DOI: 10.7860/JCDR/2022/57552.17176

Original Article

Physiotherapy Section

Effect of Brisk Walking and Moderate Resistive Exercises on Physical Fitness Level in Middle-aged Women: A Randomised Clinical Trial

REEMA JOSHI[1], PARITA MISHRA[2], MANISHA RATHI[3]

ABSTRACT

Introduction: Insufficient physical activity is considered as one of the leading risk factors for global mortality and morbidity. American College of Sports Medicine recommended an engagement of minimum 150 minutes per week of moderate physical activity. Physical fitness gradually declines with aging. Low muscle strength and decline in the ability to produce force quickly (power) are associated with low walking speed and, further, with mobility limitations. In India, women are more physically inactive than men. Women shows more rapid decline in physical activity than men in middle age. This sex difference may be due to the hormonal changes and barriers such as lack of time, lack of motivation, lack of energy, self awareness and health problems.

Aim: To evaluate the effect of brisk walking and moderate resistive exercises on body weight, body fat percentage (Skinfold Caliper), six minute walk distance covered and Physical Fitness Index (PFI) in middle-aged women.

Materials and Methods: A randomised clinical study was conducted in Outpatient Department at Dr. D.Y. Patil college of Physiotherapy, India, from November 2021 to January 2022. Total 40 subjects, between age group of 40-60 years with low physical activity, assessed by International Physical Activity Questionnaire, were included in the study. Subjects were divided into two groups with simple random sampling using lottery method. Group A (experimental group; n=20) brisk walking with moderate resistive exercises were given. Group B (conventional group; n=20) includes only brisk walking. The protocol was given for four days a week for four weeks. The outcome measures taken were body weight, body fat percentage, physical fitness index and six minute walk distance. The statistical analysis was done using Medcalc software 18.2.1.

Results: The mean age was 45.55±5.73 for group A and 43.30±4.62 for group B. The mean difference of Body weight (BW), Body Fat percentage (BF%), 6 minute walk distance (6MWD) and Physical Fitness Index (PFI) was 1.56, 1.98, -18.82, and -182.34 respectively for group A and 0.23, 1.22, -8.23, -126.16 for group B. On intergroup comparison, the mean difference of BW, BF%, 6MWD and PFI was 1.33, 0.76, -10.59 and -56.18. This shows significant difference between the groups.

Conclusion: Brisk walking and moderate resistive exercise can be used as effective treatment in weight management to improve physical fitness level in middle-aged women.

Keywords: Body fat, Body weight, Brisk walking, Physical strength

INTRODUCTION

Physical fitness is the ability that can achieve to perform Physical Activity (PA) with skill-related, health-related, and by physiological components [1]. Regular PA provides significant benefits for health by improving cardiorespiratory and muscular fitness reduces risk of non communicable diseases and reduces adiposity [2]. A survey conducted in 2016 globally 28% of adults aged 18 and above were not meet the global recommendation of physical activity of at least 150 minute of moderate intensity or 75 minute vigorous intensity activity per week [2]. World health survey found a lower physical activity in women (15.2%) as compare to men (9.3%) [3].

Women are more physically inactive then men, in both urban (70.8% vs 53.8%) and rural (44.5% vs 35.6%) areas. In 2013, Indian Council of Medical Research (ICMR) conduct the study in five states including Maharashtra, showed that the maximum percentage (65%) of population is physically inactive [4]. women are physically inactive and 42.2% with risk of non communicable diseases, overweight and obesity, Cardiovascular Diseases (CVD), breast cancers, osteoporosis and is also associated with other health related adverse effect such as injuries, falls and mental health [5].

Regular PA can reduce the resting blood pressure and enhance the blood carrying capacity of the arteries which help to regulate blood pressure and minimise the risk of hypertension. PA improves the quality of life and reduces the risk of cardio and metabolic disorders [6,7].

Energy expenditure performed with every activity; is usually measured in Metabolic Equivalents (METs) to evaluate the metabolic cost of physical activity. The METs can help to categories the physical activity level of an individual on the basis of daily activities with the help of International Physical Activity Questionnaire (IPAQ). For vigorous intensity activities at least 1500 MET minutes/week or moderate intensity activities of 3000 METs for a week is required. Below 600 METs categorised as low level PA [8]. Women shows more rapid decline in PA than men during middle age, this gender difference due to the hormonal changes occur during the menopausal years. Reduce level of estrogen during menopausal transition increases the risk of hyperlipedemia, decreases bone mineral density and muscle strength [9].

According to American college of sports medicine aerobic exercise with resistance exercise for at least twice a week is beneficial and can be recommended for healthy individuals [10]. Aerobic exercises are a planned, structured physical activity in large muscle group can be maintained continuously and rhythmically. Resistive exercise improves the muscle strength endurance; enhance bone, muscle and connective tissue growth and durability [8].

In studies are done on menopausal and postmenopausal women [10,11] but studies on middle aged population, menopausal transition phase experience various hormonal and physiological changes are scarce. PA from early age help to slow down the loss of physical performance during menopausal transition, also help in uncomplicated menopausal transition and maintain physical fitness in old age. In addition, PA in middle aged women is highly compromise due to various barriers such as lack of time, lack of motivation, and health problems. Thus, present study was conducted to evaluate the effect of brisk walking and resistive exercise in middle age group women.

MATERIALS AND METHODS

The randomised clinical study was conducted in Outpatient Department at Dr. D.Y. Patil college of Physiotherapy, India, from November 2021 to January 2022. The ethical approval was obtained from the Institutional Ethical Committee (DYPCT/IEC/25/2021) and CTRI (CTRI/ 2021/11/038266).

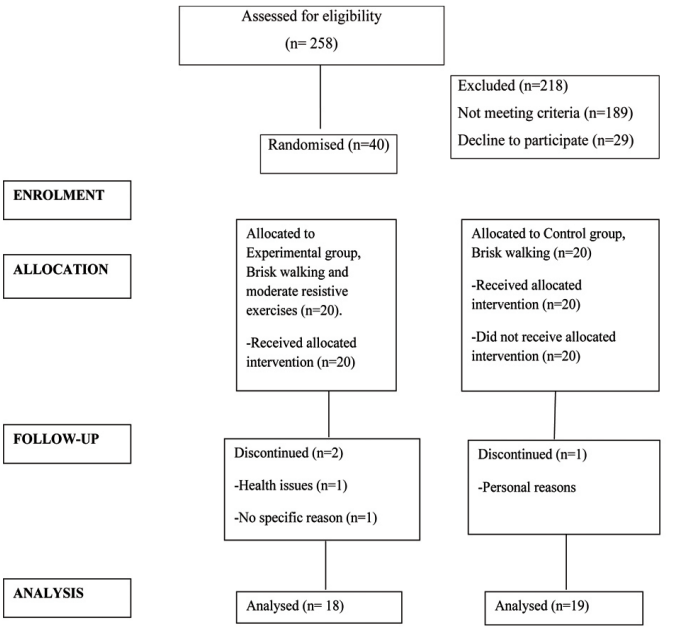
Inclusion criteria: Total 40 women aged between 40-60 years with low physical activity level below 3.3 Metabolic Equivalent rate (METs) on International Physical activity Questionnaire and Body Mass Index (BMI) more than 23 kg/m^2 (Asian classification) [12,13].

Exclusion criteria: Women with any cardiovascular diseases, neurological, respiratory condition like chronic obstructive pulmonary disease, bronchial asthma, diabetes, establish hypertension (systolic blood pressure>130 mmHg, diastolic blood pressure >85 mmHg), pregnancy, any musculoskeletal condition like severe acute joint pain, severe osteoarthritis, recent trauma or injuries, spinal surgery and women who are doing daily exercises since a year were excluded.

Sample size: Power analysis of previous studies was done with prevalence rate of 47.3 with alpha error 0.05, power of 80%, with considering dropouts, 20 sample in each group) [14].

Study Procedure

Total 258 female of age group of 40- 60 years were screened using International Physical Activity Questionnaire (IPAQ) (low physical activity below 3 METs included) and for BMI more than 23 kg/m^2 and 218 were excluded. Hence, 40 female participants were finally recruited for the study. All the females were explained the study procedure and written informed consent was taken. Subjects were randomly divided into two groups using simple random sampling method using chits female were blinded for their allocated group [Table/Fig-1].



[Table/Fig-1]: Consolidated Standards of Reporting Trials (CONSORT) diagram.

Group A (Experimental group): Brisk walking with moderate resistive exercise including, Wall push, modified pushups, back extension with alternate hand (Superman exercise), Prone extension, Curl up, Squats, Lunges (two sets with eight repetition progression to 3-4 sets of 10 repetition), warm up and cool down with four session of brisk walking for 30-35 minute with the target of 3000-4000 steps in a week for four weeks, which was monitored by phone using physical fitness application Google Fit: Activity Tracking (version- 2.75.1.arm 64-v 8a.release), [15] instructions was given to the women for using the application and daily update of the number of steps, duration of the walking was recorded by the females and update on daily basis to the therapist through telephonic communication.

Group B: - Brisk walking for 4 week/4 times week uses Google fit monitored daily. Same as group A.

Exercise

Exercise was prescribed to both the groups (Group A Brisk walking+ moderate Resistive Exercise and Group B only Brisk walking) according to FITT principle of exercise prescription [16].

Frequency: 4 times a week for 4 weeks.

Intensity: Intensity was determined by Heart Rate reserve [% of exercise intensity x (Heart Rate max- Heart Rate rest)+HR rest]. Intensity of 40%-60% is used. Calculated by the therapist and exercise performed initially with 40% of intensity then gradually increases to 60% [17].

Time: 30-35 minute of brisk walking for both the groups and 30-40 minute of Moderate resistive Exercises for intervention group with warm up and cool down.

Type: Aerobic exercise (brisk walking) and moderate resistive exercise.

The outcome measure used were body fat percentage using skinfold method, body weight, physical fitness index using Harvard step test for cardiorespiratory fitness and six minute walk distance covered for physical performance. Intervention of four week was given to both the groups to perform at their home. Follow-up on daily basis was taken by telephonic communication and video conferencing. Assessment of both the group was taken before and after four week of intervention period.

Outcome Measures

Physical fitness index- Harvard's step test is used to measure PFI. The step test consisted of stepping up and down a bench at a rate by a metronome (90 beats min, corresponding to 22 steps min_1). Maximum 5 minute of stepping period. According to subject height the height of the bench was determined. For individuals with a height up to 170 cm (5.6 ft), a bench of 33 cm (13.0 inch) was used. For individuals with a height above 170 cm (5.6 ft), a bench of 40 cm (15.7 inch) was used, and based on the performance scored as poor, fair, good, and excellent [18,19].

Body fat percentage: This is measured using Skin fold caliper method with 3- Site

Formula (Suprailiac, Abdominal, Triceps [8].

Body density =1.0994291 – 0.0009929 (sum of 3 site skinfold) + 0.0000023 (sum of 3 site of skinfold) 2 – 0.0001392 (Age). Body fat %= 495/BD- 450

Six minute walk distance covered: Aerobic capacity assessed using six minute walk test for 30 meter walking. Distance covered in meters was analysed [20].

STATISTICAL ANALYSIS

The statistical analysis was done using Medcalc software 18.2.1. All the parameter values are represented in numbers and mean±SD. Homogeneity of demographic variable and physical fitness parameters was analyse using shaphiro Francis test. Accordingly for parametric data (body weight, body fat percentage, and physical fitness index)

paired sample t-test was used to determine the pre post result in both the group. For non parametric data (six minute walk distance) Wilcoxon-Signed Rank test was used. Independent sample t-test for parametric data and Mann- Whitney independent sample test for non parametric data was used for between the groups comparison.

RESULTS

Age of the subjects enrolled in the study ranged from 40-60 years, mean age of group A was 45.55±5.73 and 43.30±4.62 for group B. BMI, Height and weight for group A and B was 29.43±2.86 and 30.45±3.74, 152.61±5.42 and 154.30±4.19, 69.36±8.82 and 72.84±8.08 respectively. The values were not significant statically (p-value>0.05) [Table/Fig-2].

Parameters	Group A (n=20) (Mean±SD)	Group B (n=20) (Mean±SD)	p-value
Age (years)	45.55±5.73	43.30±4.62	0.18
BMI (kg/m^2)	29.43±2.86	30.45±3.74	0.33
Height (cm)	152.61±5.42	154.30±4.19	0.27
Weight (kg)	69.36±8.82	72.84±8.08	0.14

[Table/Fig-2]: Demographic details of group A and B at baseline.

Analysis of body weight, body fat percentage, physical fitness index and six minute walk distance within group A shows that there was an improvement in body weight (p-value<0.0001), body fat percentage (p-value<0.0001), physical fitness index (p-value<0.0001) and six minute walk distance (p-value <0.0001) [Table/Fig-3].

Variables	Postintervention (M±SD) (Week 1)	Postinterven-tion (M±SD) (Week 4)	Mean Df	p-value
BW	69.36±8.82	67.80±9.00	1.56	<0.0001
BF%	32.81±1.84	30.83±1.59	1.98	<0.0001
PFI	48.43±3.35	67.25±3.98	-18.82	<0.0001
6MWD	570.88±77.28	753.22±71.61	-182.34	<0.0001

[Table/Fig-3]: Comparison of pre-post values for group A (n=18).
BW: Body weight; BF%: Body fat %; PFI: Physical fitness index; 6 MWD: 6 minute walk distance. M: Mean; SD: standard deviation

Group B showed significant changes in body weight (p-value=0.03), body fat percentage (p-value=0.0001) and physical fitness index (p-value<0.0001), 6 minute walk distance (p-value<0.0001) [Table/Fig-4].

Variables	Pre brisk walking (M±SD) (Week 1)	Post brisk walk-ing (M±SD) (Week 4)	Mean df	p-value
BW	72.84±8.08	72.61±7.98	0.23	0.03
BF%	31.87±1.71	30.65±1.52	1.22	0.0001
PFI	49.59±4.89	57.82±4.63	-8.23	<0.0001
6MWD	575.31±70.10	701.47±60.23	-126.16	<0.0001

[Table/Fig-4]: Comparisons of Pre-post Values for group B (n=19).

Intergroup comparison of body weight, body fat percentage, and physical fitness index and 6 minute walk distance indicated that group A shows more beneficial effect on all the given parameter of fitness compare to control group [Table/Fig-5].

Variable	Group A MD±SD	Group B MD±SD	Mean diff.	p-value
BW	1.56	0.23	1.33	<0.0001
BF%	1.98	1.22	0.76	<0.0001
PFI	-18.82	-8.23	-10.59	<0.0001
6MWD	-182.34	-126.16	-56.18	0.0002

[Table/Fig-5]: Comparisons of the mean difference of group A and group B.

DISCUSSION

The aim of the present study was to compare the effect of brisk walking with moderate resistance exercises and only brisk walking on body weight, body fat percentage, and physical fitness index and 6 minute walk distance in middle aged women. This study was conducted with 18 subjects in experimental group and 19 in group B, followed by four week training of brisk walking and moderate resistive exercises. The findings suggests in group A with moderate resistance and brisk walking intervention shows beneficial effect on physical fitness level in middle aged women.

Wilmore JH et al., state that when the body shifts from rest to aerobic exercise, energy demand also progressed with frequency, intensity, duration and with oxygen demand of the exercise [21]. In study by Kisner C et al., during early phase of exercise the energy is supplied by anaerobic energy system (<90 sec); carbohydrate provides energy in the form of Adenosine Triphosphate-Phosphocreatine (ATP-PCr) and glycogen breakdown. Gradually the anaerobic system shifts to aerobic oxidation (>90 sec). Glycolysis shifts to aerobic oxidation and lipid breakdown which initiate reduction in body fat and body weight [22].

Moderate resistance exercise with body weight in group A shows additional effect on body weight and body fat percentage may be by increasing bone mineral density, lean body mass and increase or maintain basic metabolic rate. This increase in metabolic rate may enhance the expenditure to control body weight. Moderate resistive training apply progressive load on bone by contraction of exercising muscle group, this muscle contraction increase in cross-sectional area due to muscle hypertrophy as there is a increase in the area of fast twitch fibers and slow twitch fibers which help to increases muscle strength, endurance, power and improves physical fitness level in group A. This study suggest increases in PFI and 6MWD in both the groups which help to improve cardio respiratory fitness may be by improving oxidative capacity of skeletal muscle by increasing stroke volume and oxygen delivery to the active tissues It also increases peripheral vasodilatation, minimise arterial pressure and prevent early fatigue. In control group, the intensity and duration of brisk walking was monitored regularly with Google fit app and subjects walk with target steps count in a given time to match moderate intensity exercise training and this may help in reduction in body weight and body fat % with increase in PFI and 6 MWD (p-value<0.0001) after 4 week of intervention in middle aged women.

Looking at previous studies on exercise programme for physical fitness. Chen CK et al., conducted a study on effects of six weeks of brisk walking on plasma, percent body fat, and aerobic fitness, in overweight and obese females. Performed brisk walking for six week, three sessions per week. The study showed that six weeks of brisk walking programme reduces body fat %, in overweight and obese females [23]. In addition, study by Kalra S et al., concludes that physical activity plays important role in maintaining physical and mental health and quality of life of women. Mental and physical fitness can be attained by introducing exercise into daily routine of postmenopausal women [24].

Mechanical load and compressive stress during resistance exercise is the important factor for stimulation of muscle protein synthesis. The theory of loading suggests that bone and muscle progressive loading increases the strength of exercising muscle. According to Ağıl A et al., resistance exercise and aerobic exercise were found to effective on menopausal symptoms, psychological health, depression and, quality of life in postmenopausal women (aged 40-60) [25].

Limitation(s)

The study had a limitation of less sample size and lack of organised diet and nutrition plan combine with intervention.

CONCLUSION(S)

Intergroup comparison of body weight, body fat percentage, and physical fitness index and 6 minute walk distance indicated that experimental group shows more beneficial effect on all the given parameter of fitness compare to control group. Brisk walking and moderate resistive exercise might be used as effective treatment in weight management to improve physical fitness level in treatment obesity management in middle aged women. The similar study can be done with longer intervention duration of more than four week with combination of supervised and organised diet and nutrition advices.

Acknowledgement

Authors would like to thank the institute and department for support and facilities to conduct the study.

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PARTICULARS OF CONTRIBUTORS:
1. Associate Professor, Department of General and Community Based Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Pune, Maharashtra, India.
2. Postgraduate Resident, Department of General and Community Based Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Pune, Maharashtra, India.
3. Professor, Department of General and Community Based Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Pune, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Parita Mishra,
Postgraduate Resident, Department of General and Community Based Physiotherapy, Dr. D. Y. Patil College of Physiotherapy, Pune, Maharashtra, India.
E-mail: mishraparita1611@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: May 06, 2022
- Manual Googling: Aug 25, 2022
- iThenticate Software: Aug 27, 2022 (13%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **May 05, 2022**
Date of Peer Review: **Jun 15, 2022**
Date of Acceptance: **Aug 31, 2022**
Date of Publishing: **Nov 01, 2022**