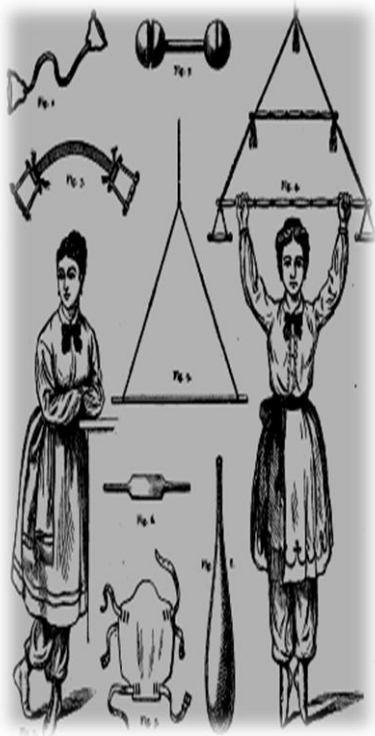


EFFECT OF PILATES, CALISTHENICS AND COMBINED EXERCISES ON SELECTED PHYSICAL MOTOR FITNESS



Dr. Rajeev Srivastava

ISBN : **978-1-329-90436-1**

First Edition: New Delhi , 2016

Copyright 2016, **Dr. RAJEEV SRIVASTAVA**

All rights reserved

Published And Printed by **ISARA PUBLICATIONS**

B-15, Vikas Puri , New Delhi 110018



JOSEPH PILATES

*Dedicated to My Family,
Teacher's & My Friends*

ACKNOWLEDGEMENTS

I express my sincere and heart-felt thanks to honored and learned guide Dr. D. SAKTHIGNANAVEL, Professor & Head Department of Physical Education and sports, Pondicherry University, Puducherry for his valuable for his valuable guidance, and encouragement for the successful completion of this study.

I owe a deep sense of gratitude to me doctoral Committee members Dr. G. VASANTHI, Associate Professor, Department of Physical Education and Sports and Dr. SENTHIL NATHAN, Associate Professor, Department of Earth Science Pondicherry University Puducherry for their encouragement and suggestion made throughout the study.

I express my thanks to Dr. D. SULTANA and Dr. P. SUBRAMANIAM, Professor, Department of Physical Education and sports, Pondicherry University.

I express my and heart-felt thanks to Dr. M. ELAYARAJA and Dr. G. VINOD KUMAR, Associate Professor, Department of Physical Education and sports, Pondicherry University for their co-operation and assistance.

I express my thanks to Mr. K. THIRUMOURGANE, Senior Guide Lecturer, Department of Physical Education and sports, Pondicherry University for their co-operation and assistance.

I express my sincere and heart-felt gratitude to Dr. RAM MOHAN SINGH & Dr. PARVEEN, Assistant Professor, Department of Physical Education and sports, Pondicherry University for their co-operation and assistance.

I express my sincere and whole heart-felt thanks to Dr. TAMILAPPAN, SAI Pondicherry, Mr. S. JAYARAM, Athletic Coach, Dr. G. SIVARAMAN, and Dr. K. CHANDRASEKARAN, Assistant directors, Mr. T. NARAYANAN and Mr. P. MALAVAN, Markers of Pondicherry University for their co-operation and assistance.

I express my sincere and whole heart-felt thanks to Mr. B. ELUMALAI, Sr. Lab, Attendant, Pondicherry University, Mr. P. VELAUTHAM, Junior Assistant Mr. M. VELAUTHAM, Office Assistant, Department of Physical Education and sports, Pondicherry University for their co-operation and assistance.

I am indebted to Dr. HARI OM SINGH Principal of Raj English School, Shivpurva, {Paharia (Benipur Road)} Sarnath, Varanasi, and Mr. MANOJ SINGH Physical Director for providing the population for the study, their kind co-operation and assistance to collect the data and also my sincere thanks to the subject for their co-operation throughout my study. This study could not have been possible without them, I remain ever grateful.

I express my sincere and whole hearted thanks to Mr. Pramod K., Mr. T. Madhan Kumar, Mr. Raju Chaudhery, Mr. Dasratan Chandramohan, Ms. Neha Srivastava and my K.K.C. Group Cricket Team, friends, classmate, hostel mate, and all Ph.D. Scholar Department of Physical Education and sports, Pondicherry University who assisted my for successful completion of this work.

A word of thanks goes to my father Mr. GULAB CHAND SRIVASTAVA, mother Mrs. LAL MUNI DEVI, my elder brother, sister and sister-in-law who has been a source of courage and strength throughout this research work.

RAJEEV SRIVASTAVA

TABLE OF CONTENTS

1	Chapter I INTRODUCTION	1
1.1	Objectives of the Study.....	9
1.2	Statement of the Problem	9
1.3	Delimitations.....	10
1.4	Limitation	10
1.5	Hypotheses	11
1.6	Meaning and Definition of the Terms.....	11
2	REVIEW OF RELATED LITERATURE	13
3	METHODOLOGY	15
3.1	Selection of Subjects.....	15
3.2	Experimental Design	15
3.3	Selection of the Variables and Tests.....	17
3.4	INSTRUMENT RELIABILITY.....	18
3.5	RELIABILITY OF DATA	18
3.6	PILOT STUDY	18
3.7	ORIENTATION OF THE SUBJECTS	19
3.8	TRAINING PROCEDURES	19
3.9	TEST ADMINISTRATION.....	53
3.10	Collection of data.....	62
3.11	Statistical Procedure	62
4	ANALYSIS OF THE DATA AND RESULTS OF THE STUDY	64
4.1	DISCUSSION OF FINDINGS	90
4.2	Discussion of Hypotheses	93
5	SUMMARY, CONCLUSION AND RECOMMENDATION.....	95
5.1	Summary	95

5.2	Conclusion.....	95
5.3	Recommendation	96
6	BIBLIOGRAPHY	97

1 Chapter I INTRODUCTION

The general knowledge of exercise is a strong foundation for professional groups like physical education teachers, coaches, and fitness experts etc., concerned with human physical activity. It helps these professionals to acquire and disseminate knowledge pertaining to physical activity of a human being. Furthermore, it assists in scientifically constructing and implementing exercise/training programmes for various categories of people, be it for those who are involved in competitive sports or those interested in acquiring optimal fitness. To accomplish high performance in competitive sports it is essential that the trainers possess knowledge of exercise training. This assists them to yield fruitful result from their athletes. It also helps in designing and managing rehabilitative programmes for those suffering from various health disorders. Moreover, the sedentary class of people can be motivated to lead a positive and healthier life style.

Exercise proves elementary in measuring the effect of exercise and training on various systems of the human body. The exercise responses may vary with different types of exercises and training programs (i.e., strength, endurance, and speed) age, sex and level of fitness. The activity needed for different categories of people is tailored to their capabilities. Quality of life is ensured in the people by this activity. Today it has a unique opportunity of potentially contributing toward the positive-healthier life style in every individual.

Research has verified that exercise improve muscle strength, balance, co-ordination and cardiovascular fitness in even the most frail and elderly participant. Strengthening and stretching exercise helps maintain balance and range of motion and are recommended in many fall-prevention studies. Exercise program relevant for the individual participant. Promoting independence and maintain or improving function are two of the greatest benefits and goals of an exercise program for frail elders and adult with special needs. By seeing an improvement in physical endurance and strength, a participant can begin to see himself and herself as a more active and more independent person.

"Sports keep one physically healthy". Sports aims at improving the quality of life and capabilities of the people through sports. This increases the five components of fitness, namely: Suppleness, Speed, Skill, Stamina, and Strength. Through Sports one can increase appetite and burn calories.

Sports Training

Sports training is a pedagogical process based on scientific principles, aimed at preparing the sportsmen for higher performances in sports competitions.

Since ancient times the word 'Training' has been a part of human language. It focuses on the process of preparation for some task. This process invariably extends to a number of days and sometimes even months and years. The term 'Training' is widely used in sports.

Sports training are done for improving performance in sports. A sport training, therefore, directly and indirectly it aims at improving the personality of the sportsman. The personality of a person has several dimensions e.g., physical, physiological, social and psychic. In order to improve sports performance the social and psychic capacities of the sports person also have to be improved in addition to the physical and physiological ones. In other words the total personality of a sportsman has to be improved in order to improve his performance.

Exercise

Daily exercises have improved cardiovascular fitness and an overall improved quality of life. Exercise will also enhance one's mental well-being and promote healthy musculoskeletal function throughout life. Exercise may positively affect cardiovascular, musculoskeletal, respiratory, endocrine function, and mental health. Exercises programs contribute to an improved mental health and an enhanced psychosocial well-being.

Exercise training programs improved the subject's cardiopulmonary fitness as, measured by an increase in their maximum level of oxygen intake. Exercise is about gaining stronger

muscles. Strength training will help improve the support mechanism of the bones and lead to fewer problems, such as back pain. Exercise helps in two ways: it stretches the joints to improve flexibility and increases the muscular support system.

Effects of Exercise

Biochemical and Physiological Changes with Exercise

Research studies have shown that exercise has a number of beneficial biochemical and physiological effects on our body, such as:

Lowers the levels of stress hormones in the blood stream	Lowers resting heart rate
Reduces the clotting time of our blood	Boosts immune function
Stimulates gall bladder to drain	Lowers estrogen levels
Causes muscles to relax	Lowers triglycerides
Lowers lactate levels (linked to being a factor in anxiety)	Improves sleep
Improves insulin resistance	Improves efficiency of cardiovascular system
Improves blood cholesterol profile	Boosts serotonin
Stabilizes blood sugar levels	Induces relaxation
Lowers blood pressure	Increases our energy level

Pilates Exercise

Pilates is not just exercise, pilates is not just a random choice of particular movements. Pilates is a system of physical and mental conditioning that can enhance ones physical strength, flexibility and co-ordination as well as reduce stress, improve mental focus, and foster an improved sense of well-being. Pilates can be for anyone and everyone. Pilates is an exercise system based on yoga principles with Germanic overtones embedded within it. It which mainly

focuses on improving endurance and flexibility of the abdomen, lower back and hips. This exercise developed by the late Joseph Pilates in the 1920s was used as a method of rehabilitation from chronic diseases such as asthma. Its original idea includes growing muscle strength, endurance, and flexibility while maintaining spine stabilization.

Pilates is a very effective exercise that combines both eastern and western concepts by including yoga (a mind body method), breath, flexibility, relaxation, strength and endurance. It is well designed to enhance both physical and mental well-being. Pilates training also strengthens the deep, core muscles and improves movement, efficiency and muscle control. Pilates is excellent for fitness, conditioning, and improving overall quality of life.

The Pilates process uses both the floor and/or specialized tools in order to complete exercises. Pilates is original exercise method which caters to each and every one, of all body types, and all fitness abilities. It has approximately 500 exercises that are performed on mats or specialized apparatus. Pilates main purpose is to organize the mind, body, and breathe to build up sleek and strong abdominal muscles and a strong and agile back. Pilates aims to develop physical harmony, balance and conditioning. Pilates for the body work out it actually provides; toned and strengthened core muscle groups, heightened body awareness, injury prevention, improved flexibility and control, developed posture and balance, and comfort of movement through daily life.

All pilates exercises flow from five essentials breathing, cervical, rib and scapular, pelvic mobility and utilizing the transverses abdominis. Furthermore, Joseph Pilates based his method of exercise on six principles: concentration, control, centering, flowing movements, precision and breathing. Pilates exercise can be performed using mat and some instruments (Reformer, Cadillac, Stability Chair, Swiss ball or Exercise Ball, Over Ball, Bands and Tubing).

History of Pilates Exercises

In recent years, a profound evolution of pilates has occurred. The pilates industry reached a tipping point (a point of critical mass) in the mid-to late 1990, whereby it morphed from a little

known form of exercise into something with a devout but small following including dancers, singers, circus performers and actors to a mainstream fitness regimen practiced in many households. The creator of pilates **Joseph H. Pilates** was born in Germany, 9 December, 1883, and began his interest in health and physical conditioning to improve his own personal medical problems. He moved to England in 1912 to training military police and detectives in self-defense. In 1917 during First World War he worked to rehabilitate the sick and wounded in a prison camp on Britain's Isle of Man. Here he began building his equipment using springs, mattresses and his own creativity.

Mr. Pilates left for New York with the opportunity to train Max Schmelling, the German boxer who first became famous in America. He wanted to find a new life and he opened his first studio in the early 1920s. During this transition, he met his wife Clara, who was an important part of the development of his practice of contrology. He began training men, women, celebrities and dancers. Martha Graham and George Balanchine, two notable choreographers, referred many of their dancers after realizing its benefits to pilates method that he referred to as contrology. He defined contrology as "The comprehensive integration of body mind and spirit". Dancers became stronger, more flexible and helped rehabilitate their injuries.

He developed more of his Pilates equipment from his 8th avenue studio and applied for several patents in United States. He continued his teaching in New York until 1966. After Joseph died in 1967 his legend lived on through his disciples. Today there is still a hand full of instructors that actually trained directly under Joseph. These instructors are referred to as the Pilates Elders.

Effects of Pilates

- Develops strength for your core
- Develops flexibility for your core
- Develops your range of motion
- Develops posture, promoting a healthy spine
- Promotes stronger bones (great for those with osteoporosis)
- Improves breathing
- Supports you on understanding your body and its limits

- Helps prevent injuries
- Low-impact and effective
- Enhanced balance and coordination

Two forms of Pilates

The two fundamental forms of Pilates exercise are:

- **Mat-based Pilates** – This is a series of exercises performed on the floor utilizing gravity and one's own body weight to provide resistance. The main aim is to condition the deeper, fortifying muscles of one's body to amend posture, balance and coordination.
- **Equipment-based Pilates** – This includes concrete equipment that works against spring-loaded resistance, including the 'reformer', which is a movable carriage that one pushes and pulls along its tracks. Some forms of Pilates include weights (such as dumbbells) and other types of diminutive equipment that offer resistance to the muscles.

Pilates Principles

During pilates kineticism, we apply the fundamental principles are these terms refer Centering, Concentration, Control, Precision, Breath and Flow. Includes those principle that form the basis of many approaches of pilates and are generally accepted as the foundation of the system. Pilates exercises are control as whole body/mind events. Working with the pilates principles avails we bring our full attention to the moves that we do.

The six pilates principles are the foundation of more than 500 exercises that condition the entire body.

Breathing

Breath can be described as the fuel of the powerhouse, which is the engine that drives pilates. Breath is one of the keys to life itself. The respiratory muscles are the only skeletal muscles essential to life and yet breath is so often taken for granted.

Centering

The concept of center can have several levels of meanings. Primarily it relates to the body's center of gravity.

Concentration

Concentration promotes the mind-body connection. Concentration can be defined as direction of attention to a single objective, in this case the mastery of a given pilates exercise.

Control

Control can be defined as the regulation of the execution of a given action. Refining control is inherent in mastering a skill.

Precision

Precision is a key when distinguishing pilates from many other exercise systems precision can be described as the exact manner in which an action is executed. Often the exercise itself is not so different from other exercise regimens, but the way it is executed is different.

Flow

Flow is an essential quality to strive for. Flow can be described as a smooth, uninterrupted continuity of movement.

Calisthenics exercise

Calisthenics was invented in ancient Greece and linked to Greco-Roman gymnastics. The word calisthenics comes from the Greek words "kallos" for beauty and "thenos" for strength. Calisthenics is a form of exercise consisting of variety movements without the use of equipment or apparatus, but mainly using your own body weight. It's intended to increase body strength and flexibility with movements such as bending, jumping, swinging, twisting or kicking; using only one's body weight for resistance.

Callisthenics are aerobic and dynamic exercises and are suitable for sedentary and also for older people. They are rhythmic, smooth, enjoyable exercises that are easy to perform alone or in a group format, and can be modified according to subject's fitness levels. Callisthenics consist of a variety of simple movements that are intended to increase body strength and flexibility using the weight of one's own body for resistance. Callisthenic fitness training can develop both muscle endurance and cardiovascular fitness in

addition to improving psychomotor skills such as balance agility and coordination. Callisthenics can be beneficial for both muscular and cardiovascular fitness.

These calisthenics exercises are intended to provide an optimally balanced, sufficiently and flexibly demanding, and highly efficient complement to the practice of daily walking. Combined with walking or hiking, the calisthenics exercises allow us to systematically exercise our entire body and achieve complete natural conditioning in a surprisingly short amount of time. For most of us, a calisthenics workout will be done 3-5 days per week and each workout will last from 10-30 minutes. As you will soon learn through their regular practice, calisthenics exercises do indeed bring both natural human beauty and strength to us, even at only a moderate level of intensity. Calisthenics greatly enhance our physical fitness and stamina, and markedly increase our personal vitality and overall preparedness for life.

History of Calisthenics

527 BC Shaolin Monks are the first group of “Warriors” to use exercise to increase mental and physical performance. I say this because the Shaolins were not a military fighting force. They were, however, the first group of people that trained as combatants all day, every day that used calisthenics in their training. The monks trained to defend their monasteries from Chinese looters. While they were not a traditional fighting force, to this day Shaolin monks are still said to have been some of the most deadly fighters in history, (predating firearms of course).

The Persian Empire was the first organization to use physical fitness for warriors that trained in offensive tactics, and they started them at the young age of six. Since then calisthenics have been used by military forces to dominate their enemies.

“Calisthenics originated in ancient Greece, where it was mentioned in a Persian scout report on Spartan warriors before the battle of Thermopylae, with the Persians interpreting the odd synchronized movements as a form of dance, and thus a sign of weakness”.

Calisthenics has been a decisive advantage that has proven to increase human mental and physical performance for thousands of years. Their implementation has only been improved upon and continues to deliver faster workout results than any machine or equipment. The only thing you need to increase your mental and physical performance is yourself.

Effects of Calisthenics Exercise

- Calisthenics can be done by people in all age groups and genders and without risk of injury when done properly.
- By adding calisthenics to your exercise regime and going on a good diet, tremendous improvements to your health and level of fitness will result.
- Improves overall stamina, strength, energy, agility, coordination, balance, and promotes overall fitness for your health.
- Can improve mental health just as it does psycho-motor skills like balance and coordination. Can help treat mental problems such as stress, anxiety, depression, etc. and can boost your self-esteem.
- You can achieve greater vigor, flexibility, and agility from your muscles by performing calisthenics.

1.1 Objectives of the Study

- To examine the effect of pilates exercise on selected physical motor fitness variables of school boys.
- To examine the effect of calisthenics exercise on selected physical motor fitness variables of school boys.
- To examine the effect of combination of pilates and calisthenics exercise on selected physical motor fitness variables of school boys.

1.2 Statement of the Problem

The purpose of the study was to find out the effect of pilates exercise, calisthenics exercise and combination of pilates and

calisthenics exercise on selected physical motor fitness variables of school boys.

1.3 Delimitations

The study was delimited to the following aspects.

- The study was delimited to sixty school boys from Varanasi district, Utter Pradesh, India.
- They were subdivided into four groups' namely pilates exercise group I, calisthenics exercise group II and combined pilates and calisthenics exercise group III and control group. Each group consists of 15 students each, which is assumed to be sufficient and appropriate for the purpose of the study.
- The age of the subjects was ranged between 12 to 15 years.
- The experimental treatment assigned to pilates exercise group I, calisthenics exercise group II and combined pilates and calisthenics exercise group III respectively which is stipulated for 12 weeks (5 Alternate days per week).
- Selected physical motor fitness was tested by the standardized testing procedure.

1.4 Limitation

The study was limited to the following aspects.

- Methodological variation such as air temperature, atmospheric pressure, and relative influence on the result of the study was recognized as limitation for the study.
- The living condition, life style, diet, personal habits family heredity, emotional status, motivational factor of the subject were not taken into consideration for this study.
- The social, economic and cultural background of the subjects was not being taken into consideration.
- The subject's routine work and habitual free play was not controlled and their possible influences on the result of the study were noted as limitations.

1.5 Hypotheses

It was hypothesised that the effect of pilates exercise, calisthenics exercise and combination of pilates and calisthenics exercise on selected physical motor fitness variables would be significantly increased when compared with the control group.

1.6 Meaning and Definition of the Terms

Speed

It is the performance prerequisite to do motor action under given conditions (Kineticism Task, External Factors, Individual Prerequisite) in minimum of time. (Schnabel, 1987)

Muscular Power

It's an ability of a muscle or set of muscles to move an object expeditiously.

$$\text{Power} = \frac{\text{Force X Distance}}{\text{Time}} \text{ (Mary M. Yoke, 1958).}$$

Muscular Strength

The maximum force a muscle or muscle group can produce at one time. (Mary M. Yoke, Carol Kennedy A. 1958)

Cardiovascular Fitness

The ability of your heart, lungs and organs to consume, transport and utilize oxygen.

Muscular Endurance

Its ability maintains a static muscle action for a prolonged duration. (Carol Kennedy A. 1958)

Endurance is the ability to resist fatigue. (Harre d. 1986)

Balance

The ability to stabilize and produced movement or the ability of the body to statically and dynamically stabilize against resisting intrinsic and extrinsic forces.

Co-ordination

The ability is understood as relatively stabilized and generalized pattern of motor control and regulation processes. (Hirtz 1985, Harre 1986, Meinel and Schnabel 1987)

Flexibility

Flexibility is a motor ability which is not clearly a condition or coordinative ability. (Meinel and Schnabel 1987)

Significance of the Study

- The result of the study would be of great interest and would be helpful to exercise psychologist, physiologist, physical educators and coaches to adopt the effect of pilates exercise, calisthenics exercise and combination of pilates and calisthenics exercise for school boys.
- The findings of the study will provide guidance to physical educationists and coaches to prepare training schedules on the basis of the physical fitness capacity of the individual.
- The findings of the study will add to the quantum of knowledge in the area of physical and performance in sports.
- The result of the study may be used to identify the importance of pilates exercise, calisthenics exercise and combination of pilates and calisthenics exercise training to attain remarkable changes in selected physical motor fitness variables.
- The study would be able to assess variation in selected physical motor fitness variables among the four groups.

2 REVIEW OF RELATED LITERATURE

A literature review is one of the most crucial steps of any scientific research. It is undertaken for the purpose of discovering and verifying the amount of knowledge regarding the variables available to us. It is possible to plan further research only by the dint of the guidance provided by this knowledge. Here the research scholar refers to some of the literature raised around the problem under study. Such review brings about a deep insight and clear perspective of the overall field. The literature in any field forms the foundation upon which all future work will be built.

Pilates Exercise

The Pilates exercise method was produced by Joseph Hubertus Pilates in the initial 1920s. He formulated an exercise program with the purpose of growing muscle strength, endurance and flexibility while maintaining spine stabilization. In the last ten years, the pilates exercise method is a popular for body conditioning has better enormously. Several researchers studied the effect of pilates exercise.

Callisthenic Exercise

Callisthenic exercise is a systematic rhythmic isotonic exercise that is performed with four counts movements using the upper or the lower body parts. It can be performed with slow, moderate, or fast cadence and it is usually included in cardiac rehabilitation.

Precipitate of the literature

The reviews of literature suggest that the researcher spot out related topics and variables. Further the literatures suggest the researcher to frame suitable hypothesis leading to the problem. The newest works also suggest the investigator to support his finding with regard to the problem. More literature composed around the study will also benefit the research scholars understanding in similar areas, the review of related literature suggest researcher from the methodological idea of vision too. It was learnt that most of the research study cited in this chapter on contact analysis and

experiment design as the suitable method for finding out the effect on selected variables.

The reviews were presented fewer than six sections such as:

- 1) Studies based on Pilates exercise (N = 23)
- 2) Studies based on Calisthenics exercise (N = 19)
- 3) Studies based on Physical activity/exercise (N = 7)
- 4) Studies based on Physical variables (N = 31)

All the research studies presented in the section prove that the Pilates exercise and calisthenics exercise significantly enhance the selected dependent variables. The research studies reviewed are from many journals available in the websites such as www.Pubmed.com, Google scholar, employ such as physical, physiological and psychological variables etc. The reviews of literature suggest the investigator from the methodological point of view too. It was learnt that most of the research studies cited in this chapter on content analysis and experimental design as the appropriate method for finding out the lapses and remediation.

3 METHODOLOGY

In this chapter, the procedures followed toward the selection of subjects, experimental design, selection of variables and test, instrument reliability, reliability of data, pilot study, orientation of the subjects, calibration of instruments, training procedures, test administration, collection of data and statistical techniques have been explained.

3.1 Selection of Subjects

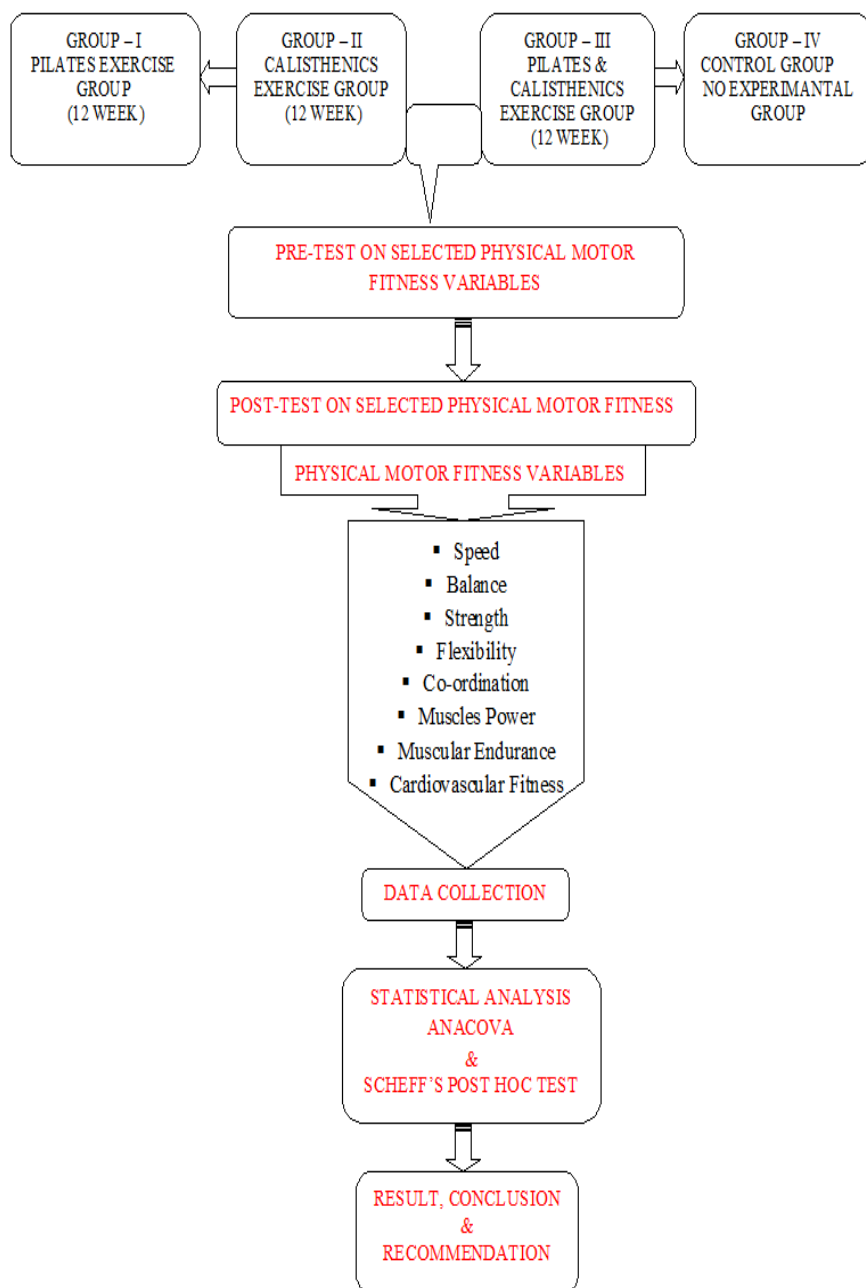
To achieve the purpose sixty (60) school boys were selected randomly, from Varanasi, Uttar Pradesh state. Their age ranged from 12 to 17 years. The selected subjects were divided into four equal groups of fifteen subjects each. There were three experimental groups namely pilates exercise (Group I), calisthenics exercise (Group II) and combination of pilates and calisthenics exercise (Group III) and a control (Group IV). They were subjected to a treatment for 12 weeks (5 alternate days per week). All the subjects participated in the research voluntarily and cheerfully without any compulsion. School curriculum has regular physical education classes in which they learn calisthenics, indigenous games and major games and sports at recreation level.

3.2 Experimental Design

The experimental design used for this study was formulated as random group design involving sixty (60) school boys, who were divided into four groups of fifteen each. They were further subdivided into three experimental groups and a control (Group I), pilates exercise (Group II), calisthenics exercise (Group III) and combined pilates and calisthenics exercise (Group IV). Each group consist of fifteen subjects each, which are assumed to be large enough for the purpose of the study. The experimental treatment was pilates exercise, calisthenics exercise, pilates and calisthenics exercise assigned to the experimental group I, II and experimental group III respectively, which was stipulated for 12 week (5 alternate days per week). Control group did not go for any training. All the subjects were tested prior and after the experimental treatment period on selected physical motor fitness criterion variables.

Figure-I

Flow Chart Showing the Methodology Adopted In the Study



3.3 Selection of the Variables and Tests

In the present study, the investigator selected the following variables under guidance from the experts in the field of physical education, many theories related to the exercise training and athletic performance and overview of various articles in the selected field.

3.3.1 INDEPENDENT VARIABLES

- Pilates exercise
- Calisthenics exercise
- Combined Pilates and Calisthenics exercise

3.3.2 DEPENDENT VARIABLES

Physical Variables

- Speed
- Power
- Strength
- Cardiovascular endurances
- Flexibility
- Muscular endurances
- Coordination
- Balance

SELECTION OF TEST

TABLE-I

SL.NO	Variables	Test/Instruments
1.	Speed	50 yard dash
2.	Power	Standing broad jump
3.	Cardiovascular fitness	Run/Jog on the spot
4.	Flexibility	Sit and reach test
5.	Muscular endurance	Sit Ups
6.	Co-ordination	Hand eye co-ordination test
7.	Strength	Push-ups
8.	Balance	Standing stork test

3.4 INSTRUMENT RELIABILITY

The instrument like stopwatch and digital wrist watch were all by manufactured by standard companies. Heart rate monitor and digital wrist watch were used to find out the intensity of the subjects. The researcher conducted his research work with the instruments that were standardized and reliable.

3.5 RELIABILITY OF DATA

Reliability was established by test and re-test method. Fifteen subjects were tested on selected variables. The reliability co-efficient obtained for test and re-test are presented in the Table-II.

TABLE-II

**RELIABILITY CO-EFFICIENT OF THE SELECTED
PHYSICAL MOTOR FITNESS
VARIABLES**

SI. No.	Variables	Reliability
1.	Speed	0.87
2.	Power	0.82
3.	Cardiovascular fitness	0.88
4.	Flexibility	0.87
5.	Muscular endurance	0.92
6.	Co-ordination	0.92
7.	Strength	0.86
8.	Balance	0.85

3.6 PILOT STUDY

The pilot study was conducted to assess the initial capacity of the subjects in order to fix the load. To achieve the purpose fifteen subjects were selected and they were divided into three group of five each at random. Group I underwent the pilates exercise,

group II calisthenics exercise and group III underwent pilates and calisthenics exercise under the careful supervision of researcher. Based on the response of the subject in the pilot study, the training schedules for three experimental groups were constructed. However the individual differences were not taken into consideration. The basic principles of training were followed while constructing the training program, form and technique were emphasized at all stages of the training program.

3.7 ORIENTATION OF THE SUBJECTS

The investigator supervised the subjects in the experimental and control group during the experimentation of both pre-test and post-test. The procedure for conducting the test and the method of scoring were specifically explained as well as demonstrated by the investigator to enrich the tester's reliability. The physical motor fitness variables were measured with the help of department of physical education, Banaras Hindu University at Varanasi. All the subjects agreed to participate in the training and tests.

CALIBRATION OF INSTRUMENTS

All equipment and reagent were purchased from standard companies and they were maintained in good working condition and calibrated daily.

The physiological variables were tested in the research laboratory of department of physical education, Banaras Hindu University at Varanasi, India. Calibrated instruments were used to assess the physiological variables.

3.8 TRAINING PROCEDURES

Training Programs

Pilates exercise	12 weeks
Calisthenics exercise	12 weeks
Combination of Pilates and Calisthenics exercise	12 weeks

Training Volume – 5 sessions per week (each session consisted of exercising for a maximum of 45 minutes)

12 Week Training Program of Pilates group

TABLE-III

Group 1- Pilates Exercise Group

Warm up	10 minutes
Pilates exercise training	25 minutes
Cool down	10 minutes
Total Time	45 minutes

Warm –Up

Before each session you should walk briskly/ jog for five to warm up your muscle, raise your heart rate and get your body ready for exercise.

Warm –Up Exercise

No.	Exercise	Equipment	Repetition	Intensity
1	Breathing	No Equipment	10	10 to 20%
2	Imprint and Release	No Equipment	10	
3	Spinal Rotation	No Equipment	10	
4	Cat Stretch	No Equipment	10	
5	Hip Roll	No Equipment	10	
6	Scapula Isolation	No Equipment	10	
7	Arm Circles	No Equipment	10	
8	Scapula Elevation	No Equipment	10	

Foundation for a Mat Session-:**25 Minutes**

No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Pelvic Curl	Mat	Abdominal, Hamstrings & Quadriceps Femoris, Gluteus Maximums, Muscles	05	10 to 20%
2	Chest Lift	Mat	Rectus Abdominis, Internal & External Oblique Muscles	10	
3	Leg Lift Supine	Mat	Quadriceps Femoris, Internal & External Oblique Muscles	10	
4	Leg Lift Side	Mat	Quadriceps Femoris, Posterior Spinal Group, Internal & External Oblique Muscle	10	
5	Leg Pull Side	Mat	Adductor Longus, Brevis, Magnus Gracilis, Pectineus Muscles	10	
6	Spine Twist Supine	Mat	Abdominal, Quadriceps & Hamstrings group of Muscles	10	
8	Chest Lift With Rotation	Mat	Internal & External Oblique, Rectus & Transverses Abdominis Muscles	5 Each Side	
9	Back extension prone	Mat	Abdominal group, Gluteus Maximums & Hamstrings Muscles	5 Each Side	

Rest between Exercises-: 10-20 Seconds**Rest between Set of Exercise-: 45-60 Seconds**

Abdominal Group-: Rectus Abdominis, Transverses Abdominis, Internal & External Oblique Muscles

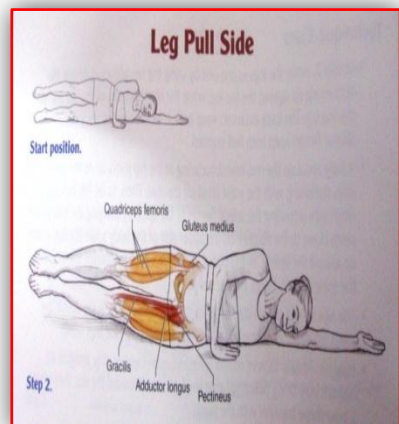
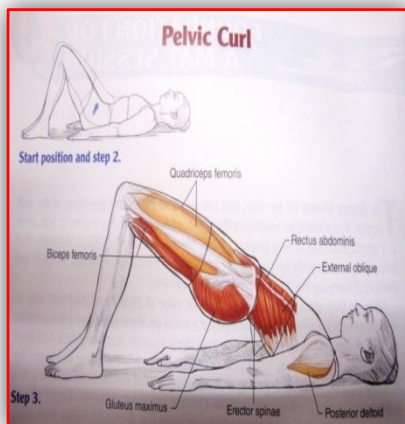
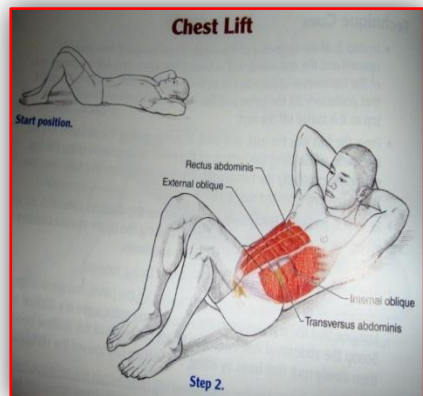
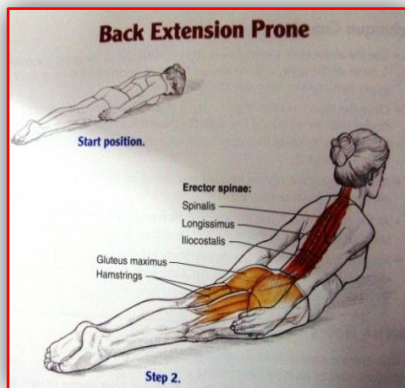
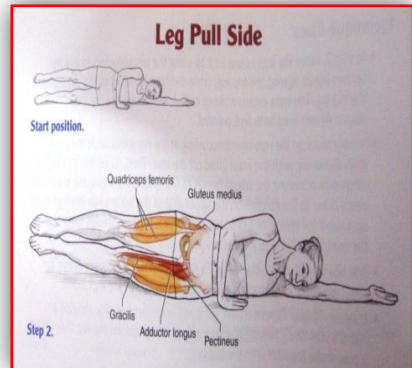
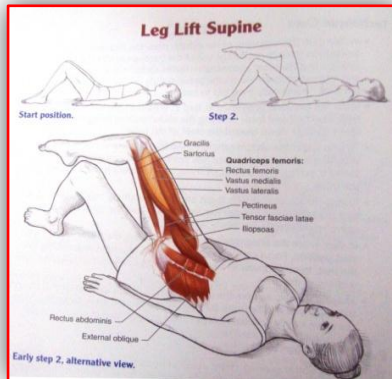
Quadriceps Femoris-: Rectus Femoris, Vastus Medialis & Vastus Lateralis

Hamstring Groups-: Semimembranosus, Semitendinosus, Biceps Femoris

Spinal group-: Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis

This training focuses on exercises that can be performed at the beginning of the mat session. These exercises emphasize the powerhouse and serve as a specific warm- up to help prepare you for the challenging Pilates exercises that follow.

PILATES EXERCISE



III & IV Weeks Pilates Exercise Training

Abdominal Work for Movement and Stabilization-: 25 Minutes

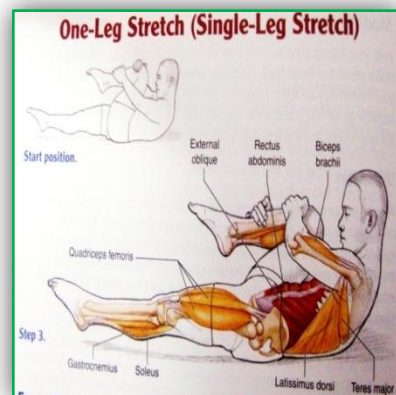
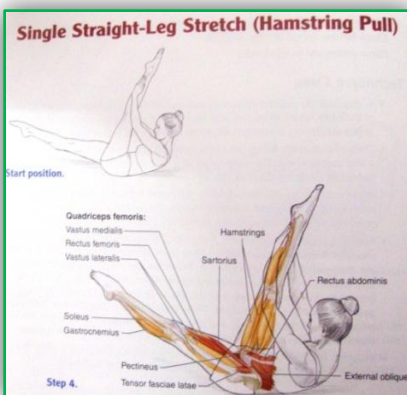
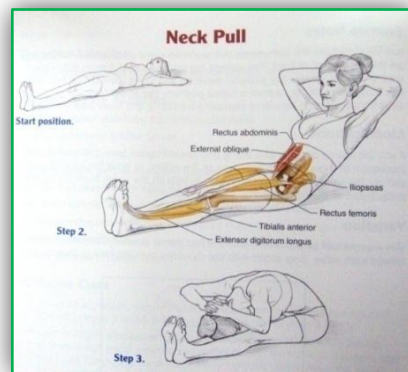
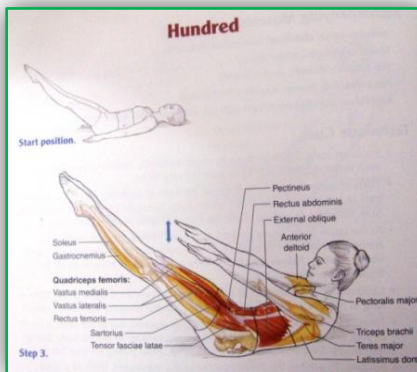
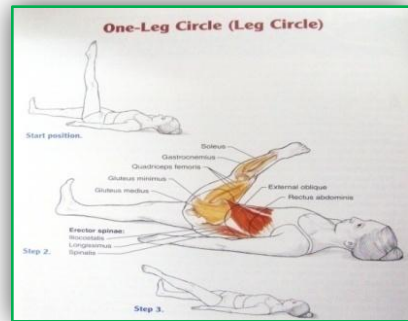
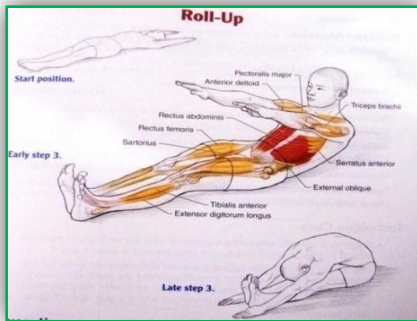
No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	One-Leg Circle	Mat	Abdominal group, Gluteus Maximums & Hamstrings Muscles	5 Circle Each Leg	10 to 20%
2	Roll- Up	Mat	Rectus Abdominis, Erector Spinae, Internal & External Oblique Muscles	05	
3	Neck pull (Sit-Ups)	Mat	Rectus Abdominis, Erector Spinae, Internal & External Oblique Muscles	10	
4	Hundred	Mat	Sartorius, Abdominal, Quadriceps & Hamstrings group of Muscles	10	
5	Single-Leg Stretch	Mat	Rectus Abdominis, Internal Oblique & External Oblique Muscles	5 Each Leg	
6	Single Straight-Leg Stretch (Hamstring Pull)	Mat	Abdominal, Gluteus Maximums Quadriceps & Hamstrings group of Muscles	5 Each Leg	
7	Double-Leg Stretch (Variation)	Mat	Rectus Abdominis, Internal Oblique & External Oblique, Iliopsoas Muscle	10	
8	Crisscross	Mat	Internal & External Oblique, Rectus & Transverses Abdominis Muscles	5 Each Leg	
9	Teaser	Mat	Abdominal group, Quadricep Femoris Iliopsoas, Sartorius, Gastrocnmius	5	

Rest between Exercises-: 10-20 Seconds

Rest between Set of Exercise-: 45-60 Seconds

In this type, exercise training focuses particularly on strengthening the abdominals in their action of spinal flexion and also develops the skill of using the abdominals for stabilization. Many exercises in future training apply the strength and skill

developed here to exercise that involve more challenging action of the abdominals, detailed articulation of the spine and more complex movement sequences.



V Weeks Pilates Exercise Training

Fine Articulation for a Flexible Spine-:

25 Minute

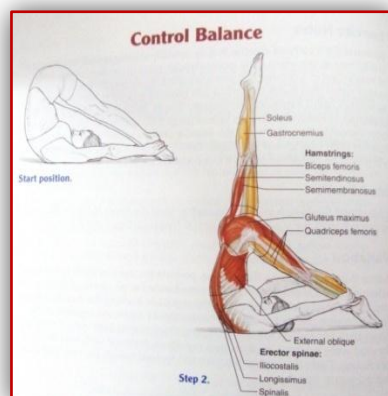
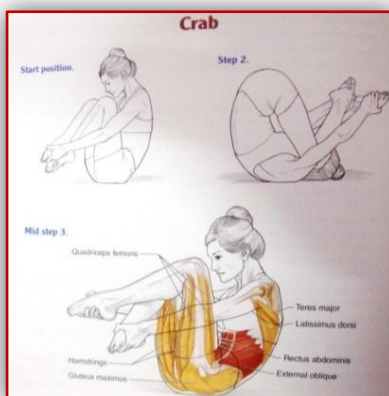
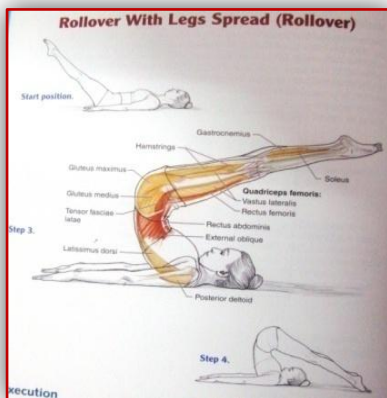
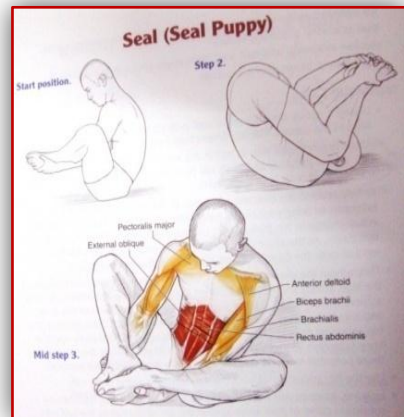
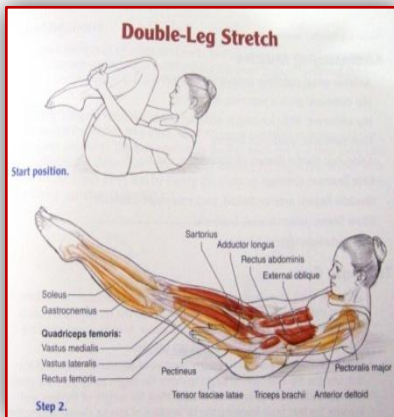
No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Spine Stretch Forward	Mat	Rectus Abdominis, Erector Spinae, Internal & External Oblique Muscles	5	10 to 20%
2	Rolling Like a Ball	Mat	Internal & External Oblique, Rectus & Transverses Abdominis Muscles	10	
3	Seal Puppy	Mat	Internal & External Oblique, Rectus & Transverses Abdominis Muscles	10	
4	Crab	Mat	Internal & External Oblique, Rectus & Transverses Abdominis Muscles	6	
5	Rocker With Open Leg	Mat	Abdominal Group, Iliopsoas, Rectus Femoris & Sartorius, Muscles	6	
6	Rollover With Leg Spread	Mat	Abdominal Group, Iliopsoas, Rectus Femoris & Sartorius Muscles	6	
7	Boomerang	Mat	Abdominal Group, Iliopsoas, Rectus Femoris & Sartorius Muscles	6	
8	Control balance	Mat	Abdominal & Hamstrings Group, Gluteus Maximums, Erector Spinae, Muscles	3 Each Side	
9	Jackknife	Mat	Abdominal, Quadriceps & Hamstrings Group, Gluteus Maximums, Erector Spinae, Muscles	5	

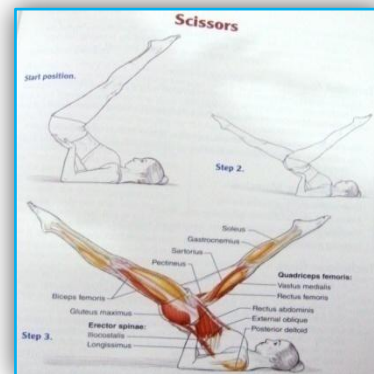
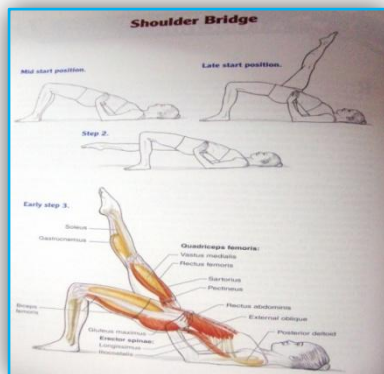
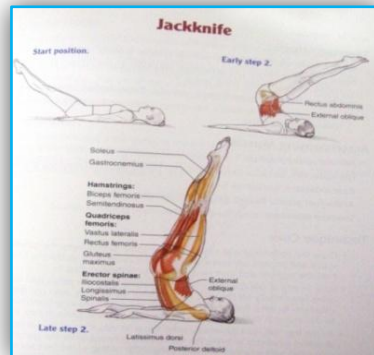
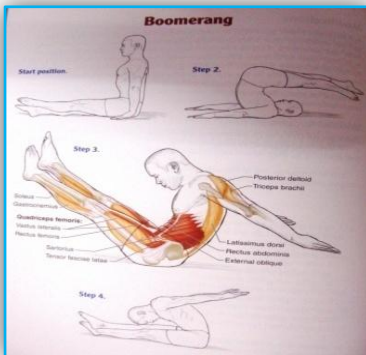
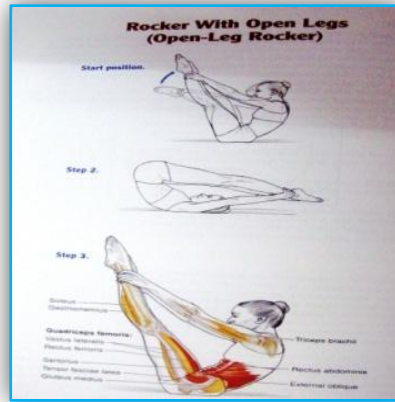
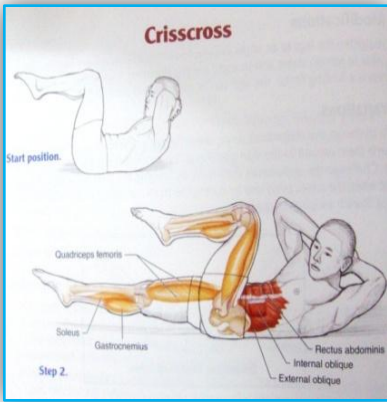
Rest between Exercises-: 10-20 Seconds

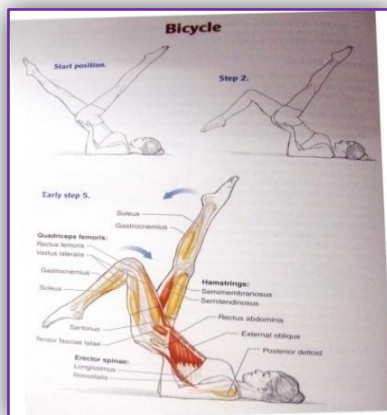
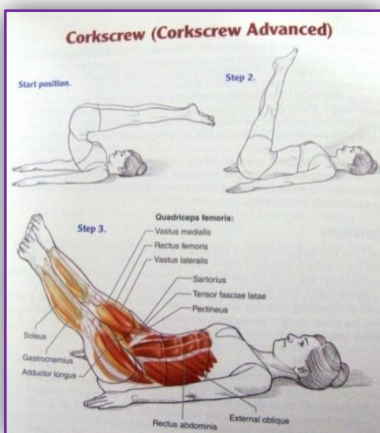
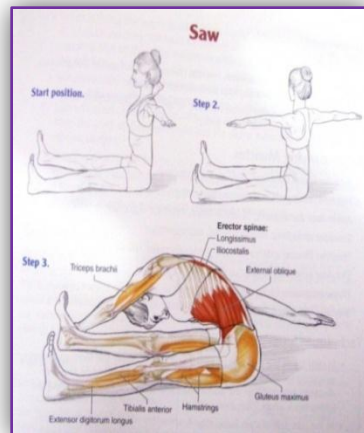
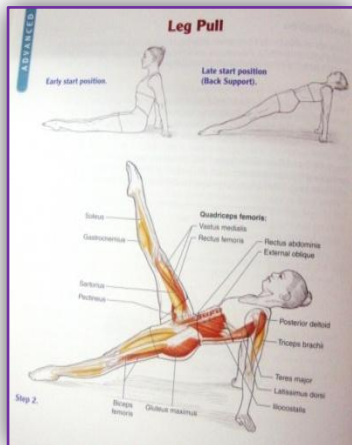
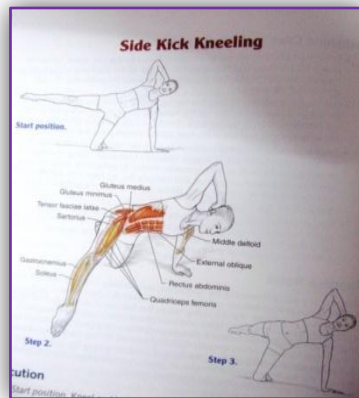
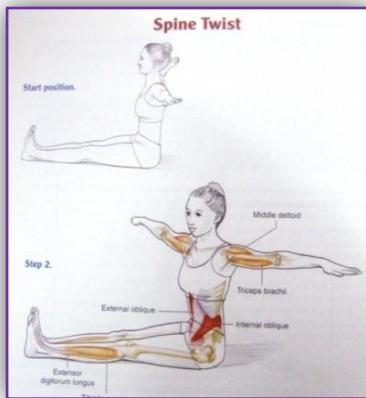
Rest between Set of Exercise-: 45-60 Seconds

The desired precise movement is called spinal articulation. This training focuses on the many people who lack flexibility in their lower back and have difficulty achieving normal motion. Because the lower back naturally arches backward (concave to the

back), spinal flexion tends to open this curve and can help restore healthy flexibility.







VI Weeks Pilates Exercise Training

Bridging For a Functional Spine-:

25 Minutes

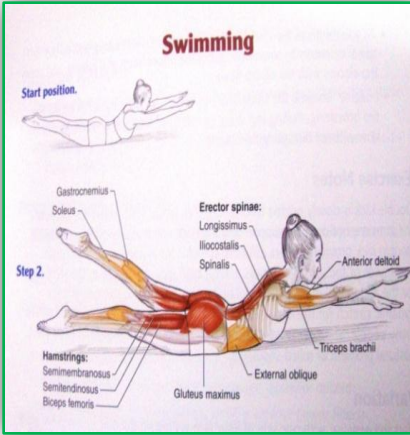
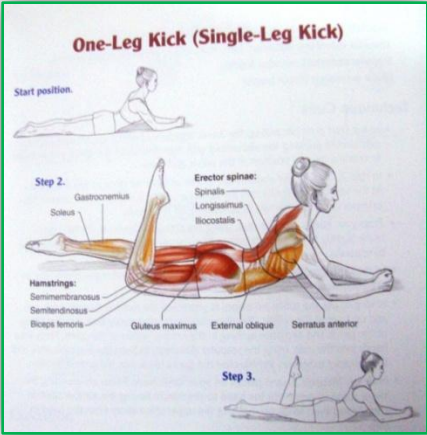
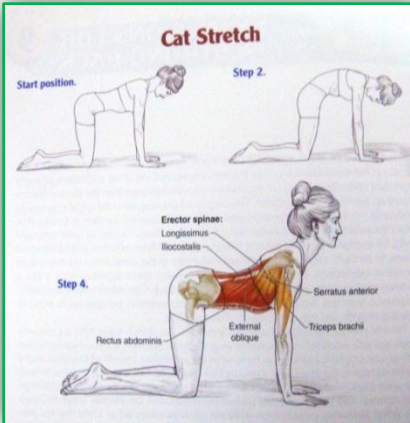
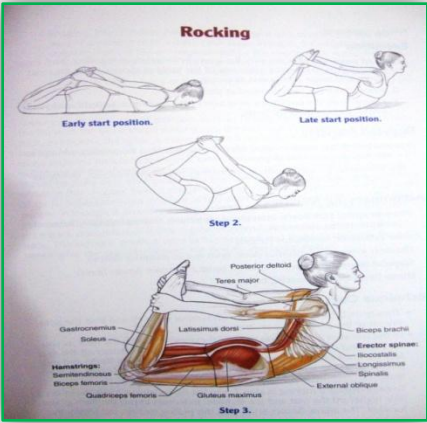
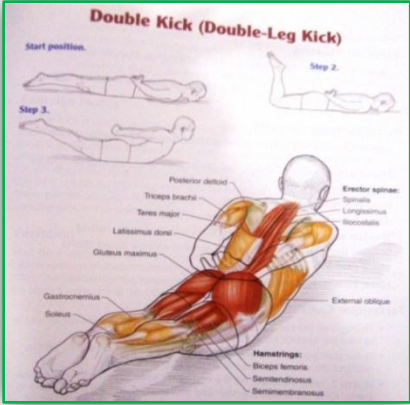
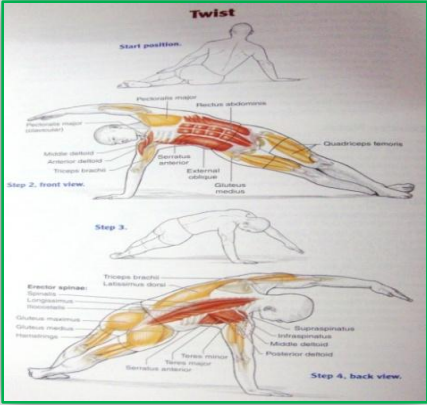
No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Shoulder Bridge	Mat	Erector Spinae, Semispinalis, Abdominal & Hamstrings Group, Iliopsoas Muscles	5 Each Leg	10 to 20%
2	Scissors	Mat	Erector Spinae, Semispinalis, Abdominal & Hamstrings Group, Iliopsoas Muscles	5 Each Leg	
3	Bicycle	Mat	Erector Spinae, Semispinalis, Abdominal & Hamstrings Group, Iliopsoas & Sartorius	5 Each Leg	
4	Leg Pull	Mat	Erector Spinae, Semispinalis, Abdominal & Hamstrings Group, Iliopsoas & Sartorius	5 Each Leg	
5	Leg Pull Front	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Hamstrings Group, Gluteus Maximums	5 Each Leg	
6	Push-Up	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Anterior Deltoid, Pectorals Major, Biceps Brachil	5	

Rest between Exercises-: 10-20 Seconds

Rest between Set of Exercise-: 45-60 Seconds

This training includes exercises that focuses on keeping the pelvis and spine stable while the spine is neutral or slightly arched (spinal hyperextension) rather than scooped (spinal flexion). These

demand a subtle, coordinated contraction of both the abdominals and spinal extensors, sometimes termed bracing.



VII & VIII Weeks Pilates Exercise Training

Side Exercises for an Effective Core:-

25 Minutes

No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Side Kick	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Erector Spinae, Gluteus Medius & Minimus, Sartorius	10 Each Leg	10 to 20%
2	Side Kick Kneeling	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Erector Spinae, Gluteus Medius & Minimus, Sartorius	10 Each Leg	
3	Side Bend	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Erector Spinae Deltoid, lower Traprzius, Pectoralis Minor	5 Each Leg	
4	Spine Twist	Mat	Internal & External Oblique, Erector Spinae (Longissimus, Illocostalis), Semispinalis	10 Times	
5	Saw	Mat	Internal & External Oblique, Erector Spinae (Longissimus, Illocostalis), Semispinalis, Deep Posterior Spinal Group	10 Times	
6	Twist	Mat	Internal & External Oblique, Erector Spinae (Longissimus, Illocostalis), Semispinalis, Deep Posterior Spinal Group	5 each leg	
7	Corkscrew	Mat	Rectus Abdominis, Internal & External Oblique, illopoas, Rectus Femoris Sartorius Muscles.	6 Times	
8	Hip Twist With Stretched Arms	Mat	Rectus Abdominis, Internal & External Oblique, illopoas, Rectus Femoris Sartorius Muscles.	5 Times	

Rest between Exercises-: 10-20 Seconds

Rest between Set of Exercise-: 45-60Seconds

This training focuses on lateral flexion and rotation of the spine. Using lateral flexion and rotation is one way to place greater emphasis on the oblique versus the rectus abdominals.

IX & X Weeks Pilates Exercise Training

Extension for a Strong Back-:

25 Minutes

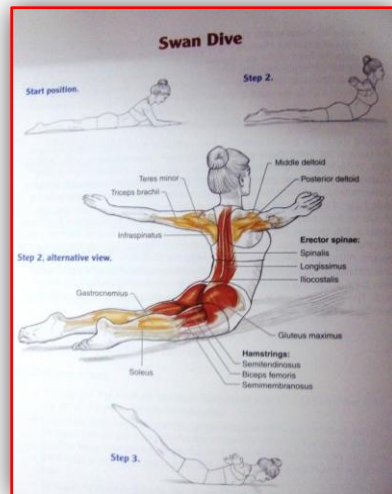
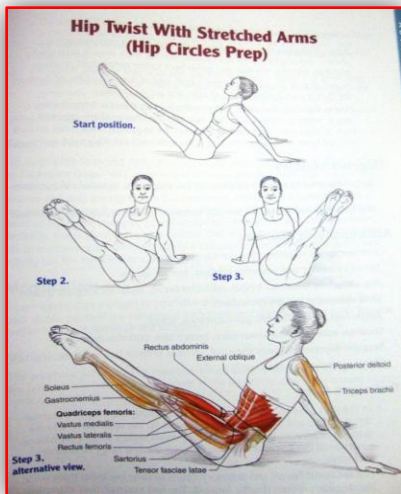
No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Cat Stretch	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis, Rectus Abdominis, Internal & External Oblique,	5	10 to 20%
2	Single-Leg Kick	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis, Gluteus Maximums, Hamstring groups of Muscles	10 Each Leg	
3	Double-Leg Kick	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis, Gluteus Maximums, Hamstring groups of muscles,	6 Times	
4	Swimming	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis, Gluteus Maximums, Hamstring groups of muscles,	10 Breath Cycles	
5	Rocking	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis, Gluteus Maximums, Hamstring groups of Muscles	5 Times	
6	Swan Dive	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis Gluteus	5 Times	

			maximums,	Hamstring	
			groups of Muscles,		
7	Standing Side Bends	ElasticBand	--	--	10 Times
8	Standing Extension	Elastic Band	--	--	10 Times
9	Seated Row	Elastic Band	--	--	10 Times
10	The Frog	Elastic Band	--	--	10 Times
11	Inner Thigh Flexion	Elastic Band	--	--	10 Times

Rest between Exercises-: 10-20 Seconds

Rest between Set of Exercise-: 45-60 Seconds

This training focuses on improving the strength, muscular endurance and skilled activation of the spinal extensors. This training emphasizes use of the spinal extensors to produce or maintain spinal hyperextension, while the abdominals function as stabilizers to reduce the potentially injurious forces bones by the lower back.



XI & XII Weeks Pilates Exercise Training

Strength Pilates Exercise With Elastic Band:- 25 Minutes

No.	Exercise	Equipment	Repetition	Intensity
1	Long sitting ankle planter flexion	Elastic Band	10 Times	10 to 20%
2	Rowing	Elastic Band	10 Times	
3	Shoulder abduction to 90 ⁰	Elastic Band	10 Times	
4	Shoulder flexion to 90 ⁰	Elastic Band	10 Times	
5	Shoulder stretch	Elastic Band	10 Times	
6	Trunk extension	Elastic Band	10 Times	
7	Bicep curl	Elastic Band	10 Times	
8	Reaching back	Elastic Band	10 Times	
9	Bilateral upper extremity exercise	Elastic Band	10 Times	

Rest between Exercises:- 10-20 Seconds

Rest between Set of Exercise:- 45-60 Seconds

Cool Down:-

At the end of each session you should walk briskly/ jog gradually showing down for 5 to10 minutes to help your body to cool down gently and your heart beat to slow down. This should be followed by stretches to help your recovery, prevent injury and soreness in your muscles the next day.



Pilates Exercise Group with Elastic Band

12 Week Training Program of Callisthenic Exercise Group

Group II

Callisthenic Exercise Group

Warm –Up

Before each session you should walk briskly/ jog for five to warm up your muscle, raise your heart rate and get your body ready for exercise.

TABLE-IV

Warm up	10 minutes
Calisthenics Exercise Training	25 minutes
Cool down	10 minutes
Total Time	45 minutes

Warm –Up Exercise

No.	Exercise	Equipment	Repetition	Intensity
1	Isometric Exercises	No Equipment	5	40 to 50%
2	Jumping Jacks	No Equipment	5	
3	Lunges	No Equipment	5	
4	Plyometric Exercise	No Equipment	5	
5	Crunches	Mat	5	
6	Sit- ups	Mat	5	
7	Pull-ups	Mat	5	
8	Push ups	Mat	5	
9	Flutter kick	Mat	5	

I & II Weeks Callisthenic Exercise Training

Callisthenic Series of Exercise

25 Minutes

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	5	2	30 to 40%

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-: 120 Seconds

III & IV Weeks Callisthenic Exercise Training

Callisthenic Series of Exercise

25 Minutes

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	2	2	30 to 40%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	5	2	

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-: 120 Seconds

V & VI Weeks Callisthenic Exercise Training

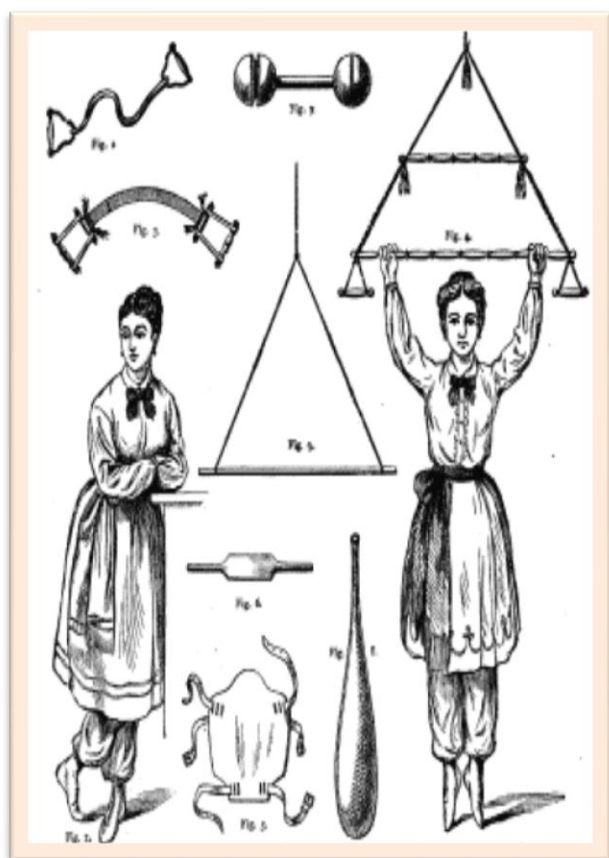
Callisthenic Series of Exercise

25 Minutes

No.	Exercise	Equipment	Variation of exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	2	2	40 to 50%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	2	2	
3	Stick Series of Exercise	Dumb- Bell	4	2	

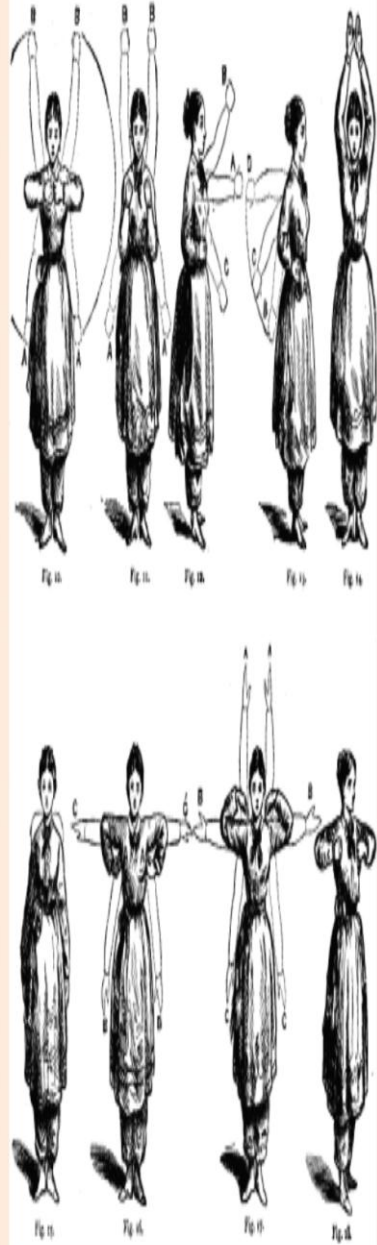
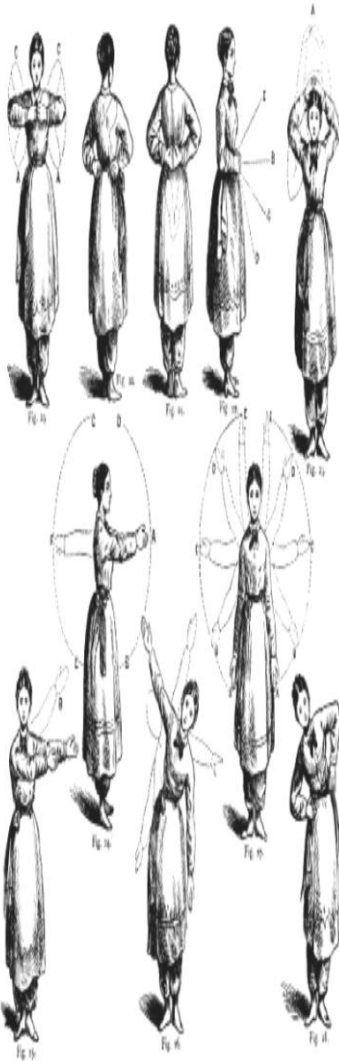
Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-:120 Seconds



CALISTHENICS FOR LADIES. III.

FREE EXERCISES (continued from p. 66).



CALISTHENICS (FREE EXERCISES)

VII & VIII Weeks Callisthenic Exercise Training

Callisthenic Series of Exercise

25 Minutes

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	1	2	40 to 50%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	1	2	
3	Stick Series of Exercise	Dumb- Bell	2	2	
4	With ball Series of Exercise	Ball	4	2	

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-:120 Seconds

IX & X Weeks Callisthenic Exercise Training

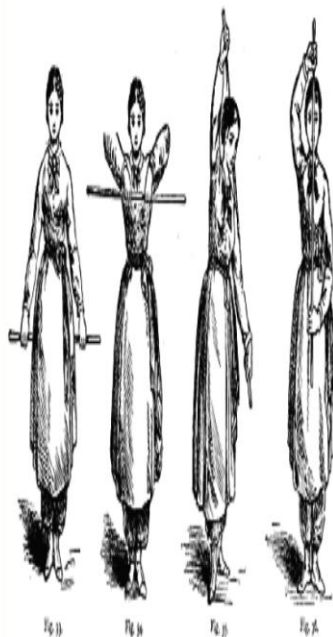
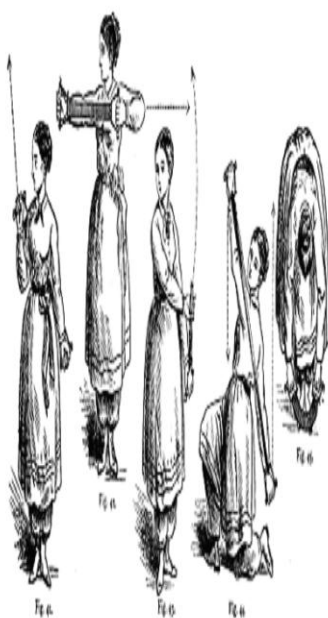
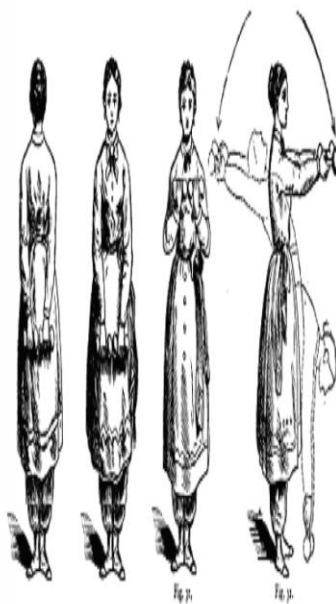
Callisthenic Series of Exercise

25 Minutes

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Indian Club Series of Exercise	Indian Club	3	2	50 to 60%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	1	2	
3	Stick Series of Exercise	Dumb- Bell	2	2	
4	With ball Series of Exercise	Ball	2	2	

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-:120 Seconds



EXERCISES WITH APPARATUS

XI & XII Weeks Callisthenic Exercise Training

Callisthenic Series of Exercise

25 Minutes

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Indian Club Series of Exercise	Indian Club	5	2	60 to 70%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	1	2	
3	Stick Series of Exercise	Dumb- Bell	2	2	
4	With ball Series of Exercise	Ball	1	2	
5	Free Hand Series of Exercise	No Equipment	1	2	

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-: 120 Seconds

Cool Down-:

At the end of each session you should walk briskly/ jog gradually showing down for 5 to 10 minutes to help your body to cool down gently and your heart beat to slow down. This should be followed by stretches to help your recovery, prevent injury and soreness in your muscles the next day.

12 Week Training Program of Pilates & Calisthenics group

TABLE-V

Group III

Pilates & Calisthenics Exercise Group

Warm up	10 minutes
Pilates & Calisthenics Exercise Training	25 minutes
Cool down	10 minutes
Total Time	45 minutes

Warm –Up

Before each session you should walk briskly/ jog for five to warm up your muscle, raise your heart rate and get your body ready for exercise.

Warm –Up Exercise

No.	Exercise	Equipment	Repetition	Intensity
1	Breathing	No Equipment	10	10 to 20%
2	Imprint and Release	No Equipment	10	
3	Spinal Rotation	No Equipment	10	
4	Cat Stretch	No Equipment	10	
5	Hip Roll	No Equipment	10	
6	Scapula Isolation	No Equipment	10	
7	Arm Circles	No Equipment	10	
8	Scapula Elevation	No Equipment	10	

9	Isometric Exercises	No Equipment	5	40 to 50%
10	Jumping Jacks	No Equipment	5	
11	Lunges	No Equipment	5	
12	Plyometric Exercise	No Equipment	5	
13	Crunches	Mat	5	

14	Sit- ups	Mat	5
15	Pull-ups	Mat	5
16	Push ups	Mat	5
17	Flutter kick	Mat	5

I & II Weeks Pilates & Calisthenics Exercise Training

Pilates & Calisthenics Exercise

No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Pelvic Curl	Mat	Abdominal, Hamstrings & Quadriceps Femoris, Gluteus Maximums, Muscles	05	10 to 20%
2	Chest Lift	Mat	Rectus Abdominis, Internal & External Oblique Muscles	05	
3	Leg Lift Supine	Mat	Quadriceps Femoris, Internal & External Oblique Muscles	05	
4	Leg Lift Side	Mat	Quadriceps Femoris, Posterior Spinal Group, Internal & External Oblique Muscle	05	
5	Leg Pull Side	Mat	Adductor Longus, Brevis, Magnus Gracilis, Pectineus Muscles	05	

Rest between Exercises-: 10-20 Seconds,

Rest between Set of Exercise-: 45-60 Seconds

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	3	2	30 to 40%

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-: 120 Seconds

III & IV Weeks Pilates & Calisthenics Exercise Training

Pilates & Calisthenics Exercise

25 Minutes

No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	One-Leg Circle	Mat	Abdominal group, Gluteus Maximums & Hamstrings Muscles	5 Circle Each Leg	10 to 20%
2	Roll- Up	Mat	Rectus Abdominis, Erector Spinae, Internal & External Oblique Muscles	05	
3	Neck pull (Sit-Ups)	Mat	Rectus Abdominis, Erector Spinae, Internal & External Oblique Muscles	5	
4	Hundred	Mat	Sartorius, Abdominal, Quadriceps & Hamstrings Muscles	5	
5	Single-Leg Stretch	Mat	Rectus Abdominis, Internal Oblique & External Oblique Muscles	3 Each Leg	

Rest between Exercises-: 10-20 Seconds,

Rest between Set of Exercise-: 45-60 Seconds

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	1	2	30 to 40%
2	Light Dumb-Bell Series of Exercise	Dumb- Bell	3	2	

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-: 120 Seconds

V & VI Weeks Pilates & Calisthenics Exercise Training

Pilates & Calisthenics Exercise

25 Minute

No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Spine Stretch Forward	Mat	Rectus Abdominis, Erector Spinae, Internal & External Oblique Muscles	5	10 to 20%
2	Rolling Like a Ball	Mat	Internal & External Oblique, Rectus & Transverses Abdominis Muscles	5	
3	Seal Puppy	Mat	Internal & External Oblique, Rectus & Transverses Abdominis Muscles	5	
4	Bicycle	Mat	Erector Spinae, Semispinals, Abdominal & Hamstrings Group, Iliopsoas & Sartorius	5 Each Leg	

5	Leg Pull	Mat	Erector Spinae, Semispinals, Abdominal & Hamstrings Group, Iliopsoas & Sartorius	5 Each Leg
6	Leg Pull Front	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Hamstrings Group, Gluteus Maximums	5 Each Leg

Rest between Exercises-: 10-20 Seconds,

Rest between Set of Exercise-: 45-60 Seconds

No.	Exercise	Equipment	Variation of Exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	2	2	40 to 50%
2	Light Dumb-Bell Series of Exercise	Dumb- Bell	2	1	
3	Stick Series of Exercise	Dumb- Bell	2	1	

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-:120 Seconds

VII & VIII Weeks Pilates & Calisthenics Exercise Training

Pilates & Calisthenics Exercise

25 Minutes

No.	Exercise	Equipment	Target Muscle	Repetition	Intensity
1	Side Kick	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Erector Spinae, Gluteus Medius & Minimus, Sartorius	5 Each Leg	
2	Side Kick	Mat	Internal & External Oblique, Rectus & Transverses Abdominis,	5 Each Leg	

	Kneeling		Erector Spinae, Gluteus Medius & Minimus, Sartorius		10 to 20%
3	Side Bend	Mat	Internal & External Oblique, Rectus & Transverses Abdominis, Erector Spinae Deltoid, lower Trapzius, Pectoralis Minor	3 Each Leg	
4	Spine Twist	Mat	Internal & External Oblique, Erector Spinae (Longissimus, Illocostalis), Semispinalis	5 Times	
5	Saw	Mat	Internal & External Oblique, Erector Spinae (Longissimus, Illocostalis), Semispinalis, Deep Posterior Spinal Group	5 Times	

No.	Exercise	Equipment	Variation of exercise	Repetition	Intensity
1	Free Hand Series of Exercise	No Equipment	1	1	40 to 50%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	1	1	
3	Stick Series of Exercise	Dumb- Bell	2	1	
4	With ball Series of Exercise	Ball	2	2	

Rest between Exercises:- 90 Seconds,

Rest between Set of Exercise:-120 Seconds

Pilates & Calisthenics Exercise

25 Minutes

No.	Exercise	Equipment	Target Muscle	Repetition	Intens
1	Cat Stretch	Mat	Longissimus, Illocostalis), Semispinalis, Rectus Abdominis, Internal & External Oblique, Erector Spinae (Spinalis,	3	10 to 20%
2	Single-Leg Kick	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis, Gluteus Maximums, Hamstring groups of Muscles	5 Each Leg	
3	Double-Leg Kick	Mat	Erector Spinae (Spinalis, Longissimus, Illocostalis), Semispinalis, Gluteus Maximums, Hamstring groups of muscles,	3 Times	
4	Standing Side Bends	Elastic Band	-- --	5Times	
5	Standing Extension	Elastic Band	-- --	5Times	
6	Seated Row	Elastic Band	-- --	5 Times	
7	The Frog	Elastic Band	-- --	5Times	
8	Inner Thigh Flexion	Elastic Band	-- --	5Times	

Rest between Exercises-: 10-20 Seconds

Rest between Set of Exercise-: 45-60 Seconds

No.	Exercise	Equipment	Variation	Repetition	
-----	----------	-----------	-----------	------------	--

			of Exercise		Intensity
1	Indian Club Series of Exercise	Indian Club	2	2	50 to 60%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	1	1	
3	Stick Series of Exercise	Dumb- Bell	1	1	
4	With ball Series of Exercise	Ball	1	1	

Rest between Exercises-: 90 Seconds,

Rest between Set of Exercise-:120 Seconds

XI & XII Weeks Pilates & Calisthenics Exercise Training

Pilates & Calisthenics Exercise

25 Minutes

No.	Exercise	Equipment	Repetition	Intensity
1	Long sitting ankle planter flexion	Elastic Band	5Times	10 to 20 %
2	Rowing	Elastic Band	5Times	
3	Shoulder abduction to 90 ⁰	Elastic Band	5 Times	
4	Shoulder flexion to 90 ⁰	Elastic Band	5 Times	
5	Shoulder stretch	Elastic Band	5 Times	

Rest between Exercises-: 10-20 Seconds

Rest between Set of Exercise-: 45-60 Seconds

No.	Exercise	Equipment	Variation of exercise	Repetition	Intensity
1	Indian Club Series of Exercise	Indian Club	2	2	60 to 70%
2	Light Dumb- Bell Series of Exercise	Dumb- Bell	1	2	
3	Stick Series of Exercise	Dumb- Bell	1	2	
4	With ball Series	Ball	1	2	

	of Exercise			
5	Free Hand Series of Exercise	No Equipment	1	2

Rest between Exercises-: 90 Seconds,
Rest between Set of Exercise-: 120 Seconds

Cool Down-:

At the end of each session you should walk briskly/ jog gradually showing down for 5 to10 minutes to help your body to cool down gently and your heart beat to slow down. This should be followed by stretches to help your recovery, prevent injury and soreness in your muscles the next day.

3.9 TEST ADMINISTRATION

Selection and Description of the Tools/Questionnaires

To Assess Physical Variables

1) Sit and Reach Test

(Devinder k. Kansal, 2008)

Purpose

The purpose of the test was to measure the hip and back flexion and extension of the hamstring muscle of the leg.

Equipment

Sit and reach test box and a measuring tape.

Procedure

This test involves in sitting on the floor with the leg stretched out forward. The sole of the foot should be placed flat against the box, shoulder-width apart. Both knees are kept straight and held flat against the floor by tester. With hand on top of each other and palm facing down, the subject reaches forward along the measuring scale as far as possible. After three practice reaches, the fourth reach is held for at least two seconds and the distance is recorded. Precaution

was taken that no jerky movements happen in the body and that the fingertips remain straight and the leg stretched straight.

Scoring

The score was recorded to the nearest centimeter as the distance before (negative) or beyond (positive) the toes. The procedures for that required the box was made with 23 centimeters at the level of feet, so 10 centimeters past the toes is recorded as 33 centimeters.

2) Standing Stork Test (Balance)

(Devinder k. Kansal, 2008)

Purpose

The purpose of this test is to measure the body's balance.

Equipment

Stopwatch, Portable score sheet and pencil.

Procedure

The subject asked to relaxed stand on the both foot and given information to place hand on the respective sides of the waist. The subject raising his one foot from the floor and place the toes of that foot against the knee of the other leg. On the signal of start subject raise the heel and stand on your toes and tester start the stopwatch. A subject raises the heel from the floor on the signal and maintains the balance as long as possible. When the subject loses the balance indicated either by touching heel to floor the tester stops the stopwatch.

Scoring

Three trails were given and the best duration of the maintenance of the balance is recorded in seconds.

3) Standing Broad Jump Test (Power)

(Devinder k. Kansal, 2008)

Purpose

The purpose of this test was to measure the explosive power of leg extensor muscle.

Equipment

Outdoor jumping pit, measuring still tape and score sheet.

Procedure

The subject was asked to stand feet apart comfortable and toes were placed just behind the take-off line. To prepare for the jump subject was instructed to swing his arm backward with knee bend. When the subject was executed he was asked to extend the knees, swing the arms push against the surface simultaneously.

Scoring

Three trials were given and the measurement was taken from the take-off line to the heel or other part of the body that touched the pit nearest to take-off line. The best distances of three trials were recorded in meters.

4) Sit-ups Test (Muscular Endurance)

(Devinder k. Kansal, 2008)

Purpose

Purpose of the test was to measure the endurance of abdominal muscles.

Equipment

A stopwatch, a mat or dry turf or clean floor, Portable score sheet and Pencil.

Procedure

The subject was to lie on the back with knees bent, feet on the floor and with heels not more than 12 inches from the buttock. The angle of the knees should be less than 90° . The subject was asked to put his hand on the back of the neck with finger clasped and to place the elbows squarely on the mat or turf or floor. The subject's feet were held by a companion to ascertain that the feet do not leave the surface and remain touching it. Then the subject was asked to tighten the abdominal muscle and to bring the head and elbows to the knees. The entire above process constitutes one sit-up. The subject was asked to return to starting position with his elbows on the surface before sitting up again. The tester gives the above demonstration to all the subjects to be tested before the actual

performance of the test. The timer gives the starting signals ready, go! At the word ‘go’ the timer starts the stopwatch and the subject starts the sit-ups performance as quickly as possible with his best effort. The tester starts counting the number of sit-ups performed. After 60 second, the timer gives the signal stop and the subject stops.

Scoring

The number of correctly performed sit-ups in 60 seconds was recorded as the score (one fair trial was allowed).



Figure V: Standing broad Jump Test (Power)



Figure VI: Sit-ups Test (Muscular Endurance)



Figure VII: Push-Up Test (Muscular Strength)

5) Push-Up Test (Muscular Strength)

Purpose

Purpose of this test is to measure the shoulder strength.

Equipment required

Depending on which protocol you use, you will need a floor mat, metronome, stopwatch, score sheet and pencil.

Procedure

The subject is asked to push up which begins with the hand and toes touching the floor, the body and leg in a straight line, feet slightly apart the arm at shoulder width apart extended and at right angles to the body. Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch some other object, or until there is a 90-degree angle at the elbows, the return back to starting position with the arm extended. This action is repeated and test continued until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.

Scoring

Record the number of correctly completed push-ups.

When you are performing the full presses up you are lifting approximately 75% of your body weight and in the modified press up position you are lifting approximately 60% of your body weight.

6) 50 yard dash

(Devinder k. Kansal, 2008).

Purpose

The purpose of the test was to determine the ability of the individual to cover the distance in the shortest period of time.

Equipment

Stopwatch (at least two) or a single stopwatch with splits second time.

Procedure

Two lines were marked on the floor 50 yard apart. One line was used as a starting line and the other as the finish line. On the signal ready go, the subject start running at their best to reach the finish line at their earliest. The signal 'go' is accompanied with the downward sweep of the starter's arm to give visual signal to the timer/timers who stands/stand at the finish line.

Scoring

The interval between the starting signal and the instant the subject crosses the finish line was the score of test. The time is recorded correct up to tenth of a second.

7) Hand and Eye Co-Ordination Test

(Devinder k. Kansal, 2008)

Purpose

This test is used to measure the co-ordination between eye and hand.

Equipment

Stopwatch, Lime, Wall, Tannis Ball, Portable score sheet and Pencil.

Procedure

One line marked two meter away from the wall. Subjects start the test from starting line. On the signal of start subject hits/throws the ball against the wall and catches the ball with the other hand, after he catches it he throws the ball with that hand and catches it with the other hand. This process continues for the 30 second, After 30 seconds, the timer gives the signal stops and the subject stop and records the number of correctly made catches.

Scoring

Three trials were given and recorded the best trial was recorded in which maximum catches were correctly taken.



Figure VIII: 50 yard dash (Speed test)



Figure IX: Jog/Run on the Spot Test (Cardiovascular Fitness)

8) Jog/Run on the Spot Test (Cardiovascular Fitness)

The objective of the test is to monitor the ability of the subject's cardiovascular fitness. It's a popular test used at the Cleveland YMCA requiring a one- minute period of jogging.

Required Resources

To undertake this test you will require:

- Stopwatch
- An Assistant

How to conduct the test: This test will be conducted in two types.

(1) A Quick Recovery Test

- Take your pulse, sitting, to determine your normal heart rate.
- Run in place for fifteen seconds.
- Sit down and take your pulse, noting how long it takes to return to normal.

Rating

If it is back to normal in 30 second	Excellent
31-60 seconds	Good
61-120 seconds	Fair
From 120 to 189 seconds	Poor

Jog on the Spot Test

- Run in place briskly for one minute.
- Stop, sit and take your pulse for fifteen seconds.
- Multiply by four to get your pulse rate per minute.

Rating

84 TO 96 Beats Per Minute	Very Good
102 TO 114	Above Average
120 TO 132	Average
138 TO 149	Below Average
150 TO 161	Poor
162 and up	Very Poor

To use your pulse rate as a kind of exercise thermostat, you need to know:

- Resting heart rate (sitting)
- Maximum heart rate
- Heart reserve- which is the difference between the resting rate and the maximum rate.

3.10 Collection of data

The data were collected on physical variables namely speed, power, strength, cardiovascular fitness, flexibility, muscular endurance, coordination and balance. For all the four groups before the experimental period the data were collected (pre-test), and again after the twelve week of training period data were collected (post-test), respectively. The data were collected on all the variables once in six days for two times. During this period the subjects were not allowed to any training programme.

3.11 Statistical Procedure

The following statistical procedures are adopted.

The data was collected from the four groups on selected physical motor fitness variables namely speed, power, strength, cardiovascular fitness, flexibility, muscular endurance, coordination and balance the data were statistically examined to find

out whether there is any significant difference by applying the analysis of co-variance (ANCOVA).

Sixty subjects were divided at random and assigned into four group of fifteen each. Hence to make adjustment for difference in this initial means and test the adjusted post-test mean of significant difference, the analysis of covariance was used.

Since four groups were involved, whenever the 'f' ratio was found to be significant for adjusted post-test means, Scheffe's test was followed as a post hoc test to determine which of the paired means difference was significant. In all the cases to test the significant, 0.05 level of confidence was utilized.

4 ANALYSIS OF THE DATA AND RESULTS OF THE STUDY

In this chapter, the data collected was analyzed statistically to reveal the results of study, discussion on hypothesis are presented.

In this study, the influence of their independent variables namely control (Group I), pilates exercise (Group II), calisthenics exercise (Group III) and pilates and calisthenics exercise (Group IV) on selected physical motor fitness variables were investigated.

To achieve the purpose of the study sixty (60) school boys studying in Raj English School of Sarnath, Varanasi, and U.P. region were selected as subject at randomly and their range of age is between 12 to 17years. The selected subjects were divided into four equal groups of fifteen subjects each at random, they were further divided into three experimental groups and a control group i.e. Group I treated as control group, Group II trained with pilates exercise, Group III involved with calisthenics exercises and Group IV trained with combination of both pilates and calisthenics exercise. The initial tests on selected criterion variables were taken and recorded for all the four groups.

After that the three experimental groups further underwent pilates, calisthenics and combination of both pilates and calisthenics exercise training schedules for 12 weeks. After 12 weeks the final test on all the criterion variables were taken and recorded.

To find out the variance in the selected criterion variables due to the application of independent variables, analysis of covariance (ANCOVA) was applied on each criterion variables. Whenever the 'F' ratio for adjusted post-test mean was found significant, Scheffe's post hoc test was applied to determine which of the four paired means significantly differed.

Test of Significance

The procedure of testing the hypothesis or rejecting the same in accordance with the results obtained in relation to the level of confidence was fixed at 0.05 levels and which was considered sufficient for the study. In the present study if the obtained value was greater than the tabulated value at 0.05 level the hypothesis was accepted to the effect that, there existed no significant difference between the means of groups compared and if they obtained values were less than the required value at 0.05 level than the hypothesis was rejected to the effect that there existed no significant difference between the means of the groups under study.

Level of Signification

The probability level below which we reject the hypothesis is termed as the level of significant. The level of significances for this study was fixed at 0.05. The 'F' ratio obtained by analysis of covariance need 2.77 for significant at 0.05 level for the degree of freedom 3 and 56, while analyzing the result the research scholar has found that the level of significant for few variables were more than 0.01 level and in order to give the correct level of significant the researcher had given the level of significant up to 0.01 level wherever it was needed. The level of significant for 0.01 levels is 4.15 for the degree of freedom 3 and 56.

TABLE VI

**ANALYSIS OF CO-VARIANCE FOR SPEED ON PRE TEST
AND POST TEST DATA OF EXPERIMENTAL GROUP AND
CONTROL GROUP (in seconds)**

	Groups				S V	df	SS	MSS	F-Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	7.05	6.91	6.99	6.85	B	3	0.344	0.115	1.190
S.D.	0.37	0.30	0.18	0.33	W	56	5.390	0.096	
Post-test Mean	7.04	6.70	6.75	6.44	B	3	2.696	0.899	11.410*
S.D.	0.35	0.28	0.14	0.29	W	56	4.411	0.079	
Adjusted post-test	6.96	6.74	6.72	6.52	B	3	1.354	0.451	35.299*
					W	55	0.703	0.013	

* Significant at 0.05 level

Required table value for df (3&56) at 0.05 level = 2.77

(3&55) at 0.05 level = 2.77

It can be derived from Table V that the pre-test means on speed of the experimental and control groups are 6.91, 6.99, 6.85 and 7.05 respectively. The obtained 'F' ratio value 1.190 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on speed for the pre-test data.

The post-test means on speed of the experimental and control groups are 6.70, 6.75, 6.44 and 7.04 respectively. The obtained 'F' ratio value 11.410 for the post-test data is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there is a significant difference between the experimental and control group on speed following the experimental training.

The adjusted post-test means on speed of the experimental and control group are 6.74, 6.72, 6.52 and 6.96 respectively. The

obtained ‘F’ ratio value 35.299 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group on speed following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests were applied.

TABLE VII
SCHEFFE’S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON SPEED

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
6.96	6.74			0.22*	0.12
6.96		6.72		0.24*	0.12
6.96			6.52	0.44*	0.12
	6.74	6.72		0.02	0.12
	6.74		6.52	0.22*	0.12
		6.72	6.52	0.20*	0.12

*Significant at 0.05 level

Table VI Shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 0.12. The mean differences between pilates exercise group and control group is 0.22, which is higher than the C.I. value. Therefore there is a significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 0.24, which is higher than the C.I. value. Therefore there is significant difference between the calisthenics exercise and control group. The mean difference between combined group and control group is 0.44, which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 0.02, which is lower than C.I. value. Therefore there is no significant difference between Pilate’s group and calisthenics group. The mean difference between pilates group and combined group is 0.22, which is higher than the

C.I. value. Therefore there is significant difference between the pilates group and combined group. The mean difference between calisthenics group and combined group is 0.20, which is higher than the C.I. value. Therefore there is significant difference between the calisthenics group and combined group.

FIGURE–XIV

GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST AND ADJUSTED POST TEST MEAN OF CONTROL AND EXPERIMENTAL GROUPS ON SPEED

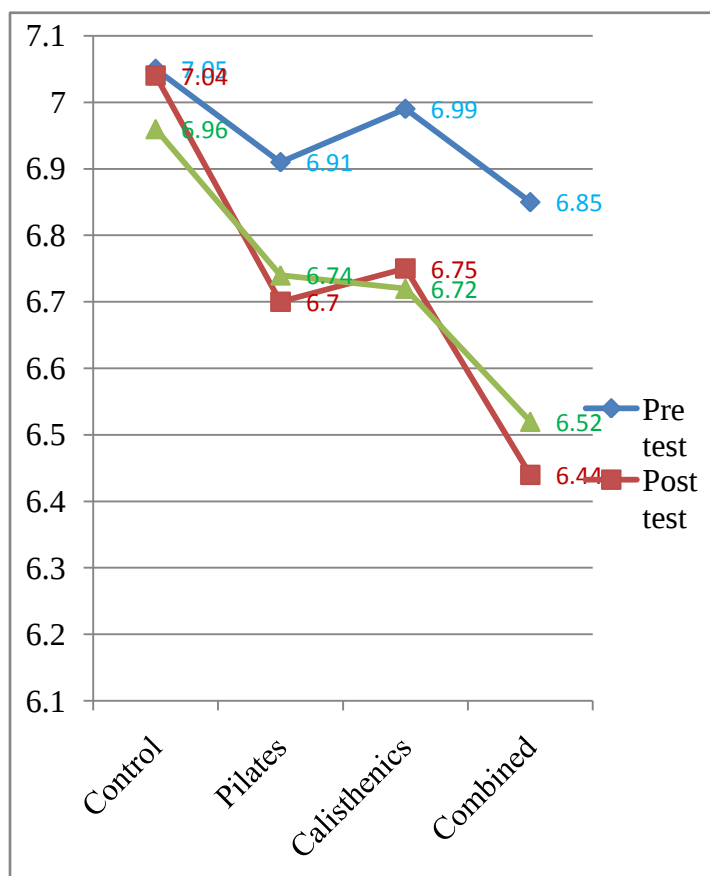


TABLE VIII

**ANALYSIS OF CO-VARIANCE FOR CARDIOVASCULAR
FITNESS ON PRE TEST AND POST TEST DATA OF
EXPERIMENTAL GROUP AND
CONTROL GROUP**

	Groups				S V	df	SS	MSS	F-Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	166.93	163.73	165.86	164.80	B	3	85.33	28.44	0.395
S.D.	10.63	7.62	7.38	7.88	W	56	4032	72.00	
Post-test Mean	166.66	154.66	165.86	153.33	B	3	1805.86	601.95	12.127*
S.D.	8.23	7.65	5.82	6.17	W	56	2779.73	49.63	
Adjusted post-test	165.44	155.89	153.72	153.74	B	3	1392.4	64.31	60.157*
					W	55	424.51	7.71	

* Significant at 0.05 level

Required table value for df (3&56) at 0.05 level = 2.77

(3&55) at 0.05 level = 2.77

It can be derived from Table VII that the pre-test means on cardiovascular fitness of the experimental and control groups are 163.7, 165.86, 164.80 and 166.93 respectively. The obtained 'F' ratio value 0.395 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on cardiovascular fitness for the pre-test data.

The post-test means on cardiovascular fitness of the experimental and control groups are 154.66, 165.86, 153.33 and 166.66 respectively. The obtained 'F' ratio value 12.127 for the post-test mean is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there

is a significant difference between the experimental and control group on cardiovascular fitness following the experimental training.

The adjusted post-test means on cardiovascular fitness of the experimental and control group are 155.89, 153.72, 153.74 and 165.44 respectively. The obtained 'F' ratio value 60.157 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group on speed following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests was applied.

TABLE IX

**SCHEFFE'S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON CARDIOVASCULAR FITNESS**

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
165.44	155.89			9.55*	2.92
165.44		153.72		11.72*	2.92
165.44			153.74	11.70*	2.92
	155.89	153.72		2.17	2.92
	155.89		153.74	2.15	2.92
		153.72	153.74	0.02	2.92

*Significant at 0.05 level

The above table shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 2.92. The mean differences between Pilates exercise group and control group is 9.55, which is higher than the C.I. value. Therefore there is a significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 11.72, which is higher than the C.I. value. Therefore there is significant difference between the calisthenics exercise and control group. The mean

difference between combined group and control group is 11.70, which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 2.17, which is lower than C.I. value. Therefore there is no significant difference between Pilate's group and calisthenics group. The mean difference between pilates group and combined group is 2.15, which is lower than the C.I. value. Therefore there is no significant difference between the pilates group and combined group. The mean difference between calisthenics group and combined group is 0.02, which is lower than the C.I. value. Therefore there is no significant difference between the calisthenics group and combined group.

FIGURE-XV

**GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST
AND ADJUSTED POST TEST MEAN OF CONTROL
AND EXPERIMENTAL GROUPS ON
CARDIOVASCULAR FITNESS**

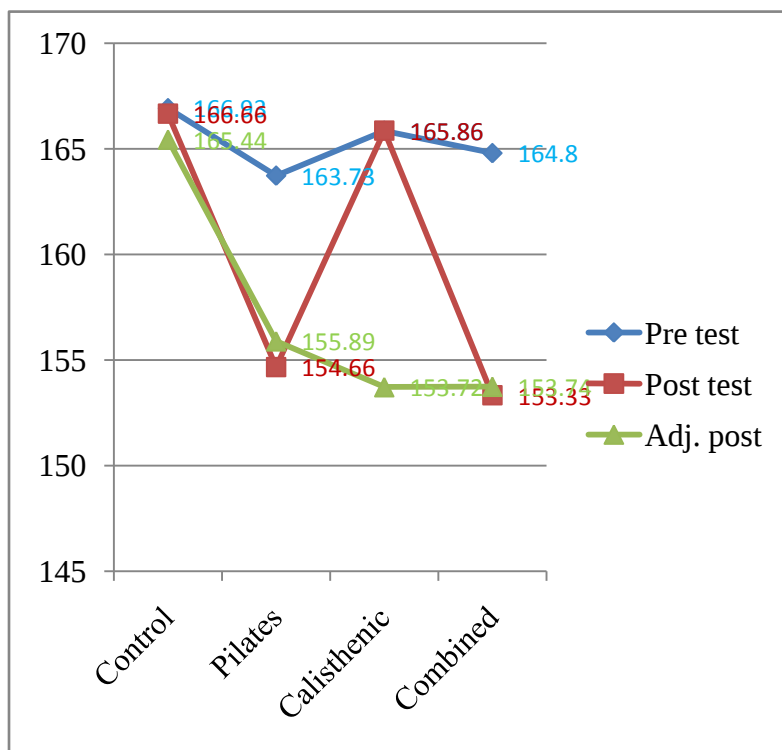


TABLE X

**ANALYSIS OF CO-VARIANCE FOR CO-ORDINATION ON
PRE TEST AND POST TEST DATA OF EXPERIMENTAL
GROUP AND CONTROL GROUP**

	Groups				SV	df	SS	MSS	F-Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	25.00	25.66	24.46	25.26	B	3	11.40	3.80	0.357
S.D.	2.87	3.81	3.04	3.23	W	56	596	10.64	
Post-test Mean	26.00	30.13	31.93	31.93	B	3	352.40	117.46	11.272*
S.D.	2.69	3.96	3.05	3.05	W	56	583.60	10.42	
Adjusted post-test	26.09	29.60	32.51	31.77	B	3	373.52	124.50	93.21*
					W	55	73.46	1.33	

* Significant at 0.05 level

Table value for df (3&56) at 0.05 level = 2.77

(3&55) at 0.05 level = 2.77

It can be derived from Table IX that the pre-test means on co-ordination fitness of the experimental and control groups are 25.66, 24.46, 25.26 and 25.00 respectively. The obtained 'F' ratio value 0.357 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on co-ordination for the pre-test data.

The post-test means on co-ordination of the experimental and control groups are 30.13, 31.93, 31.93 and 26.00 respectively. The obtained 'F' ratio value 11.272 for the post-test mean is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there is a significant difference between the experimental and control group on co-ordination following the experimental training.

The adjusted post-test means on co-ordination of the experimental and control group are 29.60, 32.51, 31.77 and 26.09 respectively. The obtained 'F' ratio value 93.21 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group on co-ordination following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests was applied.

TABLE XI

**SCHEFFE'S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON CO-ORDINATION**

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
26.09	29.60			3.51*	1.213
26.09		32.51		6.42*	1.213
26.09			31.77	5.68*	1.213
	29.60	32.51		2.91*	1.213
	29.60		31.77	2.17*	1.213
		32.51	31.77	0.74	1.213

*Significant at 0.05 level

The above table shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 1.213. The mean differences between Pilates exercise group and control group is 3.51, which is higher than the C.I. value. Therefore there is significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 6.42, which is higher than the C.I. value. Therefore there is a significant difference between the calisthenics exercise and control group. The mean difference between combined group and Control group is 5.68, which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 2.91, which is higher than C.I. value. Therefore there is significant difference between Pilate's group and calisthenics group. The mean difference between

pilates group and combined group is 2.17, which is higher than the C.I. value. Therefore there is significant difference between the pilates group and combined group. The mean difference between calisthenics group and combined group is 0.74, which is lower than the C.I. value. Therefore there is no significant difference between the calisthenics group and combined group.

FIGURE-XVI

GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST AND ADJUSTED POST TEST MEAN OF CONTROL AND EXPERIMENTAL GROUPS ON CO-ORDINATION

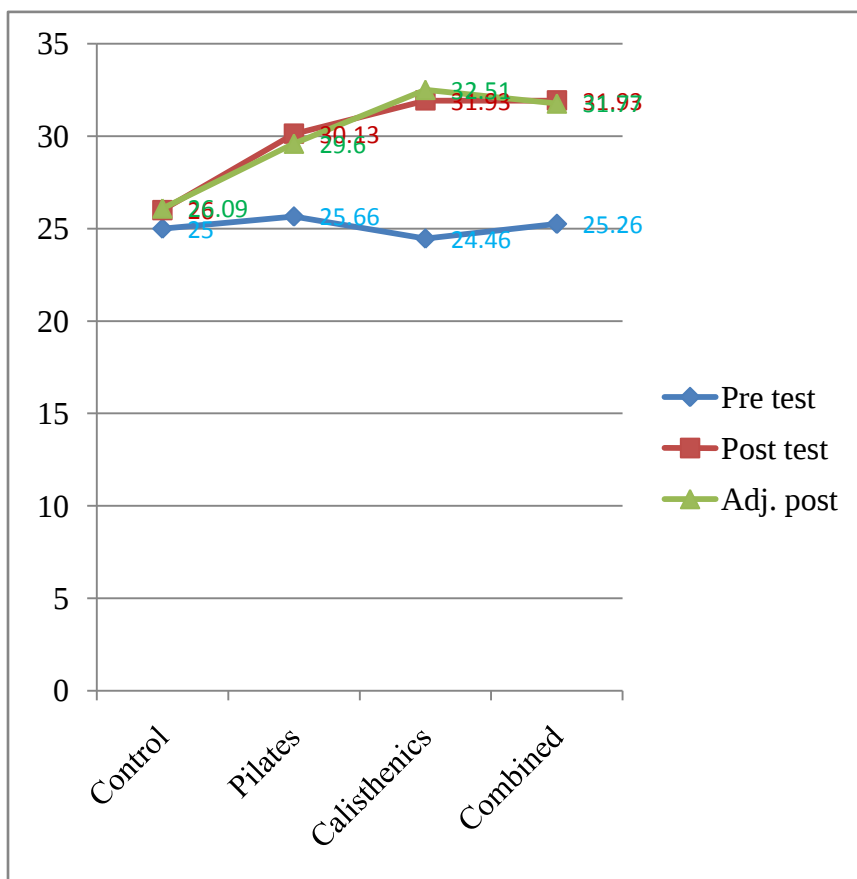


TABLE-XII

**ANALYSIS OF CO-VARIANCE FOR BALANCE ON PRE
TEST AND POST TEST DATA OF EXPERIMENTAL
GROUP AND CONTROL GROUP**

	Groups				SV	df	SS	MSS	F-Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	9.06	10.13	8.93	9.06	B	3	14.06	4.68	0.275
S.D.	3.84	4.18	4.36	4.09	W	56	954.53	17.04	
Post-test Mean	9.40	20.20	15.93	22.46	B	3	1485.33	495.11	22.82*
S.D.	4.01	5.49	3.76	5.12	W	56	1214.66	21.69	
Adjusted post-test	9.59	19.52	16.23	22.65	B	3	1406.13	468.71	44.11*
					W	55	584.34	10.62	

* Significant at 0.05 level

Table value for df (3&56) at 0.05 level = 2.77

(3&55) at 0.05 level = 2.77

It can be derived from Table XI that the pre-test means on balance of the experimental and control groups are 10.13, 8.93, 9.06 and 9.06 respectively. The obtained 'F' ratio value 0.275 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on balance for the pre-test data.

The post-test means on balance of the experimental and control groups are 20.20, 15.93, 22.46 and 9.40 respectively. The obtained 'F' ratio value 22.82 for the post-test mean is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there is a significant difference between the experimental and control group on balance following the experimental training.

The adjusted post-test means on balance of the experimental and control group are 19.52, 16.23, 22.65 and 9.59 respectively. The obtained 'F' ratio value 44.11 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group

on speed following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests was applied.

TABLE XIII
SCHEFFE'S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON BALANCE

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
9.59	19.52			9.93*	3.43
9.59		16.23		6.64*	3.43
9.59			22.65	13.06*	3.43
	19.52	16.23		3.29	3.43
	19.52		22.65	3.13	3.43
		16.23	22.65	6.42*	3.43

*Significant at 0.05 level

The above table shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 3.43. The mean differences between Pilates exercise group and control group is 9.93, which is higher than the C.I. value. Therefore there is significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 6.64, which is higher than the C.I. value. Therefore there is a significant difference between the calisthenics exercise and control group. The mean difference between combined group and control group is 13.06, which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 3.29, which is lower than C.I. value. Therefore there is no significant difference between pilates group and calisthenics group. The mean difference between pilates group and combined group is 3.13, which is lower than the C.I. value. Therefore there is no significant difference between the pilates group and combined group. The mean difference between calisthenics group and combined group is 6.42, which is higher than the C.I. value. Therefore there is significant difference between the calisthenics group and combined group.

FIGURE-XVII

**GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST
AND ADJUSTED POST TEST MEAN OF CONTROL AND
EXPERIMENTAL GROUPS ON BALANCE**

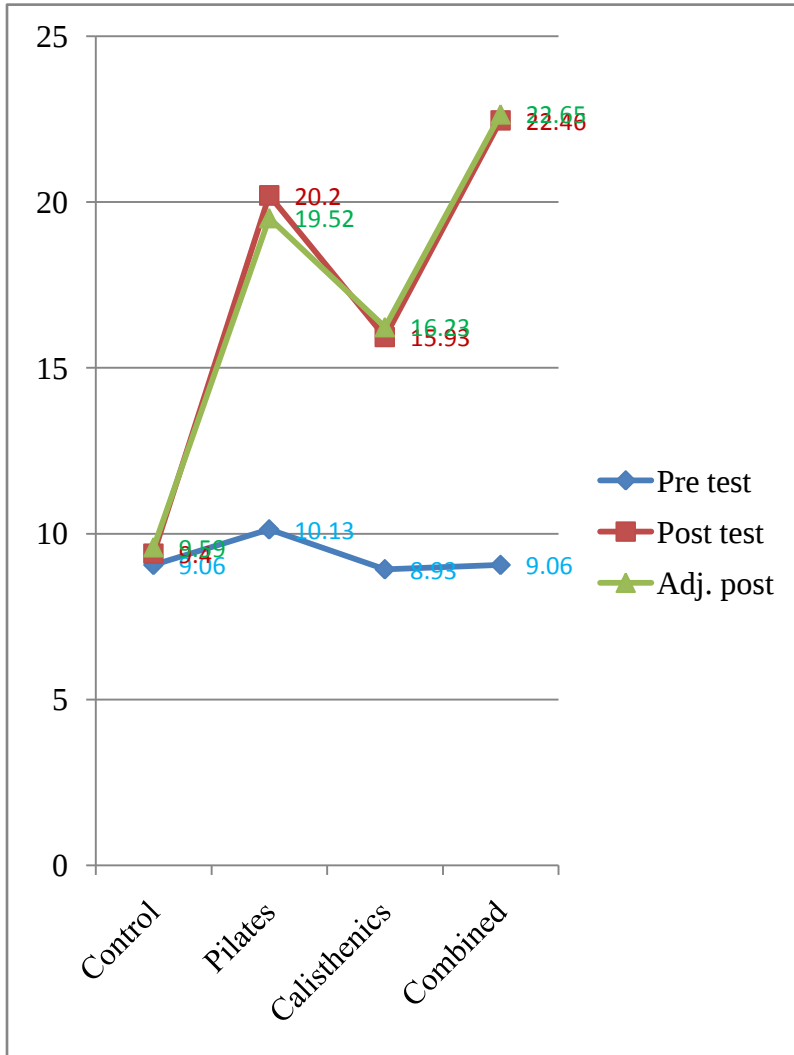


TABLE XIV

**ANALYSIS OF CO-VARIANCE FOR FLEXIBILITY ON PRE
TEST AND POST TEST DATA OF EXPERIMENTAL
GROUP AND CONTROL GROUP**

	Groups				SV	df	SS	MSS	F-Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	13.32	13.96	13.25	13.18	B	3	5.84	1.95	2.54
S.D.	0.82	0.89	0.92	0.85	W	56	69.16	1.23	
Post-test Mean	14.40	15.25	15.94	16.12	B	3	27.55	9.18	7.71*
S.D.	0.81	1.08	1.16	1.24	W	56	66.68	1.19	
Adjusted post-test	14.41	15.89	15.27	16.15	B	3	26.65	8.88	7.38*
					W	55	66.23	1.20	

* Significant at 0.05 level

Table value for df (3&56) at 0.05 level = 2.77

(3&55) at 0.05 level = 2.77

It can be derived from Table XIII that the pre-test means on flexibility of the experimental and control groups are 13.96, 13.25, 13.18 and 13.32 respectively. The obtained 'F' ratio value 2.54 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on flexibility for the pre-test data.

The post-test means on flexibility of the experimental and control groups are 15.25, 15.94, 16.12 and 14.40 respectively. The obtained 'F' ratio value 7.71 for the post-test mean is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there is a significant difference between the experimental and control group on flexibility following the experimental training.

The adjusted post-test means on flexibility of the experimental and control group are 15.89, 15.27, 16.15 and 14.41

respectively. The obtained 'F' ratio value 7.38 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group on flexibility following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests was applied.

TABLE XV

**SCHEFFE'S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON FLEXIBILITY**

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
14.41	15.89			1.48*	1.148
14.41		15.27		0.86	1.148
14.41			16.15	1.74*	1.148
	15.89	15.27		0.62	1.148
	15.89		16.15	0.26	1.148
		15.27	16.15	0.88	1.148

*Significant at 0.05 level

The above table shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 1.148. The mean differences between pilates exercise group and control group is 1.48, which is higher than the C.I. value. Therefore there is significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 0.86, which is lower than the C.I. value. Therefore there is no significant difference between the calisthenics exercise and control group. The mean difference between combined group and control group is 1.74, which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 0.62, which is lower than C.I. value. Therefore there is no significant difference between Pilate's group and calisthenics group. The mean difference between pilates group and combined group is 0.26, which is lower than the C.I. value. Therefore there is no significant difference between the pilates group and combined group. The mean difference between

calisthenics group and combined group is 0.88, which is lower than the C.I. value. Therefore there is no significant difference between the calisthenics group and combined group.

FIGURE-XVIII

GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST AND ADJUSTED POST TEST MEAN OF CONTROL AND EXPERIMENTAL GROUPS ON FLEXIBILITY

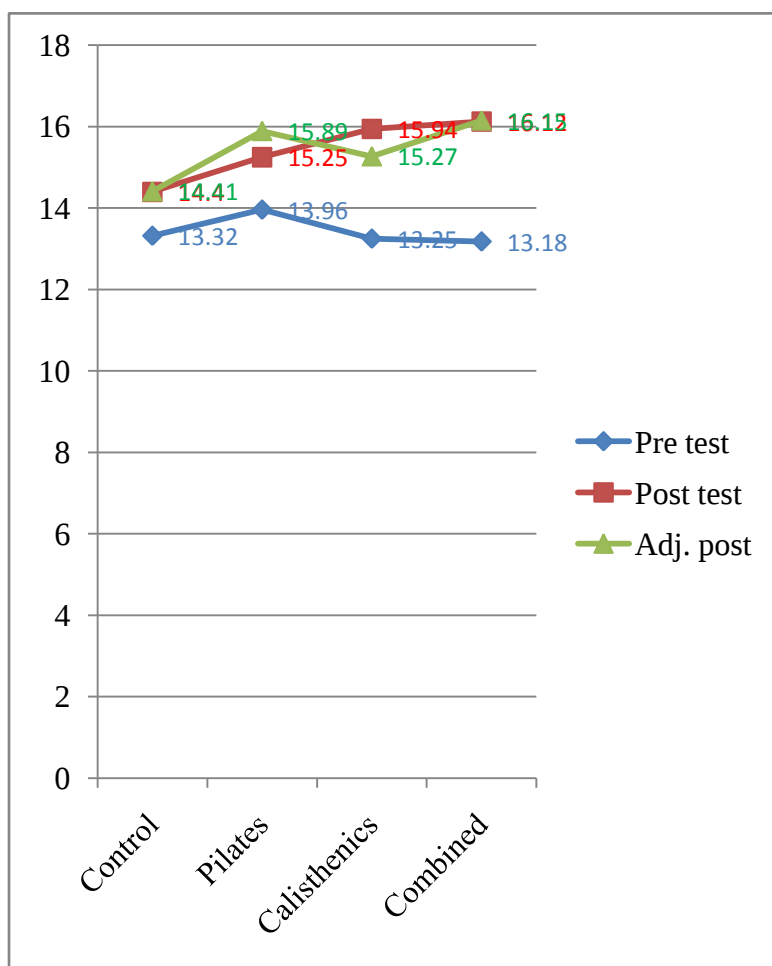


TABLE XVI

**ANALYSIS OF CO-VARIANCE FOR STRENGTH ON PRE
TEST AND POST TEST DATA OF EXPERIMENTAL
GROUP AND CONTROL GROUP**

	Groups				SV	df	SS	MSS	F- Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	13.46	13.06	12.73	13.80	B	3	9.73	3.24	0.56
S.D	1.92	2.25	1.98	3.21	W	56	322.00	5.75	
Post-test Mean	14.40	17.53	17.86	19.86	B	3	261.20	87.06	15.13*
S.D	1.53	2.03	2.69	3.04	W	56	322.13	5.75	
Adjusted post-test	13.89	17.70	18.33	19.40	B	3	258.81	86.27	61.78*
					W	55	76.79	1.39	

* Significant at 0.05 level

Table value for df (3&56) at 0.05 level = 2.77

(3&55) at 0.05 level = 2.77

It can be derived from Table XV that the pre-test means on strength of the experimental and control groups are 13.06, 12.73, 13.80 and 13.46 respectively. The obtained 'F' ratio value 0.56 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on strength for the pre-test data.

The post-test means on strength of the experimental and control groups are 17.53, 17.86, 19.86 and 14.40 respectively. The obtained 'F' ratio value 15.13 for the post-test mean is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there is a significant difference between the experimental and control group on strength following the experimental training.

The adjusted post-test means on strength of the experimental and control group are 17.70, 18.33, 19.40 and 13.89 respectively. The obtained 'F' ratio value 61.78 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group on strength following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests was applied.

TABLE XVII
SCHEFFE'S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON STRENGTH

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
13.89	17.70			3.81*	1.52
13.89		18.33		4.44*	1.52
13.89			19.40	5.50*	1.52
	17.70	18.33		0.62	1.52
	17.70		19.40	1.69*	1.52
		18.33	19.40	1.06	1.52

*Significant at 0.05 level

The above table shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 1.52. The mean differences between Pilates exercise group and control group is 3.81, which is higher than the C.I. value. Therefore there is a significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 4.44, which is higher than the C.I. value. Therefore there is significant difference between the calisthenics exercise and control group. The mean difference between combined group and control group is 5.50, which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 0.62, which is lower than C.I. value. Therefore there is no significant difference between pilates group and calisthenics group. The mean difference between pilates group and combined group is

1.69, which is higher than the C.I. value. Therefore there is significant difference between the pilates group and combined group. The mean difference between calisthenics group and combined group is 1.06, which is higher than the C.I. value. Therefore there is no significant difference between the calisthenics group and combined group.

FIGURE-XIX

GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST AND ADJUSTED POST TEST MEAN OF CONTROL AND EXPERIMENTAL GROUPS ON STRENGTH

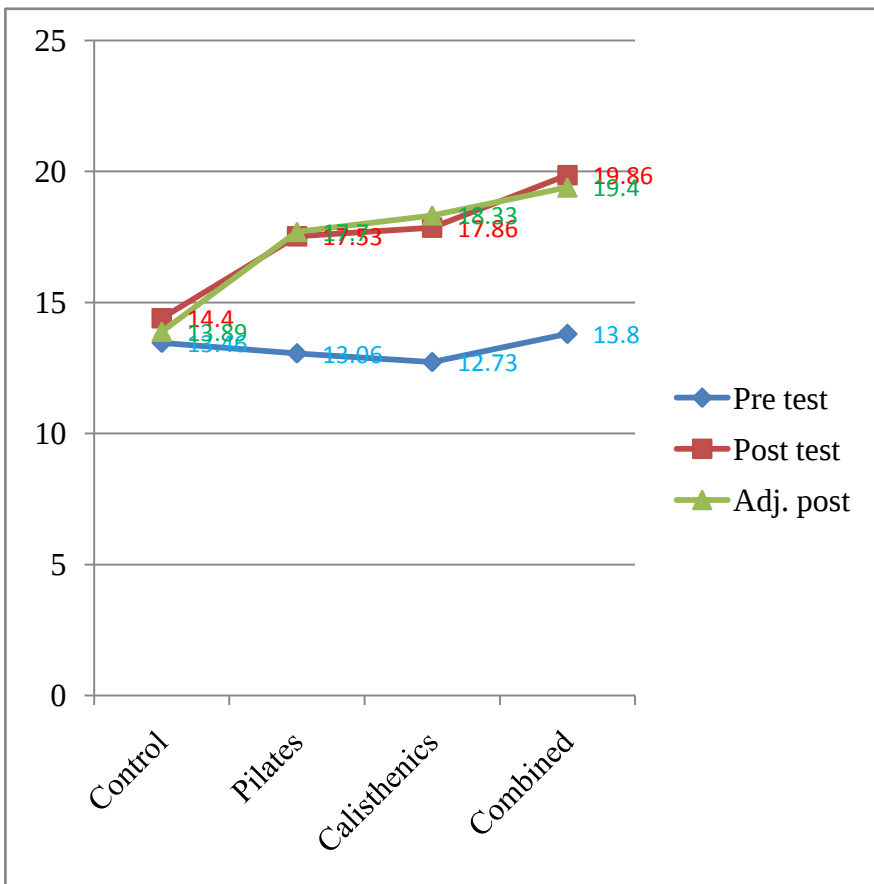


TABLE XVIII

**ANALYSIS OF CO-VARIANCE FOR MUSCULAR
ENDURANCE ON PRE TEST AND POST TEST
DATA OF EXPERIMENTAL GROUP
AND CONTROL GROUP**

	Groups				SV	df	SS	MSS	F-Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	28.46	24.66	26.33	25.20	B	3	127.53	42.51	2.03
S.D.	4.85	5.42	4.32	3.46	W	56	1170.80	20.90	
Post-test Mean	29.66	31.73	36.06	35.60	B	3	428.93	142.97	6.792*
S.D.	4.22	5.52	3.17	5.08	W	56	1178.80	21.05	
Adjusted post-test	27.50	33.14	35.91	36.51	B	3	718.49	239.50	94.14*
					W	55	139.92	2.54	

* Significant at 0.05 level

Table value for df (3&56) at 0.05 level = 2.77
(3&55) at 0.05 level = 2.77

It can be derived from Table XVII that the pre-test means on muscular endurance of the experimental and control groups are 24.66, 26.33, 25.20 and 28.46 respectively. The obtained 'F' ratio value 2.03 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on muscular endurance for the pre-test data.

The post-test means on muscular endurance of the experimental and control groups are 31.73, 36.06, 35.60 and 29.66 respectively. The obtained 'F' ratio value 6.792 for the post-test mean is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there is a

significant difference between the experimental and control group on muscular endurance following the experimental training.

The adjusted post-test means on muscular endurance of the experimental and control group are 33.14, 35.91, 36.91 and 27.50 respectively. The obtained ‘F’ ratio value 94.14 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group on muscular endurance following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests was applied.

TABLE XIX

**SCHEFFE’S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON MUSCULAR ENDURANCE**

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
27.50	33.14			5.64*	1.68
27.50		35.91		8.41*	1.68
27.50			36.51	9.01*	1.68
	33.14	35.91		2.76*	1.68
	33.14		36.51	3.36*	1.68
		35.91	36.51	0.60	1.68

*Significant at 0.05 level

The above table shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 1.68. The mean differences between pilates exercise group and control group is 5.64, which is higher than the C.I. value. Therefore there is a significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 8.41, which is higher than the C.I. value. Therefore there is significant difference between the calisthenics exercise and control group. The mean difference between combined group and control group is 9.01,

which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 2.76, which is higher than C.I. value. Therefore there is significant difference between pilates group and calisthenics group. The mean difference between pilates group and combined group is 3.36, which is higher than the C.I. value. Therefore there is significant difference between the pilates group and combined group. The mean difference between calisthenics group and combined group is 0.60, which is lower than the C.I. value. Therefore there is no significant difference between the calisthenics group and combined group.

FIGURE-XX

GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST AND ADJUSTED POST TEST MEAN OF CONTROL AND EXPERIMENTAL GROUPS ON MUSCULAR ENDURANCE

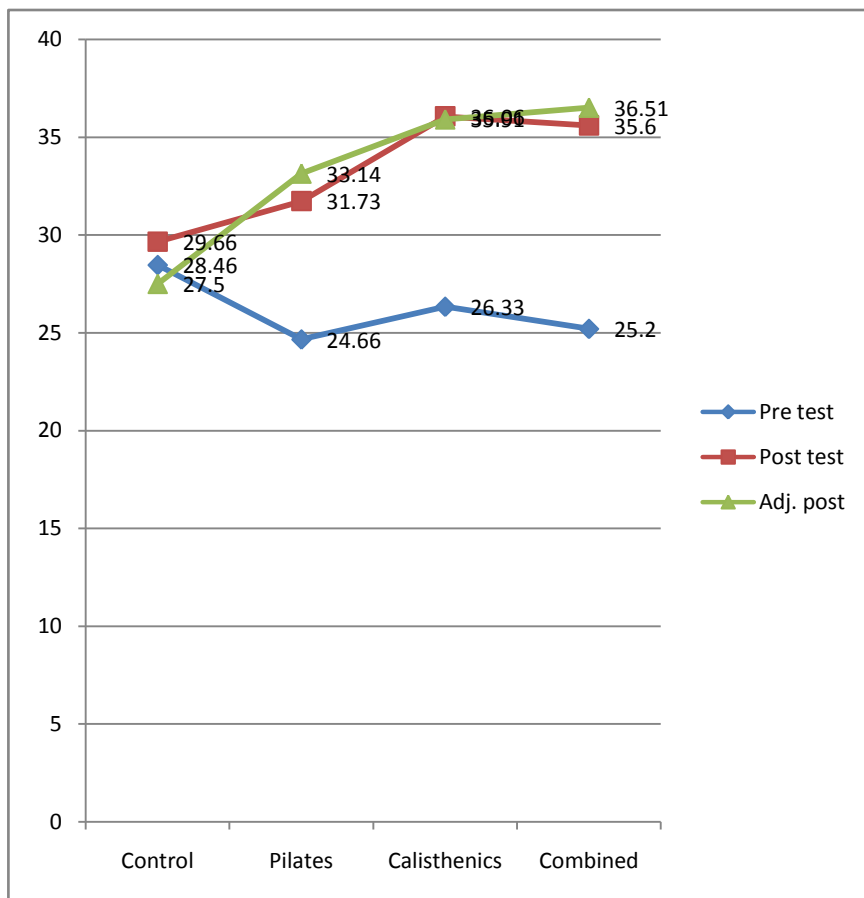


TABLE XX

**ANALYSIS OF CO-VARIANCE FOR POWER ON PRE TEST
AND POST TEST DATA OF EXPERIMENTAL GROUP
AND CONTROL GROUP**

	Groups				SV	df	SS	MSS	F-Ratio
	Control	Pilates	Calisthenics	Combined					
Pre test Mean	1.95	1.92	1.94	1.95	B	3	0.01	0.004	0.54
S.D	0.08	0.05	0.05	0.11	W	56	0.35	0.006	
Post-test Mean	1.97	2.16	2.18	2.17	B	3	0.44	0.149	12.66*
S.D	0.08	0.11	0.09	0.13	W	56	0.61	0.012	

Adjusted post-test	1.964	2.189	2.182	2.169	B	3	0.52	0.175	36.80*
					W	55	0.26	0.005	

* Significant at 0.05 level

Table value for df (3&56) at 0.05 level = 2.77

(3&55) at 0.05 level = 2.77

It can be derived from Table XIX that the pre-test means on power of the experimental and control groups are 1.92, 1.94, 1.95 and 1.95 respectively. The obtained 'F' ratio value 0.54 for the pre-test mean is lesser than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. There is no significant difference between the experimental and control group on power for the pre-test data.

The post-test means on power of the experimental and control groups are 2.16, 2.18, 2.17 and 1.97 respectively. The obtained 'F' ratio value 12.66 for the post-test mean is greater than the required table value 2.77 for 3 & 56 degree of freedom at 0.05 level of confidence. It shows that there is a significant difference between the experimental and control group on power following the experimental training.

The adjusted post-test means on power of the experimental and control group are 2.189, 2.182, 2.169 and 1.964 respectively. The obtained 'F' ratio value 36.80 for the adjusted post-test data is greater than the required table value 2.77 for 3 & 55 degree of freedom at 0.05 level of confidence. It reveals that there is a significant difference between the experimental and control group on power following the experimental training. Since the difference exists in the adjusted post-test mean, further multiple comparison tests was applied.

TABLE XXI

**SCHEFFE'S POST HOC TEST FOR MEAN DIFFERENCE
BETWEEN GROUPS ON POWER**

Adjusted Post-test Means				MD	C.I.
Control	Pilates	Calisthenics	Combined		
1.964	2.189			0.225*	0.0744
1.964		2.182		0.218*	0.0744

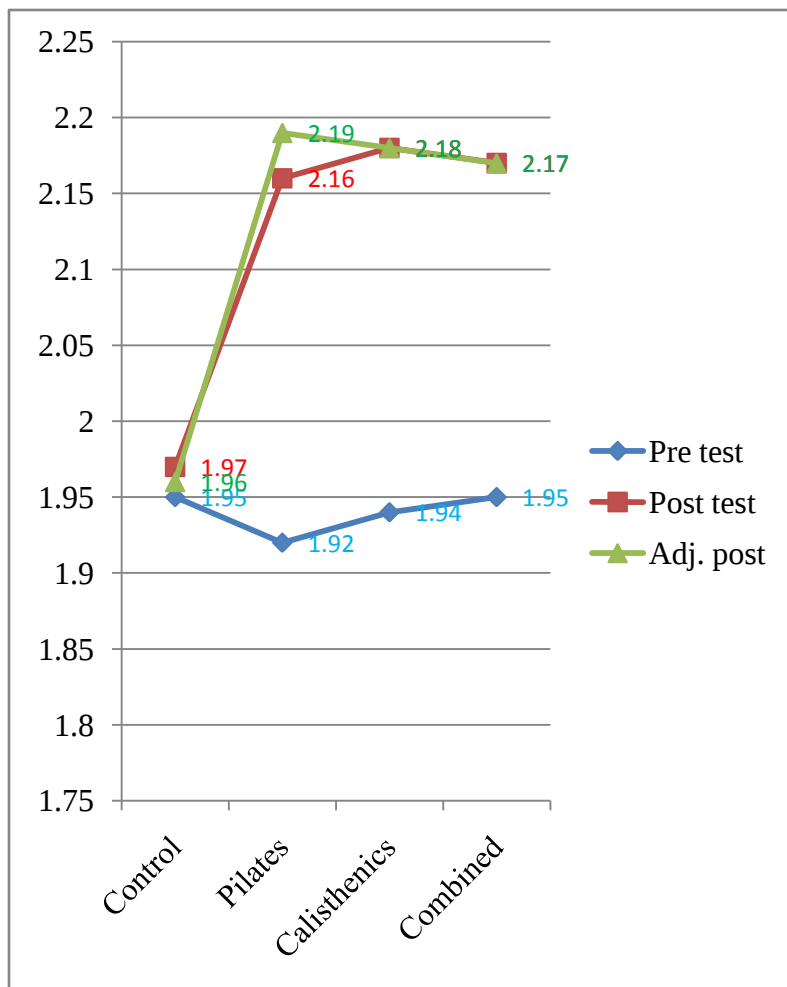
1.964			2.169	0.206*	0.0744
	2.189	2.182		0.007	0.0744
	2.189		2.169	0.020	0.0744
		2.182	2.169	0.012	0.0744

*Significant at 0.05 level

The above table shows the paired mean differences among the three experimental groups namely pilates exercise, calisthenics exercise and combined exercise and control group. The confidence interval value at 0.05 levels is 0.0744. The mean differences between pilates exercise group and control group is 0.225, which is higher than the C.I. value. Therefore there is significant difference between the pilates exercise and control group. The mean difference between calisthenics group and control group is 0.218, which is higher than the C.I. value. Therefore there is significant difference between the calisthenics exercise and control group. The mean difference between combined group and control group is 0.206, which is higher than the C.I. value. Therefore there is significant difference between the combined exercise and control group. The mean difference between pilates group and calisthenics group is 0.007, which is lower than C.I. value. Therefore there is no significant difference between pilates group and calisthenics group. The mean difference between pilates group and combined group is 0.020, which is lower than the C.I. value. Therefore there is no significant difference between the pilates group and combined group. The mean difference between calisthenics group and combined group is 0.012, which is lower than the C.I. value. Therefore there is no significant difference between the calisthenics group and combined group.

FIGURE-XXI

GRAPHICAL ILLUSTRATION OF PRE TEST, POST TEST AND ADJUSTED POST TEST MEAN OF CONTROL AND EXPERIMENTAL GROUPS ON POWER



4.1 DISCUSSION OF FINDINGS

The discussion on the result of the twelve weeks of pilates, calisthenics & combination of both exercises on selected physical, physiological and psychological variables are as follows.

Physical Variables

The result of the study for the all experimental groups namely Group I (Pilates exercises), Group II (Calisthenics exercises) & Group III (Combined Pilates & Calisthenics exercises) training with fixed intensity and volume had significantly improved the selected dependent variable namely speed, power, strength, cardiovascular fitness, flexibility, muscular endurances, co-ordination and balance than the control group.

Speed

The result of this study shows that there was no significant difference in speed in the pre- test between experimental and control group but after 12 weeks treatment the experimental group significantly improved their speed in post-test & adjusted post-test, when compared with the control group.

The finding of Bissell (1973), stated that varied package of physical training had significant changes in speed than the control group. A similar finding has been reported by Kaesler (2007), Mitchell (1999) and Dominick (1966).

Cardiovascular fitness

The result of this study reveals that there is no significant difference in cardiovascular fitness in the pre-test between experimental and control group. After 12 weeks treatment the experimental group (Pilates, Calisthenics and Combined exercise group) significantly improved their cardiovascular fitness in post-test and adjusted post-test, when compared with the control group.

The finding of Braxton (1975), who stated that varied package of physical training had significant changes in cardiovascular fitness than the control group. A similar finding has been reported by Helen (1964), Phillip (1984), Shou Yuan (2006) And Keith (1971).

Co-ordination

The result of this study reveals that there is no significant difference in co-ordination in the pre-test between experimental and control group. In post-test and adjusted post- test co-ordination were significantly improved in experimental group, when compared with the control group.

The finding of Ozer Kaya (2012) is stated that varied package of physical training had significant changes in co-ordination than the control group. A similar finding has been reported by Harry K. (1965).

Balance

The result of the study reveals that there was no significant difference between pre-test experimental and control group. But the twelve weeks of pilates, calisthenics and combination of both exercise training resulted in significant change in balance for post-test and adjusted post-test experimental groups than the control group.

The finding of Mitchell (1999) which stated that varied package of physical training had significant changes in balance than the control group. A similar finding has been reported by Prtotsfsky (2005), Hall (1999) and Kaesler (2007).

Flexibility

The result of this study reveals that there is no significant difference in flexibility in the pre-test between experimental and control group. After the post-test and adjusted post-test the experimental groups (Pilates, Calisthenics and Combined exercise group) significantly improved in their flexibility, when compared with the control group.

From the finding of Mitchell (1999) who stated that varied package of physical training had significant changes in flexibility than the control group. A similar finding has been reported by Descher, D. (2002), Scheroeder (1999), Segal (2004), Malley (2013) and Baltaci (2005).

Strength

The result of this study reveals that there is no significant difference in strength in the pre-test between experimental and control group. After the post-test and adjusted post-test the experimental groups (Pilates, Calisthenics and Combined exercise group) significantly improved in their strength, when compared with the control group.

From the finding of Fitt (1994) stated that varied package of physical training had significant changes in strength than the control group. A similar finding has been reported by Christopher (2006), Emery (2010), Prtrosfsky (2005), Malley (2013) and Mitchell (1999).

Muscular endurance

The result of the study reveals that there is no significant difference between pre-test experimental and control group. But the twelve weeks of pilates, calisthenics and combination of both exercise result in the significant changes in their muscular endurance for post-test and adjusted post-test experimental groups than the control group.

From the finding of Donahoc-Fillnore (2002) is stated that varied package of physical training had significant changes in muscular endurance than the control group. A similar finding has been reported by Sekendiz (2006).

Power

The above result found that there is no significant difference between pre-test experimental and control group. After 12 weeks treatment the experimental groups significantly improved in power, when compared with the control group in post and adjusted post-test.

From the finding of Mitchell (1999) stated that varied package of physical training had significant changes in power than the control group. A similar finding has been reported by Malley (2013) and Sekendiz (2006).

From the finding of Sonstroen, Harlow (1994) is stated that varied package of physical training had significant changes in body mass index than the control group. Similar finding can be found in Fox Kenneth (2000), and E. Ekelana (2005).

4.2 Discussion of Hypotheses

The researcher had formulated the following hypotheses

The first hypothesis, says that there would be significant improvement due to the pilates exercise, calisthenics exercise and combined pilates and calisthenics exercise on selected physical variables namely speed, power, strength, cardiovascular fitness, flexibility, muscular endurances, coordination and balance variable when compared to the control group.

Since the present study produced a similar result, the research hypothesis was accepted. So the null hypothesis was rejected at 0.05 level of confidence.

5 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The purpose of the study was to find out the effect of pilates exercise, calisthenics exercise and combined pilates and calisthenics exercise on selected physical motor fitness variables of school boys between 12 and 15 years age group.

The investigator explained the subjects about the purpose, importance of the experiment and the procedure to be employed to collect the physical motor fitness from them, Further the role of the subject during the experimentation and the testing procedure was also explained to them in detail.

Twelve weeks of pilates exercise, calisthenics exercise and combined pilates and calisthenics exercise training was given to the experimental group. The control group was not allowed to participate in any of the training programmes, except in their regular physical education programmes while the experimental group underwent the training programme as per the training schedule prepared by the investigator. The training programme was held for five days in a week for 12 weeks from 3.30 to 4.30 pm.

The test selected for the study were standardized test and most suitable for the present study. The investigator was present with the subject during the experimentation of the pre-test and the post test.

5.2 Conclusion

From the result of the study related to pilates exercise, calisthenics exercise and combined exercise training schedule the following conclusion were drawn.

Physical variables

- Systematic programmes of the three experimental groups namely the pilates group, the calisthenics group and the

combined pilates & calisthenics exercise group have achieved significant improvement as compared to control group towards improving the selected criterion variable such as speed, cardiovascular fitness, co-ordination, balance, strength, muscular endurance and power.

- The result of the study showed that flexibility had significant improved in the pilates group and combined pilates & calisthenics group when compared to calisthenics group and the control group.

5.3 Recommendation

On the basis of the conclusions drawn the following recommendation are made.

- In the present study, it was concluded that systematic pilates exercise, calisthenics exercise and combined pilates and calisthenics exercise training would produce positive changes on physical motor fitness variables in school boys.
- Similar study may be replicated with longer durations, different intensities of training.
- Pilates, calisthenics exercise and combined pilates and calisthenics exercise programme can also be suggested for the occasional participants to obtain reasonable results in their health related fitness.
- Similar studies may be conducted at various levels of participation such as college, rural, state and national level.
- Further, similar research may be undertaken on female student.
- Further studies may be necessary to examine the effect of pilates exercise, calisthenics exercise and combined pilates and calisthenics exercise training on physical motor fitness variables for different age groups.

6 BIBLIOGRAPHY

Book

Ajmer Singh, Jagdish Bains, Jagtar Singh Gill, R.S. Brar and Nimaljit Kaur Rathee, **Essential of Physical Education**, New Delhi, Kalyani Publishers, 2003.

Biddle, S. J. H., Fox, K. R., Boucher, and S. H., “The Effects of Exercise on Self-Perceptions and Self-Esteem,” *Physical Activity and Psychological Well-Being*, London, Routledge Publishers, 2001, pp. 88-117.

Campbell, and R.N., **The New Science: Self-Esteem Psychology**, Lanham, MD, University Press of America, 1984.

Cliipinger K., **Dance Anatomy and Kinesiology**, United State of America, Champaign IL, Human Kinetics Publication, 2007.

Devinder K. Kansal, **Test and Measurement in Sport and Physical Education**, New Delhi, D.V.S. Publication, 1996.

Devinder K. Kansal, **Test and Measurement in Sport and Physical Education**, New Delhi, D.V.S. Publication, 2008.

Sandhya Tiwari, **Exercise Physiology**, Mansarover Garden, Delhi, Lokesh Thani Sports Publication, Jogno Office Printers, 1999.

Hardyal Singh, **The Science of Sports Training**, New Delhi, D.V.S. Publication, 1991.

Isacwatiz and Cliipinger K. **Pilates Anatomy**, United State of America, Champaign IL, Human Kinetics, 2006.

Kennedy, Carol A. & Mary M. Yoke, **Method of Group Exercise Instruction 2nd ed.**, United State of America, Human Kinetics, 1958.

Meinel and Schnabel, **Bewegungslehre Sportmotrik**, LVD GmbH, Berlin, Czech Republic, 2004.

Murphy, G., **Personality: A Biosocial Approach to Origins and Structure**, New York, Harper & Row 1947.

Journals

- Alfermann, D., and Stoll O., "Effects of Physical Exercise on Self-Concept and Well-Being," *International Journal of Sport Psychology*, Vol. 31 (1), 2000, pp. 47-65.
- B. Don Franks and George C. Moore, "**Effects** of Calisthenics and Volleyball on the AAHPER Fitness Test and Volleyball Skill," Research Quarterly American Association for Health, Physical Education and Recreation, Vol. 40 (2), 1969, Pages 288-292.
- Ballor DL, and Keesey RE, "A Meta-Analysis of the Factors Affecting Exercise-Induced Changes in Body Mass, Fat Mass and Fat-Free Mass in Males and Females," *Int. J Obesity*, 1991 Nov; 15:717-726.
- Baltaci, G., Bayrakci, V., Tunay, E Yakut, and N Vardar, "A Comparison of Two Different Exercises on The Weight Loss in the Treatment of Knee Osteoarthritis: Pilates Exercises Versus Clinical-Based Physical Therapy," **Osteoarthritis and Cartilage 10th World Congress on Osteoarthritis**, Volume 13, Supplement 1, 2005, pp. 280, page.*
- Bernardo, and L.M., "The Effectiveness of Pilates Training in Healthy Adults: An Appraisal of the Research Literature," **Journal of Bodywork and Movement Therapies**, Vol. 11 (2), 2007, 106-110.
- Blumenthal, J.A., Emery, C.F., Madden, D.J., George, L.K., Coleman, R.E. and Riddle, and M.W., "Cardiovascular and Behavioural Effects of Aerobic Exercise Training in Healthy Older Man and Woman," **J. Gerontology**, 1989, 44:pp. 147-157,
- Carter, ND, Khan, KM, Petit, MA, A Heinonen, C., Waterman, MG Donaldson, PA., and et al., "Results of A 10 Week Community Based Strength and Balance Training Programme to Reduce Fall Risk Factors: A Randomized Controlled Trial In 65-75 Year Old Women With Osteoporosis," **Br J Sports Med**, 2001, 35:pp. 348-351.

Dominick A. Taddonio , “Effect of Daily Fifteen-Minute Periods of Calisthenics upon the Physical Fitness of Fifth-Grade Boys and Girls”, Research Quarterly,” **American Association for Health, Physical Education and Recreation**, Volume 37 (2), 1966, Pages 276-281.

Donahoe Fillmore, B. Hanahan, N. M. Mescher, M. L. Clapp, E. D. Addison, N. R. Weston, and C.R., “The Effects of a Home Pilates Program on Muscle Performance and Posture in Healthy Females: A Pilot Study,” **Journal of Women’s Health Physical Therapy**, 2007, 31:2.

Jaykishan Santoshi, “Effect of Calisthenics and Yogic Practices on Selected Physical and Physiological Variables,” **Research Analysis and Evaluation International Research Journal**, Vol. I (13), October 2010, Page 61-62.

E Ekeland, F Heian, K Hagen, and E Coren (2005), “Can Exercise Improve Self-Esteem in Children and Young People,” A Systematic Review of Randomized Controlled Trials, **Br. J Sports Med**, Vol. 39 (11), 2005 November; Page 792–798.

Erkal Arslanoğlu and Ömer Şenel, “Effects of Pilates Training on Some Physiological Parameters and Cardiovascular Risk Factors of Middle Aged Sedentary Women,” **International Journal of Sport Studies**, Vol. 3 (2), 2013, pp. 122-129,

fitt, S., Sturman, J., and McClain-Smith, S., “Effects of Pilates Based Conditioning on Strength, Alignment and Range of Motion in University Ballet and Modern Dance Majors,” **Kinesiology and Medicine for Dance**, 1993/94, 16:pp. 36-51.

Fox, Kenneth R., “Self-Esteem, Self-Perceptions and Exercise,” **International Journal of Sport Psychology**, Vol. 31 (2), Apr-Jun 2000, Page 228-240.

Frankin gene and Bissell, “The Effects of No Warm-up and Calisthenics Warm-up on Selected Football Skill, Agility and Speed,” **Dissertation Abstracts International**, 31 Dec- 1973:3113.

Harry K. Campney and Richard W. Wehr , “Effects of Calisthenics on Selected Components of Physical Fitness,” Research Quarterly. American Association for Health, Physical Education and Recreation, Vol. 36 (4), 1965, pp. 61-67.

Heatherton F. and Polivy, J., "Development and Validation of a Scale for Measuring State Self- Esteem," **Journal of personality and social psychology**, 1991, 60:pp. 895-910.

Helen Fabricius, "**Effect of Added Calisthenics on the Physical Fitness of Fourth Grade Boys and Girls,**" **Research Quarterly**. American Association for Health, *Physical Education and Recreation*, Vol. 35 (2), (1964), pp. 135-140.

J. A. Kloubec, "Pilates for Improvement of Muscles Endurance, Flexibility, Balance, and Posture" **Journal of Strength Conditioning Research**, Vol. 24 (3), March 2010, pp. 661-667.

Jesse Bucy, "A Comparison of the Effect of Three Method of Training of Physical Fitness," *Completed Research in Health*, **Physical Education and Recreation**, 1965, 7:34.

JIA Sun-Yong, "Influence of Different Aerobic Calisthenics Exercise Loads on Young Office Lady's Cardiopulmonary Function." **Journal of Beijing Sport University**; Zhejiang Police Vocational Academy, Hangzhou 310018, Zhejiang China; 2007-12.

Johnson, E.G., Larsen, A., Ozawa, H., Christine A. Wilson, C.A., Kennedy, K.L., "The Effects of Pilates-Based Exercise on Dynamic Balance in Healthy Adults," **Journal of Bodywork and Movement Therapies**, Vol. 11 (3), 2007, Pages 238-242.

Jorge Fernandes, Dulce Gomes, Lisa Marie Bernardo, Bruce D. Kirkcaldy, Tiago, M. Barbosa & António Silva, "Effects of Pilates-Based Exercise on Life Satisfaction, Physical Self-Concept and Health Status in Adult Women", **Women & Health**, 2011, 51:pp. 240–255,

K. Emery et al., "The Effects of a Pilates Training Program on Arm-Trunk Posture and Movement," **Indian Journal of Physiology and Pharmacology**, Vol. 25 (2), Feb 2010 pp. 124-30.

K. Rogersand Al. Gibson, "Eight-Week Traditional Mat Pilates Training-Program Effects on Adult Fitness Characteristics," **Research Quarterly for Exercise and Sport**, Sep 2009, 80:3, pp. 569-74.

Kaesler D.S., Mellifont, R.B., Kelly P.S., Taaffe, and D.R., "A Novel Balance Exercise Program for Postural Stability in Older Adults: A pilot study," **Journal of Bodywork and Movement Therapies**, Vol. 11, 2007, pp. 37-43.

Keith Farrell Hoffman, "A Comparison of Four Selected Program of Physical Education upon Physical Fitness and General Motor Ability," **Dissertation Abstracts International** 31 April 1971.3178-A.

Kewal Krishan and Sudhir Kumar Sharma, "Effects of Yogic Practices and Callisthenic Exercises on Resting Pulse Rate Variable of Secondary School Boys", http://shodhganga.inflibnet.ac.in/bitstream/10603/7693/10/10_chapter2.pdf, 2009.

Leonard H. Epstein, Rena R. Wing, Randi Koeske, and Alice Valoski, "A Comparison of Lifestyle Exercise, Aerobic Exercise, and Calisthenics on Weight Loss in Obese Children," **Journal of Behavior Therapy**, Vol. 16 (4), September 1985, Pages 345–356.

Leslie L. Stockton "The Effects of Selected Conditioning Methods on Physical Fitness Level on 9th and 10th Grade Girls," **Completed Research in Health, Physical Education and Recreation**, 1977, 19:110.

Mallery LH, Mac Donald EA, Hubley-Kozey CL, Earl ME, Rockwood K, and Mac Knight C., "The Feasibility of Performing Resistance Exercise with Acutely Ill Hospitalized Older Adults," **BMC Geriatrics**, 2003; 3(1):3.

Marjorie Greer, Therese Weber, Susan Dimick, and Ronald Ratliff, "Physiological Responses to Low-Intensity Cardiac Rehabilitation Exercises," **Physical Therapy**, 1980; 60 pp. 1146-1151.

Maryela o. Menacho, Karen Obara, Josilene S. Conceição, Matheus L. Chitolina, Daniel R. Krantz, Rubens A. da Silva, and Jefferson R. Cardoso, "Electromyography Effect of Mat Pilates Exercise on the Back Muscle Activity of Healthy Adult females," **J Manipulative Physiological Therapeutics**, 2010, 33 pp. 672-678.

Metel S., Milert A., and Joseph Pilates, "Method and Possibilities of Its Application in Physiotherapy," **Medical Rehabilitation**, Vol. 11 (2), 2007, Page No.19-28.

Mitchell, L.S., Grant S., and Aitchison T., "Physiological Effects of Exercise on Post-Menopausal Osteoporotic Women," **Phys. Ther.**, Vol. 84 (4), 1998, pp. 157–163.

Neil Wolkodoff, Sue Peterson, and Jeff Miller, "Effects of a Combined Pilates Program and Pilates-Cardio Program on Fitness Variables", *Ijssjournal* /01/122-1291, 2013.

Nevin Atalay Guzel, Lamia Pinar, Filiz Colakoglu, Selma Karacan , and Cigdem Ozer, "Long-Term Callisthenic Exercise–Related Changes in Blood Lipids, Homocysteine, Nitric Oxide Levels and Body Composition in Middle-Aged Healthy Sedentary Women," **Chinese Journal of Physiology**, Vol. 55 (3), 2012, pp. 202-209,

Ozer Kaya D, Duzgun I, Baltaci G, Karacan S, and Colakoglu F., "Effects of Calisthenics and Pilates Exercises on Coordination and Proprioception in Adult Women: A Randomized Controlled Trial," *J Sport Rehabil.*, Vol. 21 (3) 2012 Aug, pp. 235-43.

Pauline Ginter, "The Effect of Flexible Callisthenic Instruction on Achievement in a Selected Physical Fitness Battery," **Completed Research**, 1967, 9:41.

Petrofsky, J., Morris, A., Bonacci, J., Hanson, A., Jorritsma R., and Hill, J., "Muscle use during exercise: A Comparison of Conventional Weight Equipment to Pilates With and Without a Resistive Exercise Device," **The Journal of Applied Research**, Vol. 5 (1), 2005, pp. 160–173.

Phillip D. Tomporowski, and Norman R. Ellis, "Effects of Exercise on the Physical Fitness, Intelligence, and Adaptive Behavior of Institutionalized Mentally Retarded Adults," *Applied Research in Mental Retardation*, Volume 5 (3), 1984, Pages 329–337.

R. J. Young, "The Effect of Regular Exercise on Cognitive Functioning and Personality," **Brit. J. Sports Med.**: 1979, 13, pp. 110-117.

Raja Kumar J, "The Impact of Yogic Practices and Physical Exercises on Selected Physical Variables among Intercollegiate Soccer Players," *shodhganga.inflibnet.ac.in/bitstream, chapter2.pdf*, 2010.

Raja Kumar J, "The Impact of Yogic Practices and Physical Exercises on Selected Physiological Variables among the Intercollegiate Soccer Players," *shodhganga.inflibnet.ac.in/bitstream, chapter2.pdf*, 2010.

Rajeev Srivastava, D. Sakthignanavel and Vikram Singh, "Effect of Pilates Exercise Calisthenics Exercise and Combination of Pilates and Calisthenics Exercise on Flexibility & Strength of School Boys" **IJMESS**, Volume 02 (2), Oct 2013, Page no.75-77.

Salwa B. and El-Sobkey, "Acute Cardiac Response to One-Minute Upper- and Lower-Extremity Callisthenic Exercise with Different Cadences", **Middle-East Journal of Scientific Research**, Volume 6 (6), 2010, pp. 622-630,

Sandra L. Cassady and Nielsen," Cardiorespiratory Responses of Healthy Subjects to Calisthenics Performed on Land versus in Water", **Journal of Behavior Therapy**, Volume 16, Issue 4, Accepted March 3, 1992.

Sayyed Mohammad Marandi, Vahid Shayegan Nejad, Zohreh Shanazari, and Vahid Zolaktaf, "A Comparison of 12 Weeks of Pilates and Aquatic Training on the Dynamic Balance of Women with Multiple Sclerosis," **Int. J Prev. Med.**, Supplement 1, 2013 April 4 pp. S110 – S117.

Schroeder JM, et al., "Flexibility and Heart Rate Response to an Acute Pilates Reformer Session," **Medicine and Science in Sports and Exercise**, 2002, 34:5.

Segal, N.A., Hein J., and Basford J., "The Effects of Pilates Training on Flexibility and Body Composition: An Observational Study," **Archives of Physical Medicine and Rehabilitation**, 2004, 85, pp. 1977–1981.

Sekendiz B., Altun O., Korkusuz F., and Akin S., "Effects of Pilates Exercise on Trunk Strength, Endurance and Flexibility in Sedentary Adult Females," **Journal of Bodywork and Movement Therapies**, 2006, 11, pp. 318-326.

Shedden, M., and Kravitz, L, "Pilates exercise: A Research-Based Review," **Journal of Dance Medicine and Science**, Vol. 10 (3), 2006, pp. 111-117.

Shedden, Mariana & Kravitz, Len, Pilates Exercise, A Research-Based Review Journal, (2006), Volume 10 (6), Numbers 3-4, December 2006, pp. 111-116.

Sonstroem, Harlow and Josephs, "Effects of Physical Exercise on Self-Concept and Well-Being," *International Journal of Sport Psychology*, Vol. 31 (1), 1994, pp. 47-65.

Sureeporn Phrompaet, Aatit Paungmali, Ubon Pirunsan, and Patraporn Silitertpisan, "Effects of Pilates Training on Lumbo-Pelvic

Stability and flexibility,” **Asian Journal Sports Med.**, Vol. 2 (1): 2011 March; pp. 16–22.

Wilks Barbara and Lee Braxton, “Effects of Calisthenics on Heart Rate of College Women,” **Dissertation Abstracts International**, April 1975, 35: 6500-A

Zeinab Omid Ali, Fahimeh Esfarjani, Effat Bambaiechi, and Mohammad Marandi “**The Effects of Pilates Exercise on Blood Pressure and Selective Physical Fitness Components in Sedentary Overweight Females**”, British journal of Sports Medicine; **2010**, 44:28.

ZHOU Yuan-Chao, “The Research about 12 Min. Exercising Method to Improve the Function of the Young and Middle-aged Heart and Lung,” **Journal of Hubei Sports Science**; (Hunan University of Science and Technology, Xiangtan, 411201, China); 2006-01.

Thesis

Abhilash J. G. & N. Govindarajulu, “Effect of Yogasanas and Pilates Exercise for the Development of Physical Status on Obese Children,” **Unpublished Thesis-M.Phil.**, October 2010, Pondicherry University, Pondicherry.

Aguilar, L., “The Effects of Pilates-Based Training and Moderate Resistance Plus Flexibility Training on Muscular Strength and Flexibility in the Elderly,” **Thesis Master of Arts**, 1998, San Diego State University.

Anoop Pinheiro & P. K. Subramaniam, “Effect of Aerobics Exercise and Pilates Exercise on Muscular Endurance, Flexibility and Muscular Strength of Collage Men,” **Unpublished Thesis-M.Phil.**, October 2010, Pondicherry University, Pondicherry.

Deschler, D., “The Effects of Pilates on Posture and Flexibility,” **Thesis-M.S.**, 2002, Pacific University.

Dharmendra Kumar & D. Sakthignanavel, “Effect of Yogasanas and Pilates Exercise on Muscular Endurance and Body Mass Index Variables of College Men” **Unpublished Thesis-M.Phil.**, 2012, Pondicherry University, Puducherry.

- Hall, D., W., "The Effect of Pilates-Based Training on Balance and Gait in an Elderly Population," **Master Thesis**, 1998, Sandiago state University, Department of exercise and Nutritional sciences.
- Jiji Thomas & D. Sultana, "Effect of Various Type of Exercise on Selected Physical, Physiological, Parameters among Female Patients with Type II Diabetes Mellitus," **Ph.D. Thesis**, October 2010, Pondicherry University, Pondicherry.
- Kish, Robin L., "The functional Effects of Piates Training on College Dancers," California state University, **Master of Science**, 1998, UMI: 1392499.
- Kloubec, June A., "Pilates Exercises for Improvement of Muscle Endurance, Flexibility, Balance and Posture," **Doctor of Philosophy Thesis**, 2005, UMI number: 3198106, University of Minnesota, USA.
- Nagraj S. & P. K. Subramaniam, "Effect of Twelve Weeks Stretching Exercise, Aerobic Exercise and Combined Exercise on Selected Physical and Physiological Variables," **Unpublished Thesis-M.Phil.**, October 2010, Pondicherry University, Pondicherry.
- Quinn, J.V., "Influence of Pilates Based Mat Exercise on Chronic Lower Back Pain", **Master of Science Thesis**, Florida Atlantic University, 2005, UMI: 1430877.
- S. Punithavathi & D. Sakthignanavel, "Effect of Selected Aerobic Exercise and Yogic Practices on Physical, Physiological and Biochemical Variables," **Ph.D. Thesis**, April 2010, Pondicherry University, Pondicherry.

Conference Proceeding

- Gary Christopher, Jeffrey Casebolt, Tobin Silver, and Young-Hoo Kwon, "Effects of A Pilates Exercise Program on Core Strength in Females," **XXIV International Symposium on Biomechanics in Sports (ISBS) Symposium 2006**, Salzburg – Austria
- Veerendra, K. M. and Dr. T. Jayabal, "effect of aerobic and callisthenic exercise on physical fitness components of middle aged obese men's," **Doping in Sports- Invigoration, Prerequisites and Misapprehensions Proceeding 2012**, National Collage, Tiuchirappalli, Tamilnadu, India.

Websites

Copyright©2010, Inward Bound Adventures.com.

[http://wiki.answers.com/Q/What is sports training and types of training](http://wiki.answers.com/Q/What_is_sports_training_and_types_of_training)

Byrne, J. Field (2008).A Healthier Future with Pilates, retrieved from www.stottpilates.com.

Foundation N W. Washington D. C. Frediani, G.M (2005).What is Pilates? Retrieved from <http://www.style-pilates.com/pilates-method.html> October 30 09.

<http://calisthenics-magazine.blogspot.in/2012/11/introduction-to-calisthenics.html>

<http://health.nytimes.com/health/guides/specialtopic/physical-activity/exercise%27s-effects-on-bones-and-muscles.html>

<http://life.gaiam.com/article/8-principles-pilates>

<http://pilates.about.com/od/gettingstarted/a/Pil4Beg.htm>.

http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Pilates_and_yoga_the_health_benefits.

<http://www.humananatura.org/hncalisthenicsguide.pdf>, “Humana Natura Calisthenics Guide – Version 3.4,” Copyright 2002-2012HumanaNatura, Inc.

<http://www.pilatesdigest.com/the-history-of-pilates-exercises>.

http://www.weightawareness.com/topics/doc.xml?__topic_id=1112&doc_id=1370

www.ssc.wisc.edu/~jpiliavi/647/lect1white.pdf what is sports.