

# Analysis on The Effect of Resistance Training and Consequent Detraining of Different Durations on the Strength and Strength Endurance Among Young Women



## Physical Education

**KEYWORDS :** Girls, Exercise, Sprinters, Training.

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### ABSTRACT

*The purpose of the study was to experiment and analyse the effects of weight training followed by plyometric training and plyometric training followed by weight training in one session for two months and four months of continuous training on Strength and Strength endurance and also to analyse and predict the time in days in which significant decrease in strength and strength endurance gained was lost due to detraining with complete lay off from the experimental exercise protocols. The present research aims to find out the training effects with different combinations of selected exercises for different durations on the strength and strength endurance components of fitness and also the detraining effects on the selected fitness components i.e strength and its related strength endurance*

### I. INTRODUCTION

The word Fitness is all important in the modern day living. It may be to maintain optimum health status or to excel in the sporting performances. Though fitness has got so many dimensions and still experiencing dynamic transformation in the modern era, human being has to keep pace with all these dynamic changes and be thoroughly informed about the needful. This constant refurbishment of the knowledge relating to the matters of fitness is highly essential especially in the modern day world, to develop tolerance to the immense stress levels. Depending on the requirement the dimension of fitness should be understood and the components of the specific fitness must be improved.

The term physical fitness in view of a sports coach or a sports trainer is something different from the health fitness professional or a physical educationist. Physical fitness in the view of a sports coach denotes the physical capacity to tackle the external load that is placed by various exercises. It means the physical fitness is capacity to do physical work.

Harold et.al(1989 ) Physical fitness may be defined as the individual's ability to meet the requirements of their environments. Harrison H.Clarke( 1976 ) Physical Fitness is the ability to carry out task with vigour and alertness without undue fatigue and with ample energy to enjoy leisure time pursuit and to meet unusual situation and unforeseen emergencies. The concept of Physical Fitness includes the elements of strength, muscular endurance, cardiorespiratory endurance, flexibility and freedom from obesity. Some other qualities which underlie motor performances but are not essential for basic physical fitness are not given much importance by physical education and health experts. In other words, a person does not have to possess speed, agility, power, and co-ordination and coupling abilities which five success in some athletic performances in order to be healthful and physically fit. Though this controversy exists since long time, it is strongly believed that development of very extreme levels of physical fitness needs the help of the motor fitness to participate in various kinds of physical movements of complex in nature.

### II. BACKGROUND WORK

Stemm and Jacobson (2007) Plyometric training is a popular method by which athletes may increase power and explosiveness. However, plyometric training is considered a highly intense and potentially damaging activity particularly if practiced by the novice individual or if overdone. The purpose of this study was to compare vertical jump performance after land- and aquatic-based plyometric training. A convenience sample of 21 active, college-age (24 +/- 2.5 years) men were randomly assigned to 1 of 3 groups: group I, aquatic; group II, land; and group III, control. Training for the AQ and LN groups consisted of a 10-minute warm-up followed by 3 sets of 15 squat jumps, side hops, and knee-tuck jumps separated

by 1-minute rests. The aquatic group performed the exercises in knee-level water adjusted to parallel the axis of the knee joint (+1 in.). The land group performed identical plyometric exercises on land. The control group engaged in no training. Participants trained twice a week for 6 weeks, and all training sessions were monitored. Pre- and post-test data were collected on maximum vertical jump height. A 2x3 analysis of variance with repeated measures was used to compare vertical jump height among the 3 groups. Results suggested that the aquatic- and land-based groups significantly ( $p < 0.05$ ) outperformed the control group in the vertical jump. No significant difference was found in vertical jump performance between the aquatic- and land-based groups. It was concluded that aquatic training resulted in similar training effects as land-based training, with a possible reduction in stress due to the reduction of impact afforded by the buoyancy and resistance of the water upon landing".

Schranz (2013) studied the Effect of Resistance Training on the Strength, Body Composition and Psychosocial Status of Overweight and Obese Children and Adolescents? A Systematic Review and Meta-Analysis. the peer-reviewed literature to determine the effect of resistance training on the strength, body composition and psychosocial status of overweight and/or obese children and/or adolescents. Relevant databases (MEDLINE, Embase, Scopus, Web of Science, SPORT-Discus, CINAHL, PsycINFO, Cochrane library, ProQuest) were searched up to and including 30 January 2013. Included studies ( $n = 40$ , from the 2,247 identified) were randomised controlled trials (RCTs), non-randomised controlled trials (NRCTs) and uncontrolled trials (UCTs) which had run an exercise intervention, with a resistance training component, for overweight and/or obese children and/or adolescents, and which had examined the effect of resistance training on either strength, body composition or psychosocial outcomes. Studies were initially critically appraised for risk of bias by the lead author, following which both co-authors critically appraised five randomly selected studies to assess reliability. Randomised controlled trials and NRCTs were analysed separately from UCTs.

### III . EXPERIMENTAL METHODOLOGY

To meet the purpose of the present study 150 women students from SPMVV (Sri Padmavathi Mahila Visva Vidyalayam) Tirupati, Chittoor District, were Selected as subjects and their age ranged between 20 to 22 years. Volunteered subjects did not participate in any systematic training Previously. In order to be qualified as subjects each member was given a written formed consent and examined. All subjects declared that they were free from Chronic disease.

#### Testing Procedure:

The Experimentation required 5 groups of thirty subject in each group a total of 150 women students of SPMVV (Sri Padmavathi Mahila Visva Vidyalayam).

| Group        | Duration      | Nature of Exercises                                                                                                 | Nature of Exercises                                                                                                 |
|--------------|---------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| First Group  | 2 months      | Weight Training Exercises: military press, bench press, biceps curl, half squats, leg extension followed by flexion | Plyometric Exercises : skipping, on the spot jumps, jump and hops, lunges, tucks jumps                              |
| Second Group | 2 months      | Plyometric Exercises: skipping, on the spot jumps, jump and hops, lunges, tucks jumps                               | Weight Training Exercises: military press, bench press, biceps curl, half squats, leg extension followed by flexion |
| Third Group  | 4 months      | Weight Training Exercises: military press, bench press, biceps curl, half squats, leg extension followed by flexion | Plyometric Exercises : skipping, on the spot jumps, jump and hops, lunges, tucks jumps                              |
| Fourth Group | 4 months      | Plyometric Exercises: skipping, on the spot jumps, jump and hops, lunges, tucks jumps                               | Weight Training Exercises: military press, bench press, biceps curl, half squats, leg extension followed by flexion |
| Fifth Group  | Control Group | -                                                                                                                   | -                                                                                                                   |

**Strength:**

| Exercise                           | Testing Procedure                                                                                                                                                                                                                | Mode of Calculation |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1. Flexed knee situps with weights | Weight plates were held by the subject at the back of the neck portion and situp was performed the maximum lifted was measured for every subject (abdominal Core muscles)                                                        | Weight in kgs       |
| 2. Bench squat                     | Subjects flex the knees from the standing position to the half squat keeping weighted barbell and performed the exercise. (quadriceps, hamstring group, adductor group, gluteus group muscles)                                   | Weight in kgs       |
| 3. Standing vertical Arm press     | Subjects pressed the barbell loaded with weights and performed to exercise. (The strength of deltoid, triceps, biceps upper portion of the pectorals major, upper portion of trapezes etc. representing the upper body strength) | Weight in kgs       |

**Strength Endurance:**

| Exercise            | Testing Procedure                                                                                                                                                                                                               | Mode of Calculation             |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1. Sit-ups Test     | Subjects sitting with flexed knee keeping hand sat the back of the neck and performed as long as they can complete sit-ups. (To test core group muscles strength endurance.                                                     | number of completed repetitions |
| 2. Flexed Arm hang  | Subjects were asked to hang to a bar and raise themselves on the hand strength up to the chin level, Keeping the flexed hands at ninety degrees and were asked to hang like that as long as they can sustain the same position. | Time elapsed in seconds.        |
| 3. Half squat jumps | Subjects were asked to jump up with both feet from the half squat position fully extending the knees.                                                                                                                           | Number of completed repetitions |

**IV. EXPERIMENTAL DESIGN & STATISTICAL PROCEDURES****( I ) To find the effects of experimental variables on criterion variables:**

ANCOVA (Analysis of Covariance) statistical tool was used to analyse and find if the experimental variable brought any significant change in the strength and strength endurance of the subjects. Scheffe's Post Hoc Comparison tests were conducted to find out the source of significant difference among all the groups of experimentation for both the criterion variables.

**II ) To find the effects of detraining of different periods on the two criterion variables:**

ANCOVA (Analysis of Covariance) statistical technique was used to analyse and find if there is any significant decrease occurred in the developed strength and strength endurance factors of the subjects.

**( III ) Level of Significance:**

Level of significance used for statistical verification was 0.05.

**Analysis on Strength (Individual Factors of Strength):****( I ) Analysis on sit up factor of strength:**

Analysis of Covariance as presented in table 1 indicates that the means of the experimental groups vary when compared to the control group due to the experimental treatment since the obtained F value 12.93 is higher than the critical F value 2.45 and also the P value is insignificant to the level of significance of 0.05.

| Source         | SS      | df  | MS     | F     | Cr F | P     |
|----------------|---------|-----|--------|-------|------|-------|
| adjusted means | 1442.29 | 4   | 360.57 | 12.93 | 2.45 | 0.009 |
| adjusted error | 4016.64 | 144 | 27.89  |       |      |       |
| adjusted total | 5458.93 | 148 |        |       |      |       |

**Table. 1. Ancova for Strength (Sit Up Factor)****( II ) Analysis on bench squat factor of strength:**

Analysis of Covariance as presented in table 2 indicates that the means of the experimental groups vary when compared to the control group due to the experimental treatment since the obtained F value 38.61 is higher than the critical F value 2.45 and also the P value is insignificant to the level of significance of 0.05.

| Source         | SS      | df  | MS     | F     | Cr F | P     |
|----------------|---------|-----|--------|-------|------|-------|
| adjusted means | 2845.65 | 4   | 711.41 | 38.61 | 2.45 | 0.002 |
| adjusted error | 2653.58 | 144 | 18.43  |       |      |       |
| adjusted total | 5499.23 | 148 |        |       |      |       |

**Table. 2. Ancova for Strength (Bench Squat Factor)**

Analysis on Arm press factor of strength: Analysis of Covariance as presented in table 3 indicates that the means of the experimental groups vary when compared to the control group due to the experimental treatment since the obtained F value 76.69 is higher than the critical F value 2.45 and also the P value is insignificant to the level of significance of 0.05.

| Source         | SS      | df  | MS      | F     | Cr F | P      |
|----------------|---------|-----|---------|-------|------|--------|
| adjusted means | 4081.04 | 4   | 1020.26 | 76.69 | 2.45 | 0.0034 |
| adjusted error | 1915.71 | 144 | 13.30   |       |      |        |
| adjusted total | 5996.75 | 148 |         |       |      |        |

**Table. 3. Ancova for Strength (Arm Press Factor)\****( III ) Analysis on Strength Endurance (individual factors):**

Analysis on Sit up factor of Strength Endurance: Analysis of Covariance as presented in table 4 indicates that the means of the experimental groups vary when compared to the control group due to the experimental treatment since the obtained F value 36.80 is higher than the critical F value 2.45 and also the P value is insignificant to the level of significance of 0.05.

| Source         | SS      | df  | MS      | F     | Cr F | P       |
|----------------|---------|-----|---------|-------|------|---------|
| adjusted means | 4832.87 | 4   | 1208.22 | 36.80 | 2.45 | 0.00021 |
| adjusted error | 4728.44 | 144 | 32.84   |       |      |         |
| adjusted total | 9561.31 | 148 |         |       |      |         |

**Table. 4. Ancova for Strength Endurance (Sit Up Factor)**

**(IV) Analysis on flexed arm hang factor of Strength Endurance:**

Analysis of Covariance as presented in table 5 indicates that the means of the experimental groups vary when compared to the control group due to the experimental treatment since the obtained F value 84.48 is higher than the critical F value 2.45 and also the P value is insignificant to the level of significance of 0.05.

| Source         | SS       | df  | MS      | F     | Cr F | P       |
|----------------|----------|-----|---------|-------|------|---------|
| adjusted means | 7104.03  | 4   | 1776.01 | 84.48 | 2.45 | 0.00021 |
| adjusted error | 3027.44  | 144 | 21.02   |       |      |         |
| adjusted total | 10131.48 | 148 |         |       |      |         |

**Table. 5. Ancova for Strength Endurance (Flexed Arm Hang Factor)**

Analysis on Half Squat Jump factor of Strength Endurance: Analysis of Covariance as presented in table 6 indicates that the means of the experimental groups vary when compared to the control group due to the experimental treatment since the obtained F value 84.48 is higher than the critical F value 2.45 and also the P value is insignificant to the level of significance of 0.05.

| Source         | SS       | df  | MS      | F     | Cr F | P      |
|----------------|----------|-----|---------|-------|------|--------|
| adjusted means | 7988.23  | 4   | 1997.06 | 96.98 | 2.45 | 0.0004 |
| adjusted error | 2965.26  | 144 | 20.59   |       |      |        |
| adjusted total | 10953.50 | 148 |         |       |      |        |

**Table. 6. Ancova for Strength Endurance (Half Squat Jump Factor)**

**TCONCLUSION**

All the four protocols of exercises viz four months of weight training followed by plyometric exercises in each exercise session, four months of plyometric exercises followed by weight training in each exercise session, two months of weight training followed by plyometric exercises in each exercise session, two months of plyometric exercises followed by weight training exercises in each exercise session have shown significant increase in Strength of the subjects. With regard to the Strength Endurance variable Four months Plyometric exercises followed by weight training in each exercise session caused for the greater increments than other three protocols of exercise combinations. Just seven days of detraining caused significant decrease both in strength and strength endurance of 2 months protocols groups but not of the 4 months protocol groups, indicating that the 2 months of training would not consolidate both strength and strength endurance. Fourteen days of detraining or rest after two months of Weight training and plyometric exercises and two months of plyometric exercises and weight training caused for significant reduction in strength of the subjects. Twenty one days of detraining or rest after four months of Weight training and plyometric exercises and four months of plyometric exercises and weight training caused for significant reduction in strength of the subjects. But with regard to the strength endurance, significant reduction was observed within fourteen days of rest or detraining after all the four experimental protocols of exercises. Strength endurance of the subjects reduced quickly when compared to the strength factor of the subjects because of the detraining.

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