



PILOT STUDY

# Increased strength of the scapular stabilizer and lumbar muscles after twelve weeks of Pilates training using the Reformer machine: A pilot study



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## KEYWORDS

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**Summary** *Objective:* The aim of this work was to analyze muscle strength in Pilates novices who used the Reformer equipment during twelve training sessions.

*Methods:* Twenty-four healthy young female volunteers, who were non-smokers and did not exercise regularly, were split into a control group (mean age  $28 \pm 4$  years and BMI

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24.55 ± 3.21 kg/m<sup>2</sup>) and a training group (mean age 29 ± 4 years and BMI 22.69 ± 2.87 kg/m<sup>2</sup>). The data were checked for normality using the Kolmogorov–Smirnov test, and were then analyzed using the t-test ( $p < 0.05$ ).

**Results:** After the training sessions, there were statistically significant differences between the groups for the scapular stabilizer muscles ( $p = 0.0263$ ) and the lumbar muscles ( $p = 0.0001$ ). For the scapular stabilizers, the initial/final values were 14.69 ± 2.80/14.79 ± 2.89 (control group) and 15.99 ± 3.54/17.44 ± 2.88 (Pilates group). The corresponding values for the lumbar muscles were 53.83 ± 11.66/53.28 ± 11.14 (control group) and 54.75 ± 10.27/64.80 ± 10.20 (Pilates group).

**Conclusion:** After twelve sessions of Pilates with the Reformer equipment, there were improvements in lumbar extensor and scapular stabilizer strength. Several benefits are reported by practitioners of Pilates, but until now, there has been limited scientific evidence of the improvement of strength in the trunk and limbs after application of the technique.

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## Introduction

Muscle strength can be defined as the tension generated by the muscles in order to cause contraction, which is classified as isometric/static or dynamic (McCardle et al., 2008). Muscle strength is very important for the performance of daily activities, since it provides independence, agility, and safety, maintaining physical fitness and overall health (Valls et al., 2014). Currently, in Brazil there are no public health guidelines concerning physical activity as a strategy for health (Sebastião et al., 2014). However, the Brazilian Guidelines on Cardiovascular Prevention state the need to implement comprehensive strategies to encourage the practice of sports throughout life, from childhood to old age (Simão et al., 2013).

The most common types of strength training are free weight lifting or the use of devices that offer resistance. Enhanced strength training requires application of the principle of overload, increasing the amount of resistance used over time. Increased muscle strength results from the muscle being forced to endure relatively high tensions. This strength training method is called progressive resistance exercise (Powers and Howley, 2009).

There are various forms and methods of achieving increased muscle strength. One is Pilates. There have been several positive reports regarding its benefits (Granacher et al., 2013; Oliveira et al., 2015), although limited scientific evidence is available (Aladro-Gonzalo et al., 2012). The Pilates method is a comprehensive body-conditioning technique that aims at the development of both the body and the mind of the individual. To this end, Pilates incorporates six key principles: centering, concentration, control, precision, breath, and flow (Latey, 2002). Pilates-based core stability training is a precise, controlled form of exercise using the stabilizing muscles of the body (Kilber et al., 2006). The exercises that make up the method emphasize isometric contraction of the core muscles. This strength center consists of the abdominal muscles (the transversus abdominis), the deep extensors of the spine, and the pelvic floor muscles (Marés et al., 2012; Silva and Mannrich, 2009; Key, 2013).

The Reformer is an item of resistance exercise equipment designed by Joseph Pilates. It consists of a platform

that moves back and forth along a carriage. Resistance is provided by the exerciser's body weight and by springs attached to the carriage and platform, and the training performed with this device complies with the principle of overload.

The question to be addressed here is whether there are any changes in the strengths of the lumbar extensor or scapula stabilizer muscles, after Pilates training sessions using the Reformer device. The aim of this study was therefore to analyze the strengths of these muscles in a control group and in a group of Pilates novices who were submitted to twelve sessions of Reformer training.

## Material and methods

### Subjects

This pilot study design was classified as quantitative, experimental, descriptive, and longitudinal. The work was approved by the Research Ethics Committee of Universidade Federal do Triângulo Mineiro (protocol number 2406). The volunteers signed informed consent forms after being advised about the objectives and procedures of the study.

The participants consisted of 24 healthy young adult female volunteers, aged between 21 and 34 years, who were self-reported non-smokers and were not engaged in any regular mode of exercise. This was a simple random sample, whose size was chosen according to the literature (Dias et al., 2008; de Oliveira Menacho et al., 2013). Using closed envelopes, the participants were randomly allocated to one of two groups: a training group (TG,  $n = 12$ ) or a control group (CG,  $n = 12$ ).

### Experimental design

The TG volunteers were first submitted to a session of muscle stretching performed on the ground. The aim was to prepare the muscles for the exercises and help to reduce the incidence of muscle strains, although the scientific evidence is mixed concerning the effectiveness of this practice in preventing lesions (Kisner and Colby, 2005; Simic

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