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THE EFFECT OF FIVE WEEKS OF RESISTANCE BAND EXERCISE ON HANDGRIP STRENGTH IN WOMEN WITH POSTMENOPAUSAL OSTEOPENIA / OSTEOPOROSIS

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Abstract

Fifteen women with osteopenia / postmenopausal osteopenia (55.5 ± 2.1 years old) participated in a strength program for a period of 5 weeks (twice a week). Both at the beginning of the study and at the end of the study, the clenching force of the fist was measured, using the JAMAR dynamometer. At the end of the study, there was an increase by 11.8% in handgrip strength in the dominant hand compared to the initial test, $p < .001$ and by 15.3% for the non-dominant hand, $p < .001$.

Introduction

Increased bone turnover and low mineral density that result in increased risk of fractures and increased bone fragility define osteoporosis, with osteoporosis being a condition that makes bones thinner and loses strength over time. This condition is more common in women, especially postmenopausal women, and the incidence of women with osteoporosis worldwide is estimated to reach 30% [1].

Recently, many instruments have been developed to measure the risk of osteoporotic fractures, a well-known instrument called FRAX, which was introduced in 2008 and which calculates, based on specific formulas and algorithms, the probability that a person to suffer from osteoporotic fractures in the next 10 years. Risk areas are the hip, spine, humerus or wrist – distal radius fractures) [2].

Particular emphasis is placed on the prevention of osteoporosis or, if osteoporosis has already set in, on the prevention of osteoporotic fractures. Thus, preventive measures include an optimal intake of calcium (1200 mg / day for women aged 50 or over) and vitamin D (between 1000 and 2000 international units, daily), as well as avoiding excessive alcohol consumption and of beverages containing caffeine, quitting smoking and adopting a lifestyle as active as possible, thus avoiding sedentary lifestyle (minimum 30 minutes of physical activity per day is recommended). There are also markers of bone turnover that can be tracked,

which predict the evolution of osteopenia or osteoporosis, a high level of these markers suggesting a more accelerated loss of bone mineral density [3].

Globally, osteoporosis affects many people, both men and women, and the incidence rate of fractures is estimated to reach 9 million [4], [5]. The consequences of osteoporotic fractures affect not only the mental state of patients, but also the economy, because the costs for hospitalization and care of patients who have suffered osteoporotic fractures are very high [6], [7].

Material-method

Fifteen women with osteopenia / postmenopausal osteopenia (55.5 ± 2.1 years old) participated in a strength program for a period of 5 weeks (twice a week). The training program took place twice a week, and each training session lasted 40 minutes. The included exercises targeted the muscles of the arm, forearm, muscles of the back and chest: elbow flexion, extension of the elbow, horizontal adduction of the arm, horizontal abduction of the arm. All exercises were performed using resistance band. Each training session included 3 sets of each exercise mentioned above, with a number of 12 repetitions per series. The rest between sets was 1:30 – 2 minutes. Both at the beginning of the study and at the end of the study, the clenching force of the fist was measured using the JAMAR dynamometer. Parametric t test was used to determine if there were changes between the initial test and the final test. Cohen's D effect size was also calculated and reported, is to refer to effect sizes as small (d = 0.2), medium (d = 0.5), and large (d = 0.8). The Pearson correlation was used to analyze whether there are correlations between patient age and handgrip strength. From sitting on the chair, the participant will hold the dynamometer in his hand, at a 90° angle between the forearm and the arm, the hand in pronosupination, and the elbow next to the body. From this position, the participant will tighten the dynamometer as much as possible and hold for 5 seconds. It will be repeated 3 times in a row, with a break of 15 seconds between attempts. The best result will be recorded. This test applies to both hands.

Results

Table 1 provides information on BMI, bone mineral density, age, handgrip strength.

At the end of the study (M = 30.87, SD = 2.2), there was an increase (Δ = 11.8%) in handgrip strength in the dominant hand compared to the initial test (M = 27.6, SD = 2.03), parametric t test showing that the difference was statistically significant $t_{(14)}$ = -6.06, p < .001, 95% CI [-4.42, -2.11] d = 1.62. In the case of the non-dominant hand, the handgrip strength increased (Δ = 15.3%) at the end of the 5 weeks (M = 30.67, SD = 1.8), compared to the initial testing (M = 26.6, SD = 2.4), $t_{(14)}$ = -12.88, p < .001, 95% CI [-4.74, -3.39] d = 3.44 (Figure 1).

Table 1. Descriptive Statistics

	Range	Minimum	Maximum	Mean	SD	Variance
Age	7.00	52.00	59.00	55.53	2.09989	4.410
BMI	8.08	20.15	28.23	23.79	2.80774	7.883
BMD L1	0.13	0.70	0.831	0.752	.039001	0.002
BMD L2	0.12	0.74	0.862	0.799	.038311	0.001
BMD L3	0.21	0.75	0.963	0.842	.071312	0.005
BMD L4	0.19	0.74	0.933	0.841	.080394	0.006
BMD	0.09	0.77	0.862	0.810	.037228	0.001
TOTAL						
HG_D	7.0	24.0	31.0	27.6	2.03	4.1
HG_ND	8.0	22.0	30.0	26.6	2.4	5.5

Note. BMI = Body Mass Index; BMD = Bone Mineral Density; HG_D = Handgrip (dominant hand); HG_ND = Handgrip (non-dominant hand).

A correlation was found between BMI and non-dominant handgrip strength (r = .561, p = .03). A correlation was found between BMI and handgrip strength, but statistically insignificant (r = .487, p = 0.06).

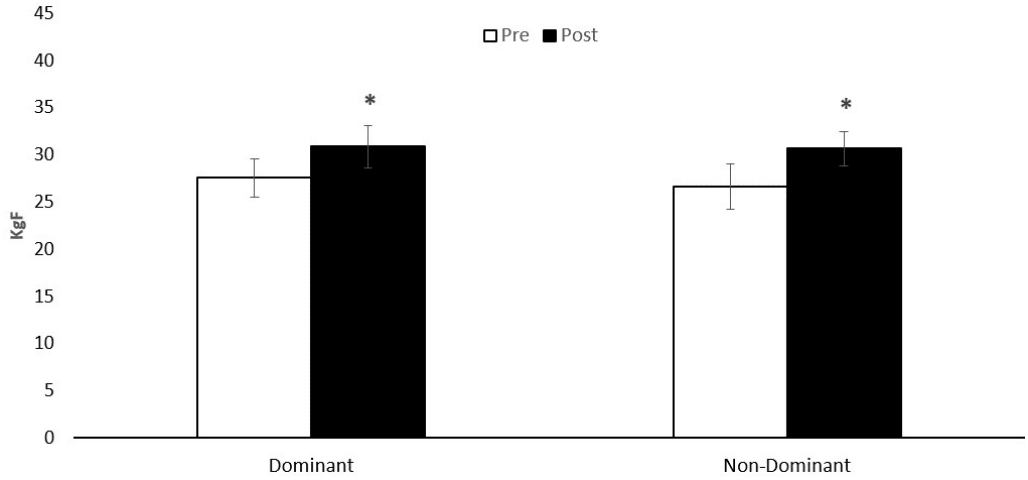

Figure 1. Baseline and Final Results For Handgrip Strength Test. Symbol (*) indicates intra-group difference (p < .001).

Conclusions

Strength training with strong bands seems to improve the strength of the fist in women with osteopenia / postmenopausal osteoporosis, after 5 weeks of exercise, twice per week, using the resistance bands.

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