

IMPACT OF STRENGTH TRAINING PROGRAM ON PHYSICAL FITNESS AND PSYCHICAL CONDITION FOR ELDERLY WOMEN

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ABSTRACT

Research background and hypothesis. There is a lot of research proving that physical activity improves psychical condition when there are symptoms of psychical illness. There is also a wide range of studies carried out investigating the impact of physical activity on physical abilities, but little is known how strength training program as a factor improves psychical condition and, at the same time, body composition, strength and endurance for elderly woman.

Research aim was to study the impact of an 8-week strength training program on physical fitness and psychical condition for elderly women.

Research methods were literature review, HADS to evaluate anxiety and depression symptoms, anthropometry, strength and endurance testing, statistical analysis of physical fitness and psychical condition indices.

Research results. In the period of 8-week strength training program we found that it had a positive impact on the indices in the experimental group compared to those in the control group. Psychical condition and strength results in experimental group were statistically significant ($p < 0.05$); a significantly different change in aerobic endurance was measured during the 2 min step test. BMI and the body composition measures did not change statistically significantly.

Discussion and conclusions. The main finding is that an 8-week strength training period had a significant impact on psychical condition for elderly women. Moreover, strength training exercises improved upper and lower body muscle strength. Endurance improvement was observed during 2-min step test, but 6-min test results were insignificant ($p > 0.05$). After the 8-week training period, no significant differences in BMI and body composition were observed, although there was a slightly tendency of decrease in the experimental group.

Keywords: elderly women, physical fitness, psychical condition, 8-week strength training programme, HADS, BMI.

INTRODUCTION

According to the population census of 2011, carried out by the Department of Statistics of the Republic of Lithuania, over the recent decade, the population decreased by 440.6 thousand or by 12.6%. At present, the population of Lithuania totalled to 3 million 43 thousand. As many as 650 934 people in Lithuania are of the retirement age. Among them 215 718 are men and 435 216 are women. According to the Lithuanian Department of Statistics, there are 50% more women of retirement age than men. Since 2001 the number of retired population has increased,

respectively, from 20.2 per cent to 21.4 (*Lietuvos statistikos departamentas*, 2011).

It has been found that health related problems, living alone, poor communication and activity in social life, feeling of loneliness lead people to social disjuncture. Usually social disjuncture is the result of a certain psychical condition (Cornwell, Waite, 2009).

Clinical tests investigating the impact of physical activity on psychical conditions identified that constant physical loads had a positive impact on psychical condition, improved wellness and had

a positive impact on mood and personal motivation. Inconsistent physical loads had a little impact on psychological condition and did not improve personal motivation. It was found that physically active adults had a lower risk of depression and cognitive decline compared with inactive or less physically active adults (Dunn et al. 2002; Elsaywy, Higgins, 2010).

It is well known that aging is related with muscle atrophy. Aging is associated with the loss of muscle mass, muscle strength and muscle fibre mass. Scientific studies have shown that muscle mass tends to decrease gradually, the largest changes are observed from 50 up to 80 years of age. It has been found that muscle strength decline is much faster and more dramatic rather than the decline in muscle mass. The decline in strength and muscle mass has a tight relation with functional limitations and worsening of health condition (Williams et al., 2002; Faulkner et al., 2007; Koster et al., 2011).

The **aim** of the current research was to study the impact of an 8-week strength training program on physical fitness and psychological condition for elderly women.

RESEARCH METHODS

Research sample included twenty five volunteering women at the age of retirement, from 64 up to 85 years of age (anthropometry characteristics are presented in Table). All participants were divided into two groups: experimental ($n = 13$) who underwent strength training program and control group ($n = 12$). Experimental group underwent an 8-week strength training program three times a week for one and half an hour. Participants of both groups were tested at the beginning and at the end of the study.

Research methods. At a baseline and after the 8-week training period, participants were weighted using scales (Tanita TBF 300, JAV), the height of the participants was measured using wooden meter ruler. Body Mass Index (BMI) was measured according the formula: $BMI = \text{mass (kg)} / \text{height (m)}^2$ (Janssen et al., 2002).

Body composition indices were taken using a centimetre measuring tape. For all participants the measures were made at crank web of the dominant hand, chest, waist, hip and femur at the dominant side of the body.

To evaluate the psychological condition of the participants, we used HADS (Hospital Anxiety and

Depression Scale – HADS), which was developed to identify anxiety disorders and depression among patients in non-psychiatric hospital clinics (Bjelland et al., 2002).

To measure upper body muscle strength, we used JAMAR® hydraulic hand dynamometer, hand grip strength was measured in kilograms. We also used a 30 s arm curl test hanging 2 kg weight (Rikli, Jones, 2001).

Lower body muscle strength was measured performing 30 s chair stand test (Rikli, Jones, 2001).

To assess aerobic endurance of legs, we used a 6-min walk test (Rikli, Jones, 2001; Reguero et al., 2009) and a 2-min step test (Rikli, Jones, 2001).

Statistical analysis of the research data was carried out using *Microsoft Excel* and *SPSS (Statistical Package for the Social Science)* version 17.0.

The following parameters were calculated: arithmetic mean (\bar{x}), standard deviation (\pm SD), ANOVA single factor analysis and index p for statistical significance. The level of significance was set when $p < 0.05$.

Table. Anthropometric characteristics of the participants

Participants Index	Experimental group n = 13	Control group n = 12
Age, years	73.5 \pm 7.2	74.7 \pm 6.6
Height, cm	157.9 \pm 5.5	158.1 \pm 6.4
Wight, kg	58.5 \pm 8.4	54 \pm 6.4

RESEARCH RESULTS

Research results showed that in the experimental group BMI at the beginning was 25.1 (4.5) and after an 8-week strength training program it was 24.8 (3.8), in the control group it was respectively 22.1 (3.5) and 22.1 (3.4). There was no statistically different change in the both groups in BMI. Evaluating body composition measure, we observed only slight changes ($p > 0.05$).

After the 8-week training period, significant changes were observed in psychological condition in the experimental group. Results showed that anxiety symptoms decreased from 12.0 (2.3) to 9.8 (1.6) after the training period ($p = 0.009$) and depression symptom values were 11.2 (2.9) at the beginning, and after the 8-week strength training period they decreased to 9.2 (1.6), ($p = 0.04$) (Figure 1). At the same time the results in the control group slightly improved, but the changes were insignificant ($p > 0.05$).

Analysis of variance showed a statistically significant difference between the right ($p = 0.00001$) and left ($p = 0.0004$) hand dynamometry measurements in the experimental group. Right hand grip results at the beginning were 21.3 (3.35) kg and after the strength training period they were 27.4 (2.2) kg, left hand – 20 (3.7) kg and 25.4 (2.9) kg (Figure 2). In the control group test results were insignificant ($p > 0.05$).

30 s arm curl test results showed statistically significant changes ($p = 0.01$) only in the right hand results. Results were 13 (3.3) before the training program and 16 (3.2) after an 8-week strength training (Figure 3). There were no changes recorded in the control group.

Assessment of lower body strength showed that in the experimental group results improved

statistically significantly ($p = 0.003$). From the 10.5 (2.3) starting strength program and at the end of it 13.3 (2.2) (Figure 4). There was seen the decreasing tendency on the results at the control group, but there was no statistical different changes.

6-min walk test results showed no significant changes in the aerobic endurance improvement in both groups.

Statistically significant improvement was measured in the experimental group results during a 2-min step test ($p = 0.01$). At the beginning the result was 63.2 (13.6) and after an 8-week strength training program it was 76.1 (11.3) (Figure 5). We observed decreasing results in the control group – from 62.1 (14.8) and to 60.8 (13.4) after the 8-week period, but the change was insignificant ($p > 0.05$).

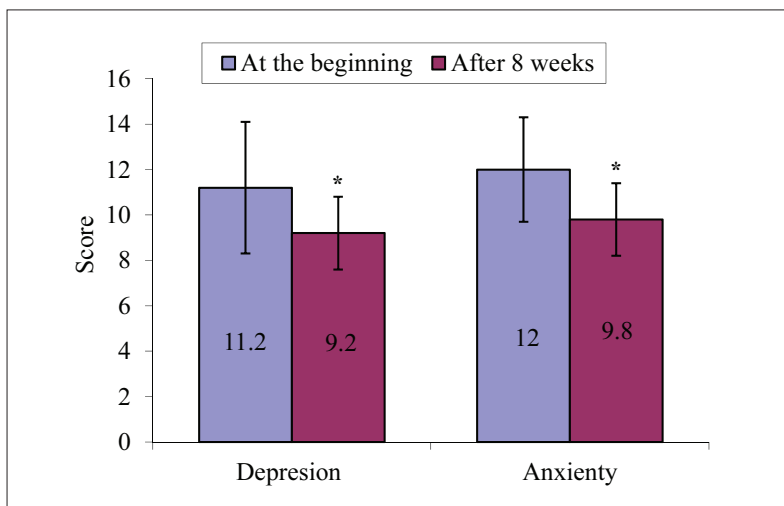


Figure 1. Depression and anxiety symptoms in the experimental group at the beginning and after an 8-week strength training program

Note. * – statistically significant difference ($p < 0.05$).

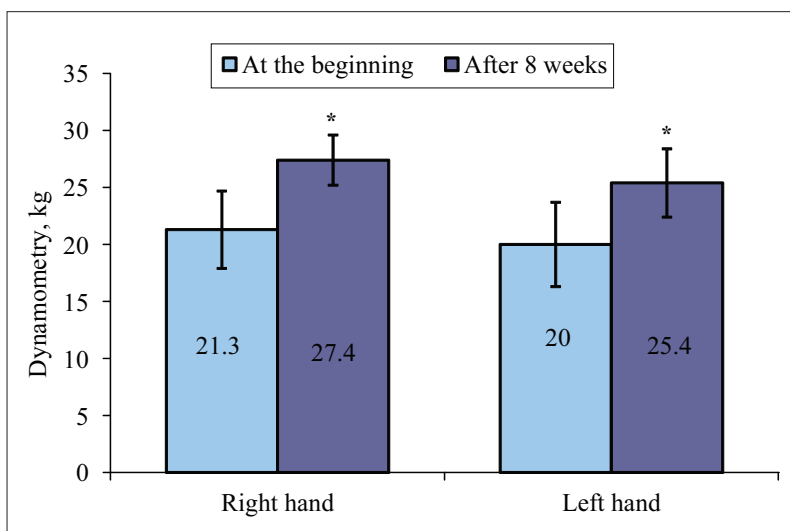
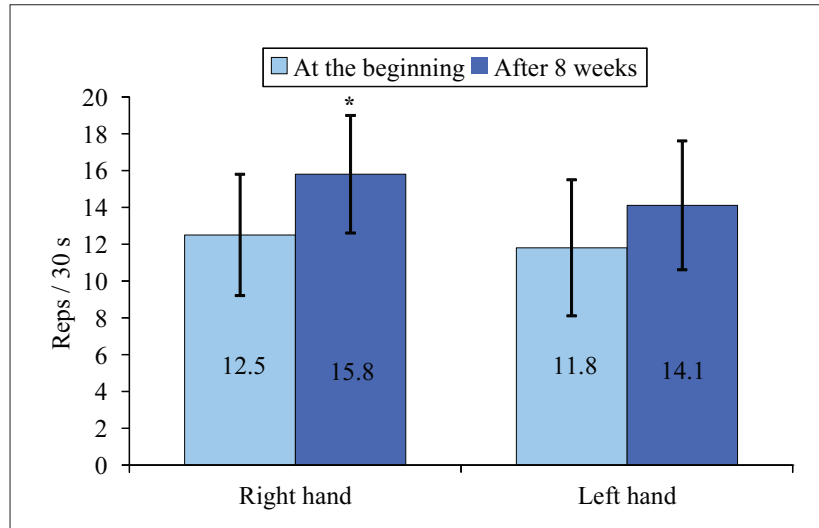


Figure 2. Hand dynamometry results in the experimental group at the beginning and after an 8-week strength training program

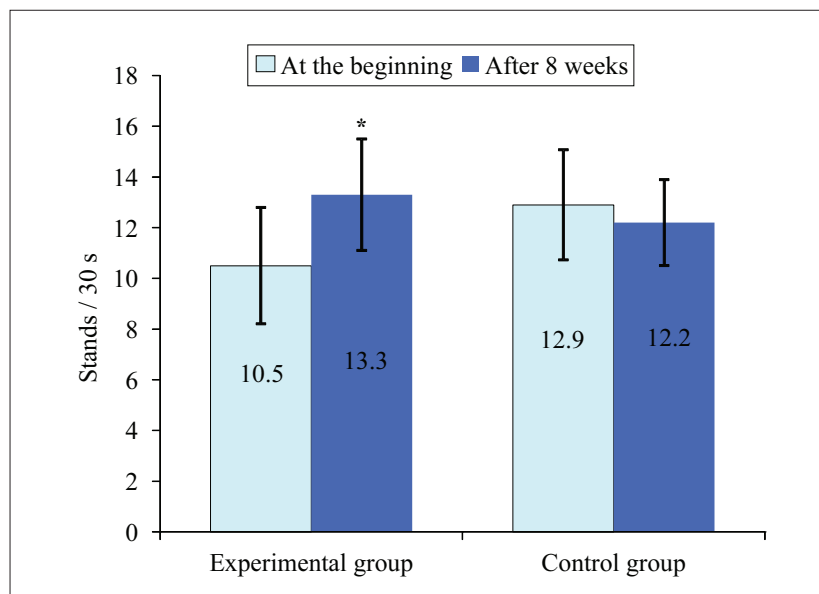
Note. * – statistically significant difference ($p < 0.05$).

Figure 3. 30 s arm curl test results in the experimental group at the beginning and after an 8-week strength training program



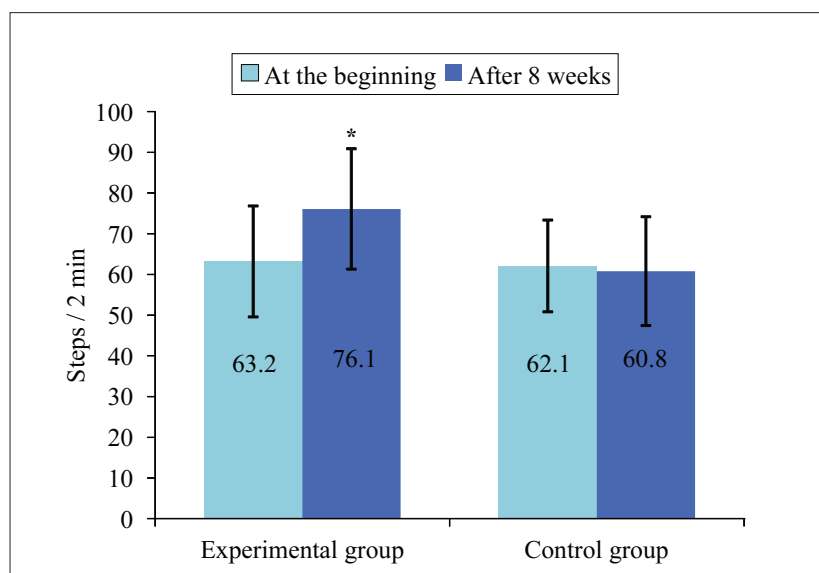
Note. * – statistically significant difference ($p < 0.05$).

Figure 4. 30 s chair stand test results at the beginning and after 8-week period in the experimental and control groups



Note. * – statistically significant difference ($p < 0.05$).

Figure 5. 2-minute step test results at the beginning and after an 8-week period in the experimental and control groups



Note. * – statistically significant difference ($p < 0.05$).

DISCUSSION

Numerous studies note that physical activity is the one of the methods for elderly people to improve their independent life from other people (Williams et al., 2002; Faulkner et al., 2007; Elsayy, Higgins, 2010; Koster et al., 2011). Adapted strength training program for elderly people improves muscle strength and endurance. An 8-week strength training program results in physical fitness go together with the results of the research made by T. R. Henwood and colleagues (2008). Strength training programs for elderly people gives significant increment in strength participating 30 s arm curl test, 30 s chair stand test and 2-min step test (Bates et al., 2008). Results of 8-week strength training period showed statistical significant differences in the experimental group results in these tests.

Scientific studies have shown that muscle mass and strength slightly start to decrease from 50 to 80 years of age, but muscle endurance remains unchanged for a longer period of time (Faulkner et al., 2007; Koster et al., 2011). 2-min step test and 6-min walk test purpose is to assess aerobic endurance. Strength training program made positive impact on lower body strength, but there were fewer exercises to improve aerobic endurance. We believe that this is the reason why the results of the 2-min step test increased statistically significant while 6-min walk test results were insignificant in both groups.

A. L. Dunn and colleagues (2002) identified that constant physical loads had a positive impact on psychical condition, improved wellness and had a positive impact on personal motivation. B. Elsayy and K. E. Higgins (2010) found that

physically active older adults had lower depression symptoms compared with inactive adults. All these results are similar with our results on the strength training program impact for elderly women's physical condition; we found significant decrease in anxiety and depression symptoms in the experimental group, in this group participants communicated with each other during the training sessions, after each training session there was a discussion about the impact of the exercises and the participants noted that they were in a better mood after the training session. At the same time, we observed slightly improving results in the control group.

After the strength training period, no significant difference in BMI and body composition indices were observed. We believe that this is because of the short time of training period and the impact of nutrition. According to B. Strasser's et al. (2009) 6-month strength and endurance training programme results, there were no significant changes in body weight, but the difference was observed in the percentage of body fat.

CONCLUSIONS AND PERSPECTIVES

The main finding is that an 8-week strength training period made a significant impact on psychical condition for elderly women. Moreover, strength training exercises improved upper and lower body muscle strength. Endurance improvements were seen during 2-min step test. After the 8-week training period no significant difference in BMI and body composition indices were observed, although there was seen a tendency of slight decrease in the experimental group.

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JĖGOS PRATYBŲ POVEIKIS SENYVO AMŹIAUS MOTERŲ FIZINIAM PAJĖGUMUI IR PSICHOLOGINEI SAVIJAUTAI

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SANTRAUKA

Tyrimo pagrindimas ir hipotezė. Atlikta nemaŹai moksliniŲ tyrimŲ, kurie įrodo fizinio aktyvumo poveikį asmenŲ psichinei būklei esant tam tikrai simptomatikai ar ligai. Labai plačiai tyrinėjamas ir fizinės veiklos įtaka asmenŲ fiziniams gebėjimams, tačiau maŹai žinoma tyrimŲ, kurie nustatyti jėgos pratybŲ poveikį senyvo amŹiaus moterŲ psichosocialinei būsenai ir kūno kompozicijos, raumenŲ jėgos ir ištvėrmės pokyčius.

Tikslas – nustatyti jėgos pratybŲ poveikį senyvo amŹiaus moterŲ fiziniam pajėgumui ir psichologinei savijautai.

Metodai: literatūros Źaltinių analizė, HADS skalė nerimo ir depresijos simptomatikos poreiŹiui nustatyti, antropometrija, raumenŲ jėgos ir ištvėrmės testavimas, rodikliŲ statistinė analizė. Jėgos ir ištvėrmės testai buvo taikomi pagal senjorŲ normatyvines skales.

Rezultatai. Nustatyta, kad aštuoniŲ savaičių jėgos pratybos teigiamai veikia senyvo amŹiaus moterŲ psichologinę būseną. VisŲ jėgos nustatymo testŲ rezultatai tiriamojoje grupėje statistiškai reikŹmingai pagerėjo ($p < 0,05$), statistiškai reikŹmingi ištvėrmės pokyčiai užfiksuoti atliekant dviejŲ minučių Źygiavimo vietoje testą. KMI ir kūno apimtys kito maŹai ($p > 0,05$).

Aptarimas ir išvados. Jėgos pratybos senyvo amŹiaus tarpsniu teigiamai veikia moterŲ psichologinę būseną. Tyrimo rezultatai parodė statistiškai reikŹmingus pokyčius. Tiriamojoje grupėje KMI ir kūno apimčių rodikliai statistiškai reikŹmingai nepakito, tačiau buvo matoma ŹiŲ rodikliŲ maŹėjimo tendencija. Nustatyta, kad jėgos pratybos teigiamai veikia senyvo amŹiaus moterŲ viršutinės ir apatinės kūno daliŲ raumenŲ jėgą. Statistiškai reikŹmingi ištvėrmės pokyčiai užfiksuoti atliekant dviejŲ minučių Źygiavimo vietoje testą.

RaktaŹodŹiai: senyvo amŹiaus moterys, jėgos pratybos, psichologinė būseną, fizinis pajėgumas, aštuoniŲ savaičių jėgos pratybŲ programa, HADS skalė, KMI.

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