



# Aerobic Exercise Intervention For Functional Recovery In Hemiparetic Patients.

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**Background:** Physical activity of an individual is positively related to aerobic capacity of cardio-respiratory system to supply oxygen to the skeletal muscle. Stroke reduces the physical activity of individual and many aerobic exercises are used to rehabilitate the stroke patients. So, there is a need to find which aerobic exercises will helpful to improve physical functional performance in Hemiparetic individuals.

**Objectives:** To find the effect of aerobic exercises on physical endurance and functional performance of subjects.

**Methodology:** Clinically diagnosed subjects (N=25) with hemiparesis were randomly assigned for study. They were treated with conventional therapy and aerobic exercises for 8 weeks. Assessments were done on first day and reassessed on fourth and eight weeks. Pre and post intervention outcomes were measured using Continuous scale Physical Functional Performance (CS-PFP).

**Result:** Aerobic exercise intervention had significant effect ( $p < 0.0001$ ) on functional recovery in hemiparetic patients both statistically and clinically.

**Conclusion:** Aerobic exercise intervention improves physical endurance and functional performance in hemiparetic patients.

**Key words:** Aerobic Exercise, Hemiparesis, Functional Recovery, CS-PFP Scale.

## INTRODUCTION

“Stroke is the sudden loss of Neurological function caused by interruption of the blood flow to the brain”. The brain is the unique organ in that the Neurons depend on a continuous blood supply because metabolism is almost exclusively aerobic. This means that the production of energy necessitates a continuous supply of oxygen and glucose delivered to the Neurons by the arterial blood. If brain is deprived of blood, consciousness is lost within seconds and permanent damage occurs within minutes.<sup>(2)</sup> Hemi paretic patients have low peak exercise responses probably due to a reduced number of motor units available for recruitment during dynamic exercise, the reduced oxidative capacity of paretic muscle, and decreased overall endurance.<sup>(6)</sup> Patients with Stroke demonstrate decreased level of physical conditioning following periods of prolonged immobility and reduced activity. The overall aim in the management of a Stroke victim is the complete restoration of the disabled person to his full physical, psychological and social capability. The role of the physiotherapist is to enhance recovery by preventing complications, promoting intrinsic recovery, teaching adaptive strategies and facilitating interaction with the environment.<sup>(5)</sup> Hemi paretic patients have

low peak exercise responses probably due to a reduced number of motor units available for recruitment during dynamic exercise, the reduced oxidative capacity of paretic muscle, and decreased overall endurance.<sup>(6)</sup>

**Aerobic exercises:-** It is a physical exercise of relatively low intensity that depends primarily on the Aerobic energy-generating process. Aerobic exercises or cardio-respiratory endurance training improves central and peripheral blood flow and enhance the capacity of muscle fiber to generate greater amount of adenosine triphosphate.<sup>(4)</sup> It increases the ability to perform prolonged sub-maximal Aerobic capacity. Improvement in endurance that accompanies daily aerobic training, such as jogging or swimming, results from many adaptations to the training stimulus. Some adaptation occurs in the muscle, and many of these involve changes in energy system. Other changes occur in cardiovascular system, improving circulation to and within the muscles.<sup>(4)</sup> Individuals recovering from Stroke can benefit from Aerobic training to improve cardiovascular function. Endurance training programs for patients with Stroke have been shown to yield significant improvements in physical fitness, functional status, psychological outlook and self- esteem muscular function.

**Continuous Scale Physical Functional Performance:** The Continuous-Scale Physical Functional Performance Test (CS-PFP) offers many attractive features for measuring physical function across a wide range of functional abilities. The CS-PFP uses time, distance, and weight to evaluate functional ability, based on the performance of 16 sequentially performed common household tasks. The CS-PFP is reported to yield valid and reliable measurements and is used to quantify physical function based on performance of 16 different tasks that reflect ability in 5 physical domains (upper-body strength, lower-body strength, upper-body flexibility, balance and coordination, and endurance). Physical functional performance was measured as weight, time, or distance. Tasks from the CS-PFP and those selected for the PFP-10. Scores are scaled from 0 to 100 utilizing the following formula based on lower and upper extremes of performance from previously tested older adults.

$$\text{CS-PFP score} = \frac{(\text{observed score} - \text{lower limit})}{(\text{upper limit} - \text{lower limit})} \times 100$$

The domain and total scores on the CS-PFP 10 are calculated using lower and upper time and weight limit for each task. Thus, when the Stroke patients take longer than the upper limit, or carried less than the lower limit, they scored 1 on that item.

## MATERIAL AND METHODOLOGY

**Type of study:** Experimental study.

**Study design:** Pre and post test.

**Sample size:** 25

**Sampling method:** convenience sampling method.

**Study duration** 1 Year.

**Place of study:** OPD of Physiotherapy Krishna Institute of Medical Sciences, Deemed to be University, Karad.

**Inclusion Criteria:**

Both male and female.

Age 40-65 years old.

Clinically diagnosed hemiparetic patients following stroke at least 3 months post event

Ability to ambulate independently or with assistive devices for short distance

Medically stable

**Exclusion criteria:**

Severe musculoskeletal problems.

Severe cardiac conditions

Cognitive impairment

Uncontrolled hypertension

Presence of other neurological disorder like parkinson's disease, MS etc.

**MATERIALS USED:**

- Recumbent cycle.
- Stopwatch and Wrist Watch.
- BP Machine.
- Stethoscope.
- Pan.
- Weights.
- Sponge.
- Jacket.
- Scarfs.
- Towels.
- Chairs.

**Treatment protocol:-****Warm up period:-**

The timing for the warm up period was 10 minutes, and 10 repetitions of each movement.

**Upper Limb movement-**

Shoulder Joint: - Flexion-extension, Abduction- Adduction, Internal and external rotation.

Elbow Joint: - Flexion-extension.

Wrist Joint: - flexion- Extension, Radial and Ulnar Deviation. Finger movements.

**Lower Limb movement-**

Hip Joint: - Flexion-extension, Abduction - Adduction, Internal and external rotation.

Knee Joint: - Flexion- extension.

Ankle joint: - Dorsiflexion- Plantar flexion.

Ankle – Toe movements.

**Stretching exercises-**

The stretching was given for the 30 second hold and 3 repetitions in per set.

Upper limb flexor stretching.

Finger stretch.

Hamstrings stretching.

Gastronemus and Soleus stretching.

Tibialis anterior stretching.

**Aerobic exercises: -**

Before starting the training pulse rate monitored and after finishing the training again pulse rate monitored.

The duration for the Aerobic training is 30 minutes.

Cycling Ergometer [low to moderate intensity]

Jogging

Walking.

**Cool down period: -**

The timing for cool down period was 10 minutes.

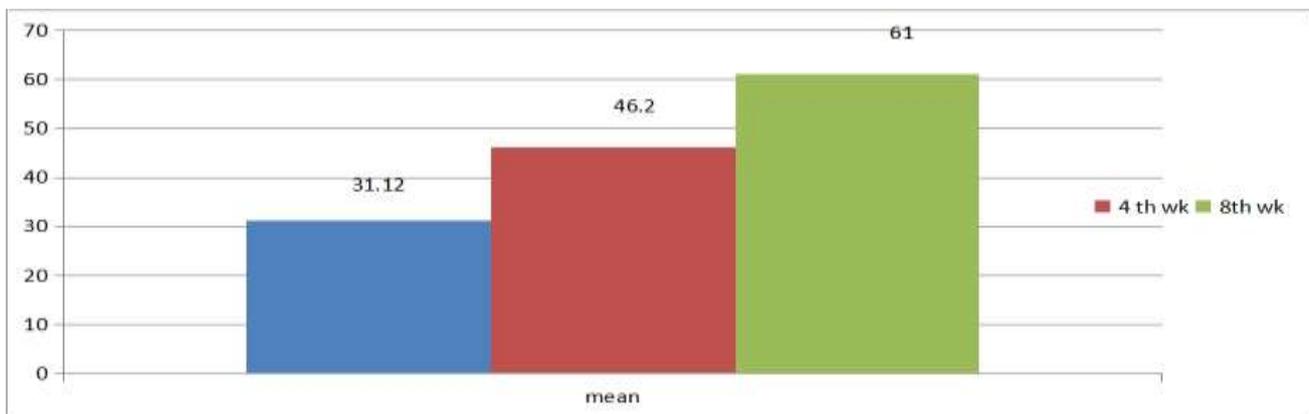
Passive relaxation.

**STATISTICAL ANALYSIS (DATA ANALYSIS AND INTERPRETATION)**

Statistical analysis was done using instat software.

**TOTAL CS-PFP SCORE**

	CS-PFP Pre-intervention Score	CS-PFP Post-intervention Score[4 <sup>th</sup> week]	CS-PFP Post-iteration score [8 <sup>th</sup> week]
MEAN	31.12	46.2	61
SD	7.860	8.860	5.050



**CS-PFP DOMAIN SCORE**

**pre post intervention upper body strength.**

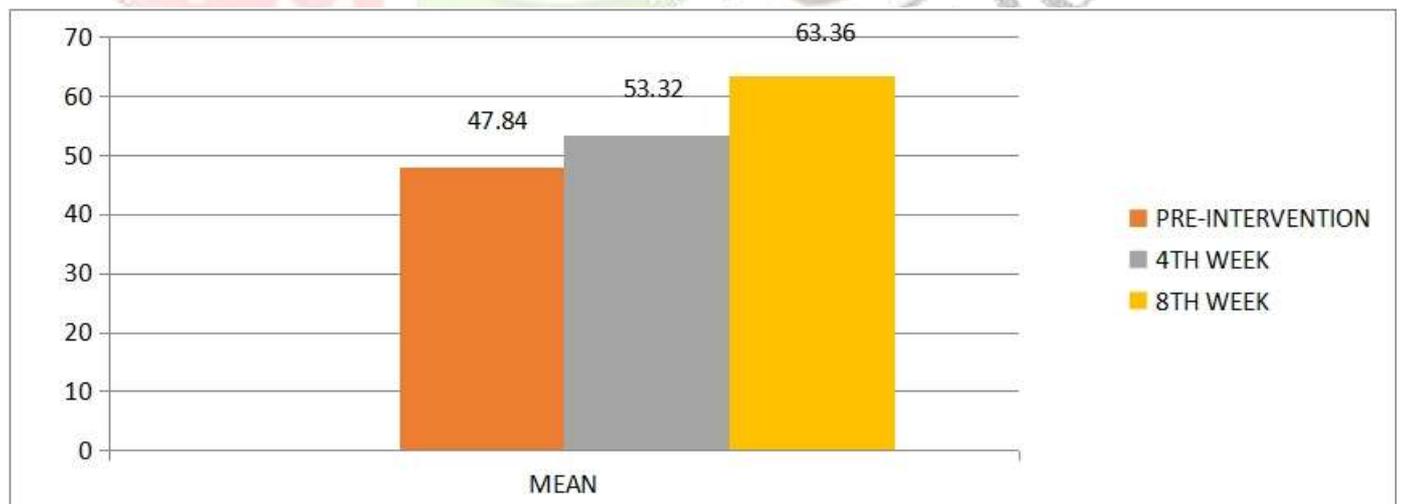
	UBS pre-intervention	UBS Post-intervention [4 <sup>th</sup> Week]	UBS Post-intervention [8 <sup>th</sup> week]
MEAN	23.72	28.68	34.12
SD	4.954	5.218	6.747



**UPPER BODY FLEXIBILITY**

**pre post intervention UBF.**

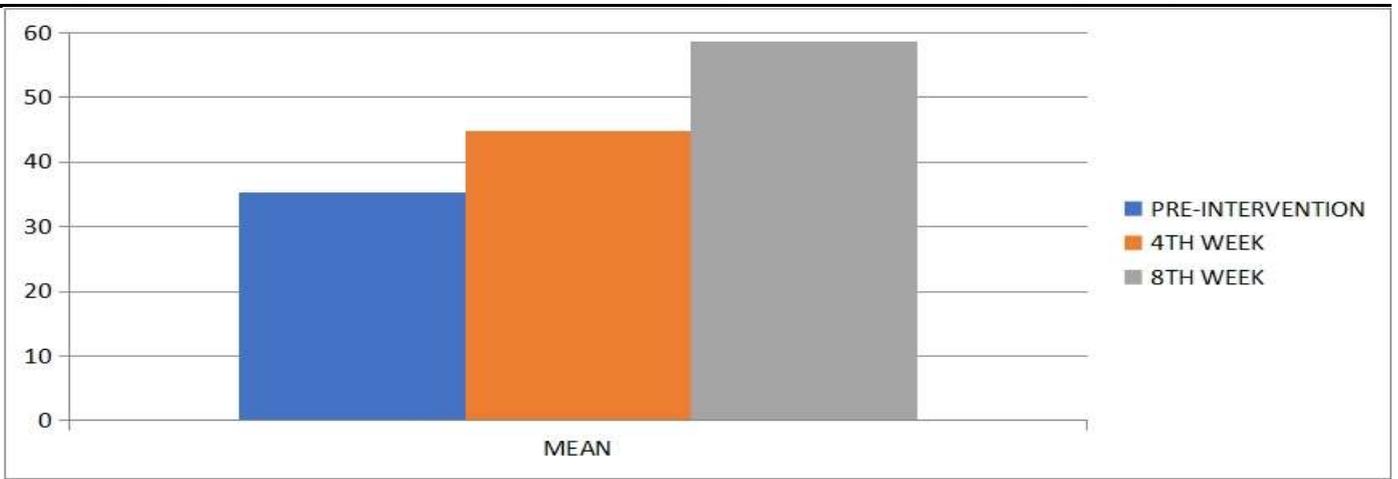
	UBF Pre-intervention	UBF post-intervention [4 <sup>th</sup> week]	UBF post-intervention [8 <sup>th</sup> week]
MEAN	47.84	53.32	63.36
SD	17.637	16.075	12.665



**LOWER BODY STRENGTH**

**pre post intervention LBS.**

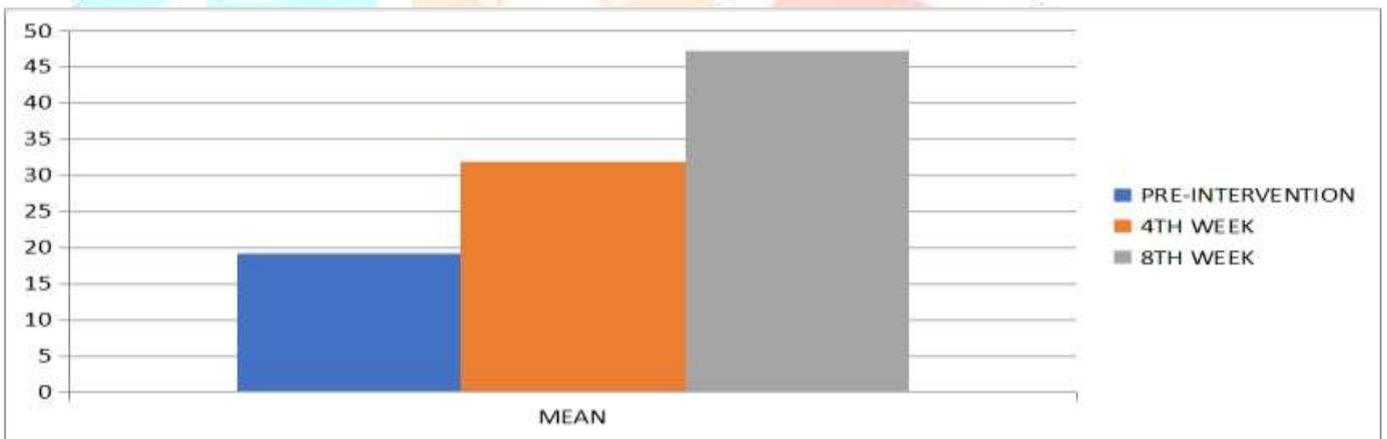
	LBS Pre-intervention	LBS post-intervention [4 <sup>th</sup> week]	LBS post-intervention [8 <sup>th</sup> week]
MEAN	35.24	44.76	58.56
SD	11.207	12.170	9.853



**BALANCE AND CO-ORDINATION**

**pre post intervention balance and co-ordination.**

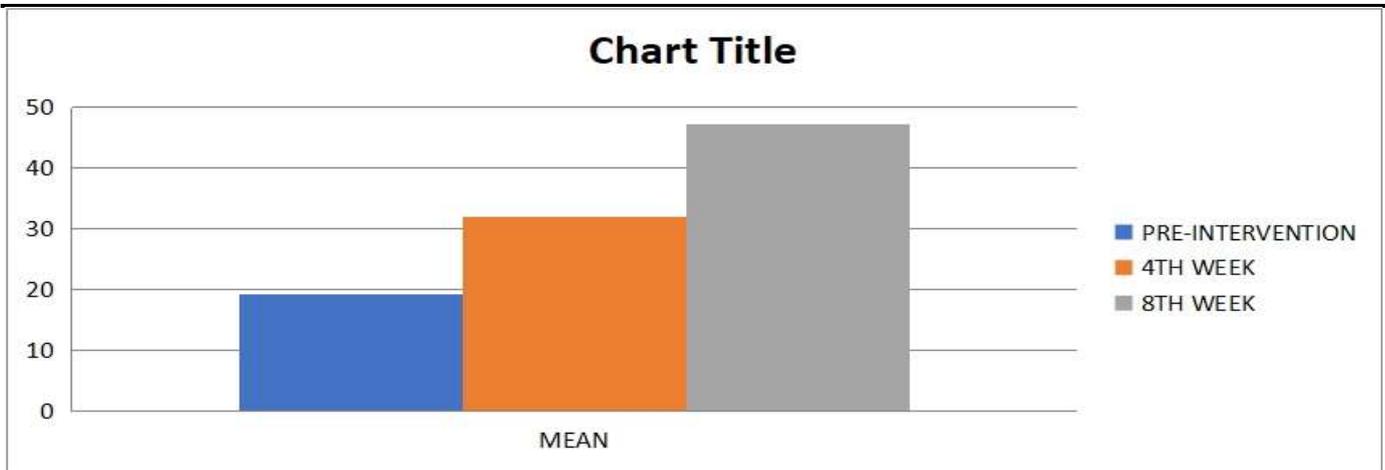
	Pre-intervention	Post-intervention [4 <sup>th</sup> week]	Post-intervention [8 <sup>th</sup> week]
MEAN	32.92	44.4	62.8
	11.202	12.038	8.703



**ENDURANCE**

**pre post intervention endurance.**

	END intervention	Pre- Post-intervention [4 <sup>th</sup> week]	END Post-intervention [8 <sup>th</sup> week]
MEAN	19.24	31.96	47.2
SD	4.465	5.127	7.659



## DISCUSSION

Stroke is the leading cause of neurological disability in adults. Poor level of fitness, including low aerobic capacity limit the ability to engage in daily activities as a result of stroke. Hemiparetic individuals have low peak exercise response as a result of - reduced no. of motor units, reduced oxidative capacity, decreased overall endurance

This study was a single group study which consisted of 25 subjects, which had 19 males & 6 females. Objective of this study was to find out the physical performance which was calculated using the CS-PFP score. Repeated measures of ANOVA have used to find out the effect of intervention within the outcome measure used.

The p value ( $p < 0.0001$ ) was highly significant. I have assessed the CSPFP score before starting the intervention, thereafter 4 weeks & 8 weeks. The results which I have got shows less improvement in UBS as compare to other domain. Significant improvement in the Upper body flexibility, Lower body strength, Balance & Co-ordination and Endurance. So, the aerobic exercises with conventional exercises shows significant improvement on patients' physical functional performance. The mechanism behind the significance of this intervention can be assigned to the following systemic changes-Aerobic exercises has been shown to improve walking, cardiovascular fitness and there by risk factor profile in chronic stroke patient. So, the aerobic exercises with conventional exercises shows significant improvement on patients' physical functional performance. The mechanism behind the significance of this intervention can be assigned to the following systemic changes. Aerobic exercises have been shown to improve walking, cardiovascular fitness and there by risk factor profile in chronic stroke patient. Stroke is the leading cause of neurological disability in adults. Poor level of fitness, including low aerobic capacity limits the ability to engage in daily living activities as a result of Stroke. After a Stroke, it is common to experience continued difficulties in mobility that leads to lack of exercises, and lack of exercises lead to further muscle weakening and reduced fitness. Inactivity can contribute to physical complications. Hemiparetic individuals have low peak exercise responds as a result of, reduced number of motor units, reduced oxidative capacity, and decreased overall endurance. Patients with Stroke demonstrate decreased level of physical conditioning following periods of prolonged immobility and reduced activity. The energy costs to complete many functional tasks are higher than normal owing to the abnormal ways in which the activities are performed.

This will presumably lead to an increased need for rehabilitation programs that enhance recovery, improve functional status and quality-of-life, thus leading to future challenges for societies, and health-care and financial systems. Rehabilitation strategies for Stroke survivors have focused primarily on restoring reduced motor control of the affected side as well as postural control. However, less than a third of the variance in disability after Stroke can be explained by the extent of neurological impairment. Around 75% of post-Stroke individuals exhibit cardiac disease. Thus, Stroke survivors may be more disabled by associated cardiac disease than by the Stroke incident itself. The study on Aerobic exercise to improve cognition and Motor Function and to improve the aerobic capacity of patients, post-stroke. They included 38 chronic stroke survivors were randomized to 2 different groups that exercised 3 times a week (45-minute session) for 8 week. The Aerobic exercise group contains 19 subjects in which 9 women and 10 men who performed progressive resistive stationary bicycle training at 70% MHR, whereas Stretching Exercise group contain 19

subjects in which 12 women and 7 men performed stretches at home. And they concluded that Aerobic exercise group shows significantly improved motor learning, which is required for daily function

The present study aimed to investigate the Aerobic exercises intervention improves functional performance of Hemiparetic patients. It was conducted with 25 samples, including 19 males & 6 females. Objective of this study was to find out the physical performance which was calculated using the CS-PFP score. Patient included in this study between the age group of 40-65 of both male and female. And those patients who are able to stand independently and able to walk with assistive devices. And excluded the patients who have musculoskeletal problems, major cardiovascular problems and other neurological problem. Patients treated according to exercise protocol and in given dosage for 8 weeks. Pre-intervention and post-intervention score measured with Continuous Scale Physical Functional Performance score. The Repeated measure of ANOVA test was used to evaluate the improvement in outcome measures. The Continuous Scale Physical Functional Performance score of the total 25 samples improved with mean of 61 with SD 5.050. Thus, post therapy results indicate statistically significant improvement as shown in graph [ $P < 0.0001$ ;  $F = 3.015$ ]. Continuous Scale Physical Functional Performance scale was utilized for evaluating the functional performance in these patients. It has good construct validity and reliability. This scale contains the 5 domain that is Upper body strength, Upper body flexibility, and Lower body strength, Balance and Co-ordination and Endurance. The Upper body strength score of the total 25 samples improved with the mean of 34.12 with SD 6.747. The Upper body flexibility score of the total 25 samples improved with the mean of 63.36 with SD 12.665. The Lower body strength score of the total 25 samples improved with the mean of 58.56 with SD 9.853. The Balance and Co-ordination score improved with the mean of 62.8 with SD 8.703. The Endurance score improved with the mean of 47.2 with SD 7.659.

Thus, this shows that less improvement in UBS as compare to other domain. And shows significant improvement in the Upper body flexibility, Lower body strength, Balance & Co-ordination and Endurance. So, the aerobic exercise intervention with conventional exercises shows significant improvement on patient's physical functional performance of Hemiparetic individual.

**CONCLUSION:** The present study concludes that Aerobic exercise intervention with conventional treatment helps to improve physical endurance and functional performance in Hemiparetic individual. Thus, the alternate hypothesis was accepted.

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