venue barrier, emphasizing that participants should be transported to the activities. Such service should be in charge of the professionals. This solution aims to make programs more “user-friendly”, adapting to one’s context, which also resolves poor adhesion. The most presented solutions to this problem, according to S7, are: encouraging commitment, social cohesion and outcomes achieved. All of this fall under the same gat: motivation.

Motivation to exercise should be proactive, based on the benefits for the quality of life of elderly, since reduction of gait capacity decreases self-care capacity and interferes in activities of daily living, instrumental and labor activities accomplishment, leading to greater loss of muscle strength and triggering a vicious cycle between inactivity and weakness [18].

In order to promote muscular strength, it’s a priority to identify management programs for frail elderly individuals, to adapt or create a risk scale for muscular atrophy, to individualize management to client preferences and needs, to individualize intervention to identified risk factors and movement [25].

Conclusion

Muscle strength promotion in elderly may contribute to the reduction of functional decline and the costs associated with the consequences of these changes, such as increased risk of falls, increased risk of pressure ulcers and dependence associated with loss of gait.

Priority exercises to prevent loss of muscle strength in community-dwelling elders are: practice of daily physical exercise, such as walking; isometric and isotonic contractions; exercises to in-

crease muscle strength; strength training exercises and resisted physical exercise (improve muscle strength and functional capacity, and increase strength), 8-10 exercises, involving the main muscle groups, 1-3 series of 8-12 repetitions each; load training (improves quadriceps strength and walking time).

Professional follow-up increases motivation and adherence to physical activity, with benefits in social interaction and therefore the programs must include these two aspects: emotional support from professionals and be carried out in groups. Studies recommend further research, not only for the identification of interventions that increase muscle strength, but also for the construction of instruments to assess muscle decline and its influence on the elder functionality.

In view of the results, for the nursing intervention in the community we recommend the evaluation of the risk of sedentary lifestyle, motivational support appropriate to the clinical condition and functional status of the elderly, with incidence in the performance of endurance exercises, balance and brand promotion, since this is the self-care that most influences the independence to carry out activities of daily living.

Further studies should consider the type of study with randomized clinical trials or quasi-experimental studies and the standardization of the instruments of evaluation of the results to enable comparisons.

For clinical practice, the recommendation is to implement professional monitored activity programs.

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