



## PREVENTION &amp; REHABILITATION: INTERVENTIONAL STUDY

## Six weeks of Mat Pilates training are enough to improve functional capacity in elderly women



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## A B S T R A C T

**Keywords:**  
 Exercise  
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The aim of the study was to evaluate the effect of Mat Pilates on the functional capacity (FC) of elderly women before and after six weeks of intervention. Eighteen women aged 62.28 ( $\pm 2.34$ ) participated in the study. Timed Up and Go test, Timed Up Stairs, Timed Down Stairs, 30-s Chair Stand, Chair Sit-and-Reach and Back Scratch tests were assessed. The results showed significant improvements in all FC tests after six weeks of the Mat Pilates intervention. Summarizing, only six weeks of Mat Pilates training of 60 min per session, three times a week, three series beginning with six repetitions and eight repetitions at the last two weeks of intervention, were enough to improve FC in elderly women. Furthermore, the exercises difficulty increased from beginners to intermediate.

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## Introduction

Science has advanced in numerous health fields resulting in an increase in human life expectancy, both in developed and in underdeveloped countries (Baptista and Vaz, 2009; Silva and Yazbek, 2014). However, technologies have also encouraged sedentary lifestyles that impact negatively on healthy aging (Baptista and Vaz, 2009).

The inevitable process of aging produces physiological (Yin, 2016) and neuromuscular changes (McGregor et al., 2014) that are related. Physiologically, fast-twitch muscle fibers (type II) decrease in number (Deschenes, 2004; Garber et al., 2011) and this reduction leads to sarcopenia, a loss of muscle mass. Consequently, the cross-sectional area of each muscle fiber diminishes with age (Landi et al., 2012; Malafarina et al., 2012; Mitchell et al., 2012).

As a result, the elderly become slower at performing activities of daily living (ADLs) which can be assessed by specific functional capacity tests (Jones and Rikli, 2000; Rikli, 2000; Rikli and Jones, 2013; Ritchie et al., 2005). The authors highlight that ADL performance decrease due to aging process making the elderly slow and sedentary which can also increase the risk of falling. Consequently, this could cause bone fractures confining the elderly to bed and, in some cases, resulting in death. (Janssen et al., 2002; Jeoung and Lee,

2015; Lord et al., 2003).

However, the consequences of the aging process can be delayed by physical activity (Herrero et al., 2015). Aqua-aerobic has shown significant improvements in DLA performance (Alves et al., 2004) as well as strength training that has been widely studied (Correa and Pinto, 2011; Izquierdo and Cadore, 2014; Pinto et al., 2014) or a combination of strength and aerobic concurrent training (Cadore et al., 2014; Herrero et al., 2015). In addition to these type of physical activity, Pilates has been widely employed, by the elderly, to improve life quality (Leopoldino et al., 2013; Vieira et al., 2013; Souza and Brum Vieira, 2006), as it aims to increase strength, flexibility, motor control and muscle resistance (Barker et al., 2014; Geremia et al., 2015).

Pilates can be practiced using different equipment such as: Wunda Chair, Combo Chair, Baby Chair, Universal Reformer, Trapeze, Wall units, Ladder barrel, Small Barrel and The Spine Corrector or without these equipment just by using a mat (Mat Pilates) or other accessories (Medicine balls, Swiss balls, Elastic bands, Magic Circle and so forth) (Owsley, 2005; Wells et al., 2012). Pilates exercises focus more on quality than on repetitions, with exercise difficulty depending on each participants' level of training (beginner, intermediate or advanced), (Owsley, 2005).

However, to date, no study has shown the number of exercise

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repetitions that should be performed at the beginning and during Mat Pilates practice as well as the number of series, time and type of intervals (active or passive). This information would bring more benefits to the elderly who practice Mat Pilates. Therefore, the aim of this study was to verify the effect of Mat Pilates in elderly functional capacity by controlling the number of repetitions, series and degree of exercise difficulty. Hence, the hypothesis of this study was that Mat Pilates improves functional capacity performance in elderly women.

## Methods

### Study design and participants

This study was approved by Santa Catarina's Hematology and Hemotherapy Human Research Ethics Committee (number 44972915.9.0000.0110) Brazil. Thirty-nine elderly women were recruited for this study. Eighteen women aged 62.28 ( $\pm 2.34$ ), height 1.57 ( $\pm 0.04$ ) meters, body mass 67.58 ( $\pm 7.67$ ) kg and fat percentage 41.28 ( $\pm 7.68$ ) completed the intervention (see Fig. 1). All of them lived in Florianópolis, SC, Brazil. Three participants did not practice any kind of physical activity, five practiced aqua-aerobics and seven practiced gymnastics for seniors, in both cases the sessions lasted 50 min, twice a week. All these activities were carried out at the Federal University of Santa Catarina in Florianópolis. Other three participants walked regularly. Before the beginning the study all participants signed the consent form, which was in accordance with ethical research standards following the National Health Council/Ministry of Health, Brazil.

### Procedures

In order to select participants, a questionnaire was applied, as well as the Depression Scale (Yesavage et al., 1983) and the Mini Mental State Examination (Folstein et al., 1983) adapted to Brazilian patients (Almeida, 1998; Brucki et al., 2003). Participants who obtained a score less than 19 in the Mini mental test were excluded (Almeida, 1998), as well as those who had higher score than five in the Depression Scale (Yesavage et al., 1983).

To participate in this study the elderly women had to be older than 60, be available to participate in data collection and in the Mat Pilates training program. The minimum frequency was three times a week (75% or more frequency per month), absence of neurological diseases (Alzheimer's, Parkinson's and multiple sclerosis diseases),

and have a medical physical fitness certificate for the tests and Mat Pilates intervention. In addition, participants could not have practiced Pilates or any kind of systematized strength training six months prior to the beginning of the study.

### Assessments and measures

Activities of daily living were evaluated by the Rikli and Jones (1999) Senior Fitness Test battery of, Rikli and Jones (2013) as well as Butler et al. (2009), Zaino et al. (2004) functional tests. Two trained evaluators applied the tests, which were previously they demonstrated them, according to the following order:

**Timed Up and Go:** this test measures lower limbs agility and dynamic balance. Three repetitions with 1 min of interval between them were performed. The first repetition was in order to get acquainted with the test, while the second and the third repetitions were assessed to choose the best score (Rikli, 2000; Rikli and Jones, 1999).

**Timed Up and Down Stairs:** this test was developed to measure postural control, lower limb strength, power and range of motion and coordination (Zaino et al., 2004). The test was separated in two moments; one for going up and another for going down stairs, and in both situations eight steps of 16 cm were used. Three attempts were completed, the first to get acquainted, the second and the third repetitions were measured to score the best value between them (Butler et al., 2009).

**Thirty Seconds Chair Stand:** this test measures the ability to sit up and sit down from a chair, sofa or bed as well as lower limbs strength, power and resistance. Each participant performed only three repetitions to get used to the test and avoid lower limbs fatigue. After 30 s, the test was performed and the participant had to sit up and sit down as fast as she could during 30 s. If there were errors in the execution of the movement, the test was repeated after 1-min interval (Jones and Rikli, 2002; Rikli, 2000; Rikli and Jones, 1999).

**Chair Sit-and-Reach:** this test evaluates the flexibility of the lumbar and hip joints. Participants sat on the edge of a chair, the preferred leg knee extended with the heel on the floor. The unpreferred leg remained with the knee flexed. Elbows stayed extended with one hand over the other. When the evaluator indicated, the participant inhaled and performed the anterior trunk flexion exhaling air. The reference point for the measurement was the tip of the hallux and the tip of hands phalanges (Jones and Rikli, 2002; Rikli and Jones, 1999; Rikli, 2000). Three attempts were performed, one for getting used and two more, from which the best mark was scored. In addition, when one evaluator recorded the value, the other held the participant's knee to keep it extended.

**Back Scratch:** this test assesses shoulder flexibility and mobility. The elbow of the non-preferred arm stayed flexed behind the back, below the shoulder, with both of the hand palms facing each other; the elbow of the preferred arm flexed over the shoulder with the hand palm facing the back. Participants should try to approximate hands or overlap them and maintain this position for about 2 s. If there was a distance between both middle fingers, the value scored would be negative; if the fingers touched each other, the value recorded was considered zero and when fingers or hands were overlapping, the value would be considered positive. Two attempts were measured and the highest value was considered (Jones and Rikli, 2002; Rikli, 2000; Rikli and Jones, 1999).

Data collection followed the Häkkinen et al. (1998, 2000) protocol which consists on a first evaluation (week -4) and after four weeks participants continued performing ADLs without any kind of physical activity intervention. At the end of the control period, the same tests were performed again (week 0) and Mat Pilates training

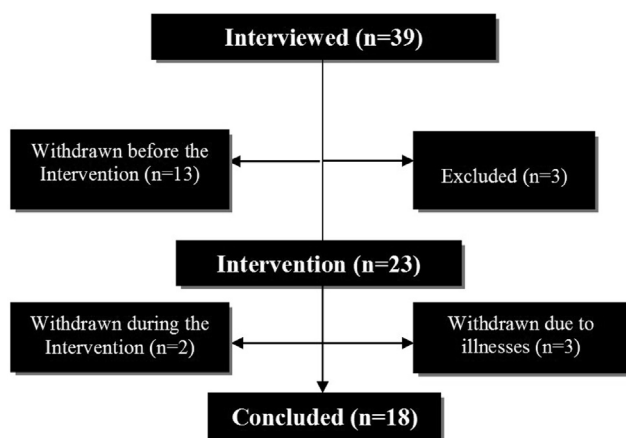


Fig. 1. Flowchart of exclusion criteria, withdraws and conclusion of Mat Pilates intervention.

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