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THE EFFECT OF INDIVIDUAL EXERCISE AND GROUP EXERCISE TRAINING ON PHYSICAL PERFORMANCE IN HEALTHY WOMEN

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Abstract: The aim of the study was to compare the effects of individual exercise and group exercise training on the physical performance of healthy women. 26 healthy volunteer women participated in the study. Participants were randomly assigned to two equal groups. Participants completed a general demographic information form and physical performance tests. The Lafayette Manual Muscle Tester was used to evaluate the participants' muscle strength to establish their physical performance. In order to evaluate muscular endurance, the time that participants remained in squat, sit-up and push-up positions was recorded. An agility rating was determined using the Burpee Test, while a flexibility rating was made using the Sit and Reach Test. Exercise training was applied to individuals in both groups as 3 sessions per week for 8 weeks. Wilcoxon Signed Ranks test was used for comparison between groups. Mann Whitney U test was used to determine the difference between the groups before and after treatment. According to the data collected from individuals, in both groups an increase was seen in muscle strength, muscular endurance, agility and flexibility scores ($p<0.05$). For all parameters, neither group showed superiority ($p>0.05$). It was concluded that exercise training positively affected physical performance; however, it did not make a difference whether the exercise was done individually or in a group.

Keywords: Endurance, Exercise, Flexibility, Muscle strength, Physical performance

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1. Introduction

Exercise is included in physical activity. It is a concept that provides protection or improvement in physical fitness parameters such as repetitive, personalised, muscle strength, endurance, flexibility and agility (Ardıç, 2019). Regular exercise benefits body composition and is important in terms of maintaining physical fitness and preventing disorders that may occur later in life, including osteoporosis, balance problems, falls and fractures as a result of balance disorders, diabetes mellitus and cardiovascular disease (Alkadhi, 2018). When one looks at the distribution by gender of these disorders which can be prevented through physical activity, it is seen that they are most common in women (Barker and Eikmeyer, 2020).

Considering the physiological and anatomical structure of women, bone density is 50% less than that of men. Limb length is shorter than men, gynecoid pelvis is present and legs tend to be in a valgus position. Shoulders are narrower and protruding when compared to men, hands and feet are smaller and improvement rates of kyphosis, lordosis and scoliosis are much higher. The strength of joints and ligaments is weaker than men, and bone structure is fragile.

When we consider the low joint strength, less ligament strength and more bone fragility, the risk of injury and osteoporosis is higher than men.

Muscular strength training, which is among the physical fitness parameters, has a positive effect on the musculoskeletal system and body composition, including bone, joint and tendon structures. It minimises the risk of osteoporosis and fractures, especially in women, by increasing bone density and decreasing fragility (Vanhees et al., 2005; Liberman et al., 2017). Flexibility is crucial to physical fitness as an inflexible individual will struggle during exercise. Aerobic physical activity increases exercise tolerance.

In a study comparing the effects of underwater and aerobic exercise on physical fitness parameters, an increase in physical fitness parameters was found between the groups (Vanhees et al., 2005; Çolak, 2008). In addition, in a study conducted on healthy male individuals doing group exercise training, it was found that male individuals who received group Pilates training experienced a higher increase in flexibility (Akyurt, 2019). There are studies in the literature comparing the effects of individual and group exercise training on some diseases or on healthy individuals (Korkmaz, 2020). However, there is no study comparing the effects of individual and group exercise in evaluating physical performance in healthy females.

Our study aimed to compare the effects of individual

exercise and group exercise training on physical performance in healthy women.

2. Materials and Methods

This study was carried out in Hasan Kalyoncu University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation between 2017 and 2018. The study was initiated with female individuals who read the Volunteers Information and Consent Form and agreed to participate in the study.

13 female individuals for the individual exercise group (age mean, 33,8 ± 8,8) and 13 females for the group exercise group (age mean, 37 ± 9) participated in the study. Individuals were randomised using the sealed envelope method in which groups A and B were separated. During our 8-week study, no individual was excluded from the study.

The inclusion criteria for the study were presented below;

- No obstacle to exercise
- Without severe cardiovascular and respiratory system distress that would limit exercise capacity
- Not included in any exercise program in the last 6 months
- Cooperative female individuals were included in the study.

The exclusion criteria from the study were presented below;

- Pregnancy status
- Loss of balance due to loss of consciousness or dizziness
- Those who refused to participate in the exercise training were not included in the study (Ağaoğlu, 2015).

After obtaining general demographic information from participants, the physical performances of the individuals were measured. The information recorded for the individuals participating in the study included age, height, weight, body mass index, education level (illiterate, literate, primary school graduate, secondary-high school graduate, university graduate, master's/doctorate degree), profession, diagnosed illnesses and surgical information. Flow diagram of the study are present in Figure 1.

2.1. Exercise Protocol

Participants were given an 8-week programme consisting of a 1-hour exercise programme per day, 3 sets of 10 repetitions, 3 days a week. For their hour-long programme, those taking part in individual exercise did warm-up exercises (brisk walking at a steady pace on a treadmill) for the first 10 minutes, exercises to increase muscle strength and endurance (abdominal strengthening, strengthening of upper and lower extremity muscles with the help of thereband, strengthening of back extensors: each exercise progressively resistant) for the next 40 minutes and cooling exercises (general body stretching) for the last 10 minutes. The individuals doing group exercise also did warm-up exercises (brisk walking at a steady pace on a treadmill) for 10 minutes the next 40 minutes, muscle strength and endurance applications (as progressive resistance exercise, general strengthening exercises for Gross muscle groups, rope skipping, upper and lower extremity strengthening with Bench-press, Leg-press, Butterfly devices, sit-ups abdominal muscle strengthening exercises) and the last 10 minutes cooling exercises (general body stretching) were performed 3 days a week for 8 weeks.

Data were collected from the participants twice using the same questionnaires at 8-week intervals, on the first and last day of exercise. The obtained data were analysed in the SPSS programme.

While evaluating the physical performance of participants, the parameters of muscular strength, muscular endurance, agility and flexibility were used.

The Lafayette Manual Muscle Test device was used to evaluate muscular strength. While the measurements were made, the resistance given by the patient was calculated in Newtons by keeping the device constant. The measurements were evaluated separately for the upper (shoulder flexion, extension, abduction, adduction; elbow flexion; hand hand dynamometer) and lower (hip flexion, extension, abduction, adduction, knee flexion and extension, foot dorsi and plantar flexion) extremities in the sitting position, and total muscle strength was recorded.

The Push-Up Test, Sit-Up Test and Squat Test were used to evaluate the peripheral muscle endurance of the participants. While applying the tests, it was observed how many seconds the individual maintained the relevant test position.

Agility was evaluated using the Burpee Test, which evaluates how many times a certain movement pattern is made in 2 minutes. However, since the tolerance of the participants was not suitable for evaluating the results within 2 minutes, the number of times that the individual repeated this pattern in 1 minute was recorded.

The Sit and Reach Test was used to test flexibility. This test was carried out using a special tool 30 cm high, 45 cm wide and 100 cm long. The 25 cm inside part of the test vehicle where the feet are placed was taken as the reference point "0". The part towards the individual from the reference point showed negative values and the part towards the opposite side showed positive values.

2.1. Statistical Analysis

SPSS 22.0 (Statistical Package for the Social Sciences) package programme was used for the statistical analysis of the data. In statistical analysis, $P < 0.05$ was used as a significance value. The number of individuals to participate in the study was determined as 26 individuals, including 13 in each group, by power analysis (G*Power) using the power of the study as 80% (= 0.20), the confidence interval of 95% and the margin of error $\alpha = 0.05$.

Or descriptive analysis, variables determined by

numerical measurement were expressed as arithmetic mean and standard deviation (X±SD), and frequency values were calculated as percentage (%) for non-numerical data. For analysis, the Wilcoxon Signed Rank test was used for in-group comparison and the Mann-Whitney U test was used for intergroup comparison. Difference variables were expressed as difference ± standard deviation (X±SD). The p significance value in all statistics was accepted as P <0.05.

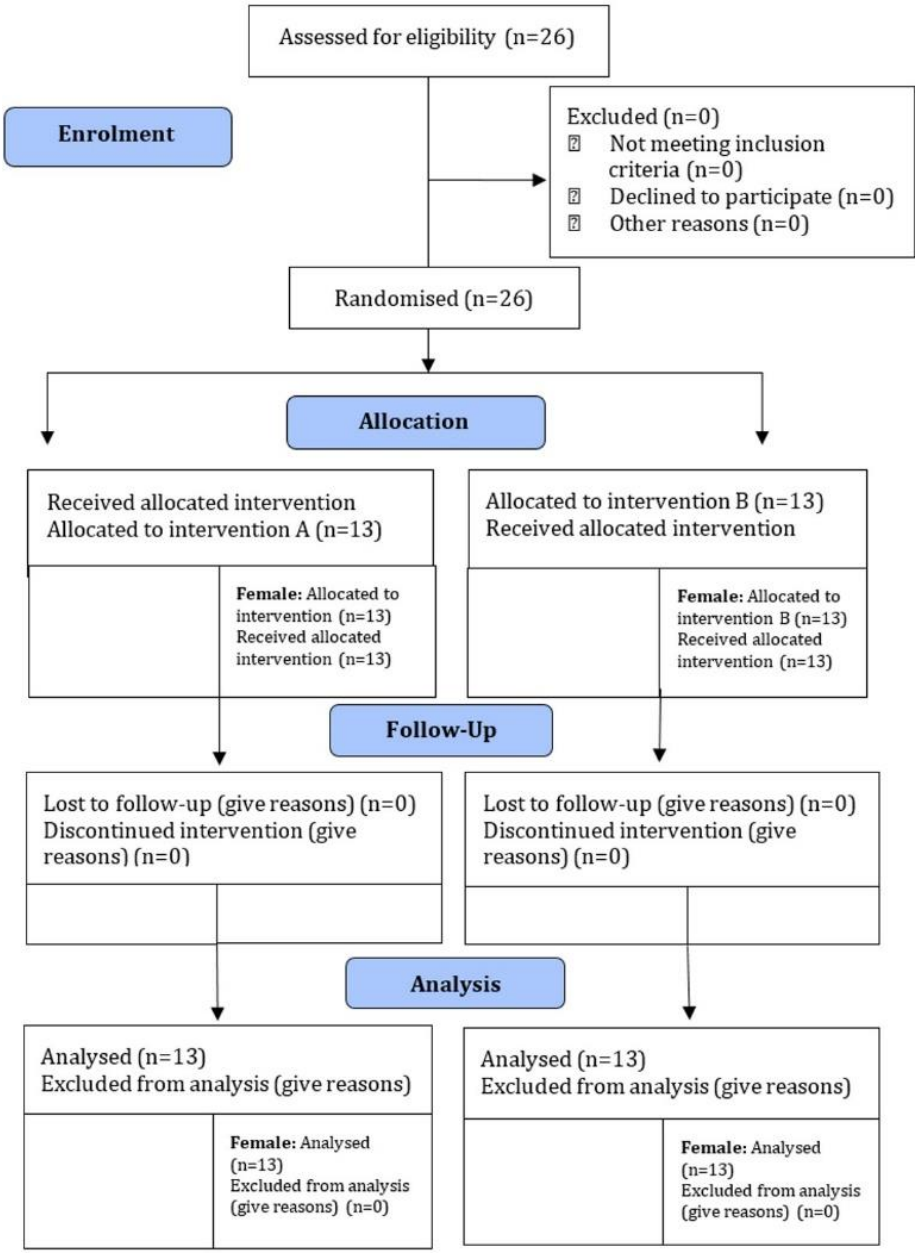

Figure 1. Flow diagram of the study

3. Results

In our study, in which we aimed to compare the effects of individual exercise training and group exercise training on physical performance in healthy women, 13 women with an average age of 33.8 years in the individual exercise group and 13 women with an average age of 37 years in the group exercise training group participated. When the physical characteristics (age, height, body weight, body mass index) of the individuals were examined before the training, it was seen that the groups showed a homogeneous distribution (P >0.05) (Table 1).

Muscular strength, muscular endurance, agility and flexibility assessment are among the physical performance evaluation parameters of individuals. The strength measurements of the participants were made separately in the upper and lower extremities using the Lafayette Manual Muscle Test device and total muscle strength was recorded. When the values of individuals participating in the individual and group exercise training before and after the exercise training were compared, an increase was found in the upper and lower extremity muscular strength after the exercise (P <0.05) (Table 2).

Table 1. Descriptive data of the individuals

	İndividual Exercise Training (n=13)		Group Exercise Training (n=13)			
	X±SD	(Min-Max)	X±SD	(Min-Max)	z	P
Age (years)	33.8 ± 8.8	(23-51)	37 ± 9	(25-53)	-0.745	0.456
Height (cm)	162.7 ± 5.3	(153-173)	163.5 ± 6.6	(158-179)	-0.207	0.836
Weight (kg)	63.3 ± 7.9	(49-73)	62.5 ± 7	(50-72)	-0.564	0.573
BMI (kg/m^2)	24.1 ± 3.4	(19-28)	23.4 ± 2.9	(20-28)	-0.513	0.608

X= mean, SD= standard deviation, P <0.05, Min= minimum, Max= maximum, BMI= body mass index

Table 2. Intra-group comparison of individuals of upper and lower extremity muscle strength total value

	İndividual Exercise Training				Group Exercise Training			
	Pre exercise X±SD	Post exercise X±SD	z	P	Pre exercise X±SD	Post exercise X±SD	z	P
ÜEMS-L (N)	214.8±33,3	278±33	-3.180	0.001*	225.2±54.9	270.8±53.5	-2.981	0.003*
UEMS-R (N)	124.1±8.6	278.3±26.2	-2.981	0.003*	123.2±11.7	277.6±47.3	-2.197	0.028*
LEMS-L (N)	173±23.5	226.8±36.4	-2.943	0.003*	178.3±33.7	227.7±48.6	-3.059	0.002*
LEMS-R (N)	174.7±20.7	233.2±33.4	-2.848	0.004*	186.2±40.5	227.5±49.4	-3.059	0.002*

X= mean, SD= standard deviation, UEMS= upper extremity muscle strenght, LEMS= lower extremity muscle strength, N= Newton, L= left, R= right, *P <0.05

The increase in upper and lower extremity total strength was similar after individual and group exercise training (P >0.05) (Table 3).

The muscular endurance of participants was evaluated before and after exercise with the Push-Up, Sit-Up and Squat Tests. The data of the evaluation are given in Table 4. An increase was observed in the muscular endurance of participants within the same group (P <0.05). When the measurements of muscular endurance of participants in the different groups were compared, the results were similar (P >0.05) (Table 5).

An agility assessment of individuals was made with the Burpee Test, while the Sit and Reach Test was used for flexibility assessment. The data obtained for the evaluations done before and after the exercise are given in Table 6. In comparing the agility and flexibility values of participants of both groups before and after exercise, an increase was observed after exercise (P <0.05). When the agility and flexibility measurements before and after exercise of participants in the different groups were compared, the results were similar (P >0.05) (Table 7).

Table 5. Comparison of muscular endurance test pre and post exercise values between groups

		İndividual Exercise Training X±SD	Group Exercise Training X±SD	z	P
Pre- Post exercise	Push-Up	47.3±17.3	55.3±28.2	-.514	.939
	Sits-Up	30.3±12.2	39.9±19.3	-.927	.354
	Squat	24.4±17.8	18.8±10.3	-.360	.719
	Push-Up	61±21.9	65.2±31.5	-.257	.797
	Sits-Up	44.2±17.5	53.5±24.3	-.976	.329
	Squat	32.5±21.1	29.7±13.2	-.026	.980

X= mean, SD= standard deviation, P<0.05

Table 6. Intra-group comparison of individuals' assessment of agility and flexibility test

	İndividual Exercise Training				Group Exercise Training			
	Pre Exercise X±SD	Post Exercise X±SD	z	p	Pre Exercise X±SD	Post Exercise X±SD	z	P
Burpee Agility	7.3±2.5	9.8±2.5	-3.275	0.001*	8.2±3.1	10±2.2	-2.683	0.007
Sit and Reach	-2.9±9.8	0.1±8.7	-3.088	0.002*	-0.8±8.1	2.2±6.6	-2.952	0.003

X= mean, SD= standard deviation, P <0.05

Table 7. Comparison of agility and flexibility test pre and post exercise between groups

Pre – Post exercise		İndividual Exercise Training X±SD	Group Exercise Training X±SD	z	P
	Burpee Agility	7.3±2.5	8.2±3.1	-.857	.392
	Sit and Reach	-2.9±9.8	-0.8±8.1	-.051	.959
	Burpee Agility	9.8±2.5	10±2.2	-.285	.776
	Sit and Reach	0.1±8.7	2.2±6.6	-.180	.857

X= mean, SD= standard deviation, P <0.05

4. Discussion

Our study aimed to compare the effect of individual exercise and group exercise training on physical performance in healthy women. Exercise training increased physical performance parameters such as strength, endurance, flexibility and agility in individual and group exercise training. In our study, which we supported with the literature, exercise training was given 3 days a week, and individuals with active participation were included in an 8-week exercise follow-up. It is possible to have high physical performance and maintain a high quality of life by participating in exercises aimed at increasing muscle strength. Thus, intense physical activity eliminates inactivity and prevents or minimises the formation of chronic diseases such as osteoporosis and cardiovascular diseases caused by inactivity (Haskell et al., 2007).

In our study, the upper and lower extremity total strengths of participants involved in individual exercise and group exercise training were recorded separately. There was an increase in the strength measurements of participants in both groups before and after the training. When the strength increases of the participants in the two groups were compared, their response to exercise was found to be similar. In a pilot study in which Yakut et al., investigated the role of Pilates exercises in patients with knee osteoarthritis, patients divided into two groups (group exercise and home exercise) showed an increase in lower extremity muscle strength after training. This increase also positively affected the Health Assessment Questionnaire scores. Although more positive results were obtained in patients who received group exercise training at the end of the treatment, there was no statistically significant difference between the groups (Yakut et al., 2006). In a study in which Pain et al., investigated the effectiveness of exercise training in terms of pain, spinal mobility, kyphosis and lordosis in patients with osteoporosis, they applied group exercise training to the treatment group and the control group. Other patients in the control group were not included in any exercise programme. While the muscle strength and consequently the spinal mobility of participants who did the 20-week group exercise training programme increased, the values were similar in the control group (Pain, 2010). In this study, which investigated the effectiveness of exercise training, our conclusions are that the exercise content of any exercise programme will increase muscle strength. We are of the opinion that exercise training with similar working styles and the same intensity will increase muscle strength regardless of the number of people involved. An increase in muscle strength is associated with adaptation, motor skills and neuromuscular activation. Likewise, exercise duration and intensity are important in terms of the occurrence of muscular hypertrophy. With muscle contraction, force is produced only as a result of the increase in the diameter of the fibrils and with neuromuscular activation.

In evaluating the muscular endurance of individuals participating in individual exercise and group exercise training, Push-Up Tests were used for the upper extremities, Squat Tests for the lower extremities and Sit-Up Tests for the trunk muscles. When participants in both groups were evaluated before and after training, it was seen that exercise had a strong effect on muscular endurance. In comparing the two groups, the results were similar. Depending on the increase in the number of adaptive muscle fibres as a result of exercise, the development in strength also positively affected endurance (Katayıfçı et al., 2014). We think that the formation of synergies in the muscles that occur as a response to exercise and the integration of movements into daily life may cause an increase in endurance. There are important parameters that ensure the improvement of performance. One of these is motor development. The most important feature that increases motor development is endurance (Owen et al., 2020). Endurance of lower and upper extremities and trunk muscles were evaluated in an 8-week group exercise training programme in healthy adults. At the end of the training, participants who took part in group exercise observed an improvement in muscular endurance (Balcı et al., 2020). Our study is in line with other studies in the literature.

Physical performance is affected by endurance, balance, flexibility and coordination. Agility is a motor skill and is developed through progressive resistance exercises. An increase in agility depends on factors such as neural adaptation of joint proprioceptors, the Golgi tendon organ and muscle spindle and restructuring of motor programming by neuromuscular conditioning (Castro et al., 2010). Thus, neural adaptation increases with strength, and agility increases as a result of neural adaptation. In a study conducted by Sheppard and Young (2006), it was suggested that the amount of body fat can affect agility. In this context, they found that in two athletes with the same weight, an individual with a lower

fat percentage and higher muscle mass should produce less force per unit muscle mass during acceleration. In our study, we think that the increase in agility in both groups and the similarity between the groups may be related to the decrease in body weight and body mass indexes.

The increase in flexibility in both groups is due to the inclusion of exercise training for muscles that cross double joints in more than one plane (Whitehurst et al., 2005; Weiss et al., 2010). Increased muscle activation increases heart rate and body temperature. The development in neuromuscular excitation that causes an increase in strength, endurance, conduction velocity, enzymatic activations, and so on causes flexibility by reducing tissue viscosity. We think that the fact that only women were included in the study could have led to the improvement in the flexibility parameter in both groups and the similarities between the groups because muscle tendons are weaker in women than in men. Along with the weaker tendons, less muscle tone increases the mobility of the joint. Along with increased mobility, flexibility is more common in women. Considering these features, it has been proven that women are more successful than men when the studies on gymnastics in the literature are examined (Koç and Yüksel, 2015).

Limitation of the study, participants varied in age from 23–53. Although age distributions between the groups give similar results, we believe that if we had narrowed our age range, our results may have varied between groups. It is possible that group exercise training will prove to be more effective, especially in studies conducted on geriatric individuals with various diseases. In this context, we think that if our study is replicated to investigate geriatric individuals, it may yield results that support our hypotheses. If our study had included evaluation parameters for balance and cardiovascular risk factors, this would have increased our knowledge.

5. Conclusion

This study shows that exercise training provides a significant increase in muscle strength, endurance, agility and flexibility parameters. The group or individual exercise preference of individuals does not have a negative effect on physical performance. Therefore, individuals should be included in exercise programmes without discrimination depending on their preferences.

Author Contributions

Concept: T.G. (100%), Design: T.G. (100%), Supervision: T.G. (100%), Data collection and/or processing: T.G. (100%), Data analysis and/or interpretation: Y.Y. (100%), Literature search: T.G. (100%), Writing: T.G. (100%), Critical review: Y.Y. (100%), Submission and revision T.G. (%50) and Y.Y. (50%). All authors reviewed and approved final version of the manuscript.

Conflict of Interest

All authors have no conflicts of interest with respect to the data collected and procedures used within this study. Authors declare that they have no sponsor in the study design, collection, analysis, interpretation of data, writing of the manuscript, and decision to submit the manuscript for publication.

Ethical Approval/Informed Consent

This study obtained the approval of the Hasan Kalyoncu University, Health Sciences Institute, Ethics Committee (Decision no: 2017/08).

References

Ağaoğlu S. 2015. Women health and exercise. J Sports Perform Res, 6(2): 67-72.

Akyurt S. 2019. The effect of pilates exercises in addition to exercise training on healty male individuals on flexibility, self esteem and quality of life. MSc thesis, Halic University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, pp. 82.

Alkadhi KA. 2018. Exercise as a positive modulator of brain function. Molecular Neurobiol, 55(4): 3112-3130.

Ardıç F. 2019. Exercise for healthy living and prevention of chronic diseases. Türkiye Klin Fiz Tıp Rehabilit Özel Konular, 12(3): 1-7.

Balcı A, Kocahan T, Akınoğlu B. 2020. The relationship between knee flexor-extensor muscle strength and balance ability in elite gymnasts. Spor Hekim Derg, 55(3): 214-221.

Barker K, Eickmeyer S. 2020. Therapeutic exercise. Med Clin, 104(2): 189-198.

Castro PJ, Ortega FB, Artero EG, Girela RMJ, Mora J, Sjöström M, et al. 2010. Assessing muscular strength in youth: usefulness of standing long jump as a general index of muscular fitness. J Strength Condit Res, 24 (7): 1810-1817.

Çolak FD. 2008. Comparison of the effects of aerobic exercise and in-water exercise on physical fitness parameters in healthy individuals. MSc thesis, Hacettepe University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, Ankara, pp. 87.

Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, Bauman A. 2007. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Circulat, 116(9): 1081.

Katayıfçı N, Düger T, Ünal E. 2014. Effects of clinical Pilates exercises on physical fitness of healthy subjects. J Exercise Therap Rehabilit, 1(1): 17-25.

Koç H, Yüksel O. 2015. Evolution of women's physical and physiological performance. Dumlupınar Üniv Sos Bilim Derg, 3(9): 1-12.

Korkmaz C. 2020. Investigation of the effect of clinical pilates exercises on physical fitness, psychosocial condition and exercise belief in healthy adults: randomized controlled trial. MSc thesis, Pamukkale University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, Denizli, pp. 79.

Liberman K, Forti LN, Beyer I, Bautmans I. 2017. The effects of exercise on muscle strength, body composition, physical functioning and the inflammatory profile of older adults: a systematic review. Curr Opin Clin Nutr Metab Care, 20(1): 30-53.

Owen PJ, Miller CT, Mundell NL, Verswijveren SJ, Tagliaferri SD,

Brisby H, Belavy DL. 2020. Which specific modes of exercise training are most effective for treating low back pain? British J Sports Med, 54(21): 1279-1287.

Pain E. 2010. Effects of exercise training on pain, spinal mobility, lordosis and kyphosis angle in osteoporosis: a pilot study. Turkish J Geriat, 13(2): 117-124.

Sheppard JM, Young WB. 2006. Agility literature review: Classifications, training and testing. J Sports Sci, 24(9): 919-932.

Vanhees L, Lefevre J, Philippaerts R, Martens M, Huygens W, Troosters T, Beunen G. 2005. How to assess physical activity? How to assess physical fitness? European J Cardiovascul Prevent Rehabilit, 12(2): 102-114.

Weiss T, Kreitinger J, Wilde H, Wiora C, Steege M, Dalleck L, et al. 2010. Effect of functional resistance training on muscular fitness outcomes in young adults. J Exercise Science Fitness, 8(2): 113-122.

Whitehurst MA, Johnson BL, Parker CM, Brown LE, Ford AM. 2005. The benefits of a functional exercise circuit for older adults. J Strength Cond Res, 19(3):647-651.

Yakut E, Yağli VN, Akdoğan A, Kiraz S. 2006. The role of Pilates exercises in patients with osteoarthritis of the knee: a pilot study. Fizyoterap Rehabilit, 17(2): 51-60.