



Effectiveness Of Aerobic Exercises In Geriatrics In Improving Functional Status

1Dr.P.RAJANI PRIYA, 2DR.BUDALA DIVYA, 3Dandabattina Siri varshini

1Assistant Professor, 2Associate Professor, 3student

1Dr.NTRUHS,

2SIMS COLLEGE OF PHYSIOTHERAPY,

3SIMS COLLEGE OF PHYSIOTHERAPY

INTRODUCTION

The geriatric population refers to individuals aged 65 years and above, characterized by age-related physiological, psychological, and social changes that may affect health and functional independence (1)

The population of elderly people in the world has increased in recent decades. Aging causes loss of physical capacity, thus undermining elderly people's essential daily activities. Physical training can minimize the deleterious effects of aging, contributing to a better daily life autonomy (2)

Older adults move less, making them prone to deconditioning and a host of other consequences including stiffness, weakness, cardiovascular changes, decreased balance, cognitive disorders etc

The science progress associated to the improvement in health conditions have direct impacts on increasing life expectancy (3)

"Functional status refers to an individual's ability to perform normal daily activities required to meet basic needs, fulfill usual roles, and maintain health and well-being. (4)

"In geriatric medicine, functional status is a key health indicator reflecting the physical, cognitive, and social capacity of older adults to live independently. (5)

A decline in maximal aerobic exercise capacity occurs across the adult age-span, accelerating in later years. This age-associated decline in aerobic capacity is accentuated by superimposed comorbidities common to the elderly such as cardiac, pulmonary, and peripheral artery disease. However, observational and training studies demonstrate significant improvement in peak oxygen consumption in both health and disease settings. In addition, exercise training exerts beneficial effects on blood pressure, lipids, glucose tolerance, bone density, depression, and quality of life. A major challenge to physicians and society is to increase the low participation rates of older adults in both home-based exercise and supervised exercise rehabilitation programs.(6)

Aerobic activity is defined as any activity that uses large muscle groups, can be maintained continuously, and is rhythmic in nature This study is to evaluate the effectiveness of Aerobic exercise in Geriatrics in improving the functional status.

Walking is a low-impact, rhythmic, and weight-bearing **aerobic activity** that improves cardiovascular fitness, muscular endurance, and overall functional mobility.(7)

Physiological and Clinical Benefits of Walking:

- ☐ Improves cardiovascular endurance
- ☐ Enhances pulmonary function
- ☐ Promotes blood circulation
- ☐ Supports weight management
- ☐ Improves mood and cognitive function
- ☐ Enhances bone density and joint mobility

Jogging is a form of moderate to vigorous intensity aerobic exercise that involves a slow, steady run over a sustained period, enhancing cardiovascular and muscular endurance."(7)

Bicycle ergometer is a stationary cycling device used for cardiovascular training or testing, allowing control of workload (resistance) and monitoring of physiological responses such as heart rate, oxygen uptake, and endurance. It provides a safe, low-impact form of aerobic exercise, suitable for older adults, especially those with orthopedic or cardiovascular limitations (8)

REVIEW OF LITERATURE

1) **Silvio Lopes Alabarse, Ricardo Munir Nahas et.al (2018)** : conducted a study to analyze the effect of physical training in elderly people's FC. Methods and material: Research with healthy elderly people randomly distributed into two groups, training group (TG) and control group (GC). Prior to the training sessions the patients answered the Protocol "Older Americans Resources and Services" (SROS) which analyses elderly people's FC in a multidimensional manner. The CG was instructed not to engage in systematic walking exercise during TG training period. At the end of the 36th training session the patients underwent a second FC evaluation. The TG had 40 patients with a mean age of 68.2 ($\pm$ 5.5) years, 67% were females, average body mass of 73 pounds ($\pm$ 12.6), height of 1.61m ($\pm$ 0.1m), BMI of 28.5 kg/m² ($\pm$ 4.9 kg/m²). While in CG there were 29 patients, with mean age of 68.4 ($\pm$ 4.5), 79% were females, BMI of 27.7 kg ($\pm$ 14.6), height of 1.57 cm ($\pm$ 0.1 cm), BMI of 27.3 kg/m² ($\pm$ 4.5 kg/m²). The TG presented changes in functional capacity [OARS (unit) 2.3 to 1.2 (p = 0.002) $\Delta\%$ of 47]. There was a weak correlation between physical capabilities analyzed by relative VO₂ peak and functional capacities in the TG [VO₂ pico and FC (r = 0.43; p = 0.005)]. While the GC showed no change in functional capacity [OARS (unit) 2.1 to 2.4 (p = 0.45) $\Delta\%$ = -15]. The correlation between physical and functional capacities resulted in a weak and negative level in CG [VO₂ pico and FC (r = -0.32; p = 0.09)]. they concluded that The aerobic physical training increased functional capacity in elderly people, resulting in a better condition for performing in daily activities, physical autonomy and quality of life for patients.

2) **Alabarse, Páblus Staduto Braga da Silva et.al (2018)**: conducted a study to Analyze the effect of the walking exercise in the IMC in the elderly people. It was a multicenter study with elderly people of both genders, randomized in Training Group (TG) and Control Group (CG) aged 60 years or above. The TG went through 12 weeks of aerobic training with moderate to severe intensity from 50% to 75% of the maximum heart rate (HR Máx .) that was determined on a stress test conducted previously. The sessions were carried out three times a week with 30 minutes of continuous walking exercise, according to the American College of Sports Medicine (ACSM) guidelines. CG members were advised not to participate in systematized walking exercises in the same period of training of TG. BMI of the patients were calculated through the division of the body weight by the square height (kg/m²). After three months, TG and CG participated in a second BMI analysis. The study applied, for statistical analysis, the "student's t Test" for paired data, with $p \leq 0.05$ for significance level. Results: The BMI in TG did not present pre and post-training modifications [28.5 Kg/m² to 28.4 Kg/m² ($\Delta\%$ 0.3) (p = 0.37)]. As for CG, the BMI also did not result in substantial changes [27.3 Kg/m² to 27.3 Kg/m² ($\Delta\%$ 0.0) (p = 0.88)] Conclusion: The predominantly aerobic physical training for a brief period and in a non-exhaustive intensity was effective in not increasing BMI in elderly

3)Silas Nery de Oliveira, Jeniffer Helena de Jesus, Rodrigo Sudatti Delevatti et.al : To evaluate the effects of CT on the functional capacity (FC) of older adults after 8 weeks of intervention. Participants were randomly allocated to the combined training group (CTG) or control group (CG). The CTG performed, with 3 weekly sessions, a TA (70–85% of the heart rate reserve) followed by ST with elastic tubes (6 exercises; 2×15 repetitions) with load progression through the perception of effort scale, color, and elastic extension. Before and after the intervention, six FC tests and a maximum isometric strength test of the knee extensors were evaluated. An improvement of 6.60% was observed in the Timed Up and Go test ($p = 0.026$), 20.56% in the sit and stand test ($p = 0.007$), 17.71% in the elbow flexion test ($p = 0.026$), and 15.64% and 26.94% for the right ($p = 0.026$) and left knee extensors ($p = 0.006$), respectively, for the CTG compared to the CG. Hence Aerobic training associated with strength training with elastic tubes was effective in improving FC and knee extensor muscle strength in older adults.

METHODOLOGY

ETHICS:

All the time during the period of studying ethical issues will be followed with almost care and due to respect towards the patient health. All the patients will be asked for their informed consent before entering trail.

Each patient shall be explained about both beneficial and potential harmful effects (if any) of treatment which she/he was supported to receive. The participants will be explained about the purpose of trail. The request for the termination of the treatment by the patient at any time of the study shall never be denied.

ELIGIBILITY CRITERIA:

INCLUSION CRITERIA:

- Both males and females with age above 60 years are included.
- Subjects who can perform their ADL's on their own.
- Subjects who can perform exercise for 30minute with rest period.
- Subjects who are willing to participate
- Subjects with good cardiac fitness and who can walk without assistive devices with rest period.

EXCLUSION CRITERIA:

- Subjects with unstable angina and other cardiac conditions
- Subjects who having co-ordination and balance issues
- Subjects with osteoporosis
- Subjects who are not co-operative

METHODOLOGY

30 elderly subjects were randomly selected based on selection criteria. Aerobic exercises such as walking, jogging and bicycle ergometry in less repetition per minute (RPM) were selected by patients depending on their convenience for 4 months. Blood pressure, Pulse rate, Respiratory rate, Dynamic lung functions such as forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), forced expiratory volume percentage (FEV%), peak expiratory flow rate (PEFR), and maximum voluntary ventilation (MVV) and their well-being was measured for all the subjects before and after each season of aerobic exercise.

PROCEDURE

Regular practice of aerobic exercise causes alterations in autonomic functions, respiratory performance and well being of elderly persons. 30 Elderly subjects were instructed to do the following Aerobic Exercises. A rest period of 15 min is given for each intervention

- 1) WALKING: It is done for 10-15 min for 5 sessions per week
- 2) JOGGING: It is done for 10 min for 5 sessions per week
- 3) BYCYCLE ERGOMETER: It is done for 10 min for 5 sessions per week

Duration: 5 SESSIONS/WEEK FOR 4 MONTHS

Pre and post test results values were recorded regularly. In moderate to severe essential hypertension, exercise should be combined with life style changes and medication. A four 10- min walking sessions per day is effective in reducing blood pressure in pre hypertension. Significant reduction in Systolic, diastolic pressure and increase in pulse rate indicates a trend of gradual shift of autonomic equilibrium toward relative parasympathetic dominance because of the reduction of sympathetic activity. It is possible that if aerobic exercises are administered along with exercises, both physical and mental performance can be improved in Geriatric patients.

RESULTS

Table :1 Analysis of systolic blood pressure of the study subjects

	MEAN SYSTOLIC BLOOD PRESSURE (mm/Hg)
Pre-Test systolic blood pressure	138.90
Post -Test systolic blood pressure	134.30

The results of the above table show the comparison of the Pre and Post-test of systolic blood pressure, In the descriptive statistics the mean pre test value of systolic blood pressure was 138.90 mm/Hg and the post test mean value of systolic blood pressure was 134.30 mm/Hg.

Graph 1: Mean of Systolic Blood Pressure of the study subjects

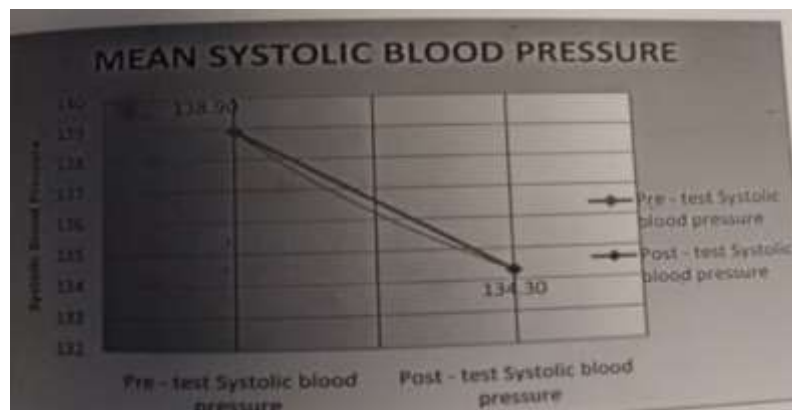


Table 2: Analysis of Diastolic Blood Pressure of the study subjects

	MEAN DIASTOLIC BLOOD PRESSURE (mm/Hg)
Pre -test diastolic blood pressure	87.17
Post -test diastolic blood pressure	85.90

The results of the above table show the comparison of the Pre and Post-test of diastolic blood pressure. The mean pre test value of diastolic blood pressure was 12.17mm/Hg and post test mean value of diastolic blood pressure was 85.90

Graph 2: Mean Diastolic Blood Pressure of the study subjects

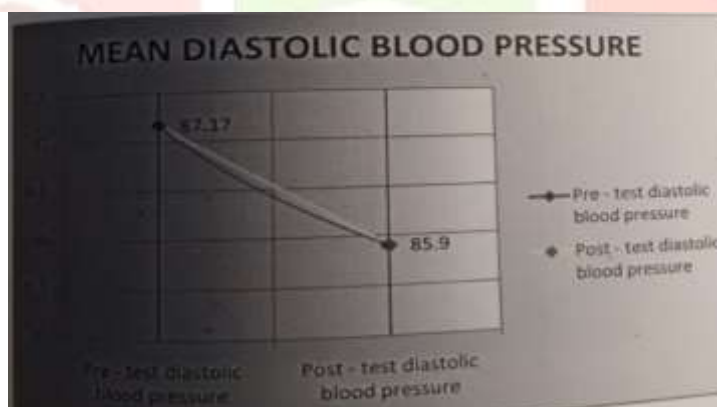


Table 3: Analysis of Pulse Rate of study subjects

	MEAN PULSE RATE (PER MINUTE)
Pre-Test pulse rate	61.83
Post -Test pulse rate	67.1

Results of the above table show the comparison of the Pre and Post-test value of pulse rates. The mean pre test value of pulse rate was 61.83 per min and the post test mean value of pulse rate was 67.1 per min.

Graph 3: Mean Pulse Rate of the study subjects

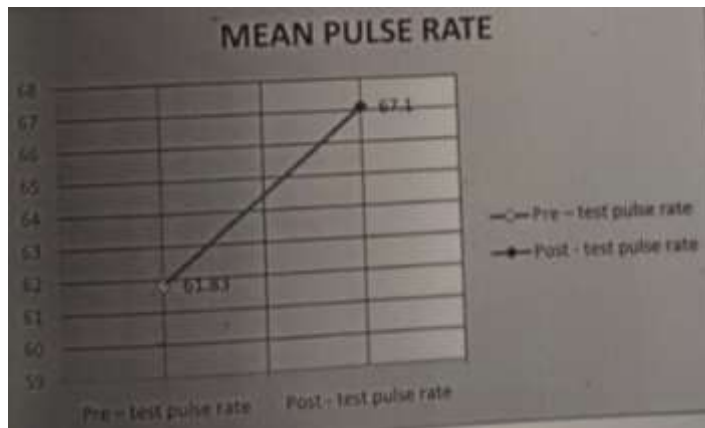


Table: 4 Analysis of Respiratory Rate of the subjects

	MEAN RESPIRATORY RATE/MIN
Pre-test respiratory rate	17.0
Post -test respiratory rate	17.5

Results of the above table show the comparison of the Pre and Post-test value of Respiratory rate. The mean pre test value of respiratory rate was 17.0 per min and post test mean value of respiratory rate was 17.5 per min.

Graph 4: Mean Respiratory Rate of the study subjects

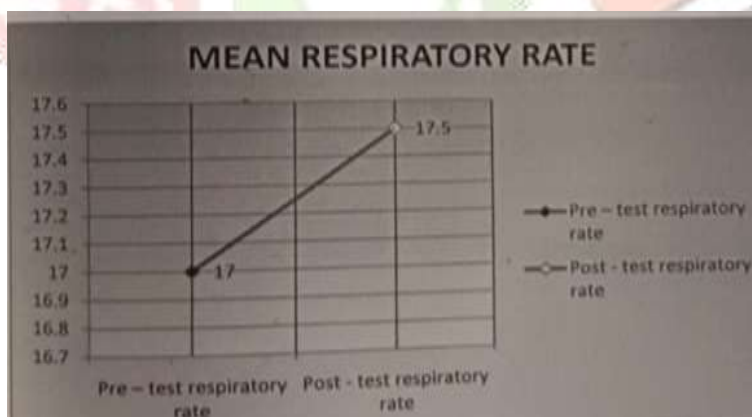
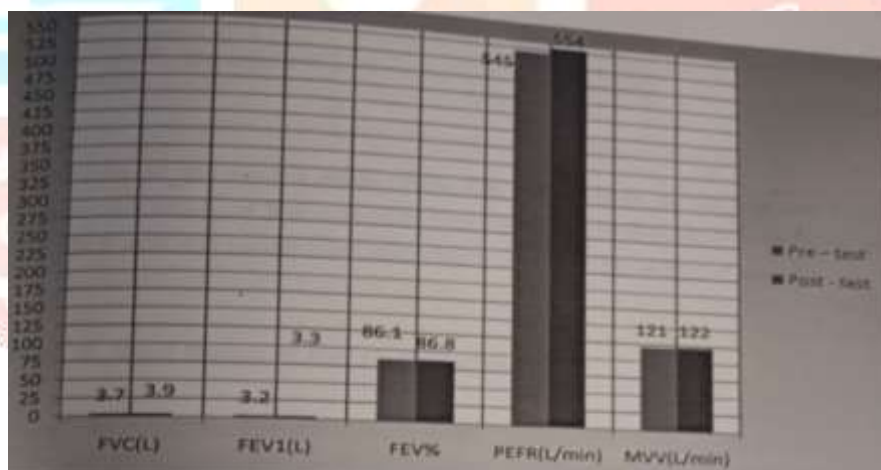


Table :5 Analysis of dynamic lung functions of the subjects

PARAMETRS	PRE-TEST	POST-TEST
FVC(L)	3.7	3.9
FEV1(L)	3.2	3.3
FEV%	86.1	86.8
PEFR(L/min)	545	544
MVV(L/min)	121	122

The results of the above table show the comparison of the Pre and Post-test value of various dynamic lung function tests. The mean pretest value of FVC(L) was 3.7 and posttest value was 3.9. The mean pretest value of FEV1(L) was 3.2 and posttest value was 3.3. The mean pretest value of FEV% was 86.1 and post test value was 86.8. The mean pre test value of PEFR(L/min) was 545 and post test value was 554. The mean pre test value of MVV(L/min) was 121 and post test value was 122.

Graph: 5 MEAN Dynamic lung functions of the subjects



DISCUSSION

The present study demonstrates that regular practice of aerobic exercise causes alterations in autonomic functions, respiratory performance and well being of elderly persons.

Significant reduction in Systolic, diastolic pressure and increase in pulse rate indicates a trend of gradual shift of autonomic equilibrium toward relative parasympatho dominance because of the reduction of sympathetic activity. This modulation of autonomic nervous system activity probably might have been brought about through the conditioning effects of aerobic exercise mediated through limbic system and higher areas of the central nervous system.

In moderate to severe essential hypertension, exercise should be combined with life style changes and medication Md Shahiddur rehaman et al (2009)" Aerobic exercise may be an important tool for blood pressure management of long-term-treated hypertension patients Emmanuel G Ciolac et al (2008). Training at intensity between 85-90% of HR max can induce a significant reduction of resting systolic BP in sedentary elderly individuals. Moderate- intensity exercise at 65-70% of HR max did not elicit a statistically significant change in SBP Guoyuan Huang, et al (2006) . The subjects aged 80 and older can

increase aerobic capacity and reduce systolic blood pressure in a community-based exercise program of moderate intensity Vaitkevicius PV, et al (2002)

A four 10- min walking sessions per day is effective in reducing blood pressure in pre hypertension. A 5mmHg reduction in SBP has been reported to reduce diastolic pressure levels James A Blumenthal., et al (1989) Similar ventilatory training even in elderly subjects (ages 60-75) has been shown to improve lung volumes and capacities (Belman et al., 1988). Lung inflation near to total lung capacity is a major physiologic stimulus for the release of lung surfactant (Hildebran et al., 1981) and prostaglandins into alveolar spaces (Smith et al.) which increases lung compliance and decreases bronchiolar smooth muscle tone respectively.

The results of this study provide evidence that low intensity aerobic training program for elderly persons is more effective in improving respiratory rate and dynamic lung functions. It can be hypothesized that low intensity aerobic exercise for a long term program can effective in improving respiratory rate and dynamic lung functions in elderly persons from the above observation it has been reported that the aerobic exercise has improved the well being of the elderly subjects. This study indicates that it may be caused by increased oxygen consumption to the tissue as a result of increased cardiovascular and respiratory functions and there by reduced the fatigability due to regular practice of aerobic exercise and cardio vascular endurance training

In view of the observations that aerobic activity counteracts sympathetic activity (Vishwanathan et al., 1986), improves quality of sleep (James et al., 1987). counteracts stress-induced disorders, resets the body's aging clock (Picrrefiche and Labonit, 1995; Poeggler et al., 1994) and elevates mood (Dawsan and Encel, 1993).

4 months of aerobic exercise training produced an overall 11.6% improvement in peak Vo₂ and a 13% increase in aerobic threshold, lower cholesterol levels and diastolic pressure levels James A Blumenthal., et al (1989)

These observations suggest that regular practice of aerobic exercise can bring significant improvement in the autonomic balance, respiratory performance and well-being. It is possible that if aerobic exercises are administered along with exercises, both physical and mental performance can be improved in elderly patients.

CONCLUSION

Significant reduction of blood pressure and increase in pulse rate, respiratory rate (RR) and dynamic lung functions such as FVC, FEV₁, FEV%, PEFR and MVV can be observed in the elderly subjects who were participated in the study. The results clearly shows that, with low intensity aerobic exercises helps elderly persons in improving the functional status and quality of life when these were introduced in the day to day life.

REFERENCES

1. "Essentials of Geriatrics Physiotherapy" by Shyam A. Kalekar.
2. Silvio Lopes Alabarse, Ricardo Munir Nahas et.al (2018) Effect of aerobic exercise training on elderly people functional capacity: a randomized controlled study.
3. Silvio Lopes Alabarse, Páblus Staduto Braga da Silva et.al. Effect of walking exercise on body mass index in elderly people: a randomized controlled trial(2018)
https://www.researchgate.net/publication/328369182_Effect_of_walking_exercise_on_body_mass_index_in_elderly_people_a_randomized_controlled_trial.
4. Brunner & Suddarth's Textbook of Medical-surgical Nursing.
5. Bundle Hazzards Geriatric Medicine and Gerontology Eighth Edition.

6. .Jerome L Fleg(2012) Aerobic exercise in the elderly: a key to successful aging.
7. ACSM's Guidelines for Exercise Testing and Prescription EIGHTH EDITION.
- 8.By AMERICAN COLLEGE OF SPORTS MEDICINE, Walter R. Thompson, PhD, FACSM, Senior Editor Neil F. Gordon, MD, PhD, FACSM, Associate Editor Linda S. Pescatello, PhD,
- 9.Emmanuel G Ciolac Edimar A Bocchi, Luiz A Bortolotto et.al (2010)Effects of high-intensity aerobic interval training vs. moderate exercise on hemodynamic, metabolic and neuro-humoral abnormalities of young normotensive women at high familial risk for hypertension DOI: 10.1038/hr.2010.72.

