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EFFECTS OF PROGRESSIVE RESISTANCE TRAINING ON ENHANCING SELECTED PHYSICAL FITNESS AND CARDIAC VARIABLES AMONG B.P.ED FIRST YEAR MALE STUDENTS OF MAA OMWATI COLLEGE OF EDUCATION

Education

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ABSTRACT

The major objective of this study was to find out effects of progressive moderate intensity resistance training on enhancing selected anthropometric, physical fitness and cardiac variables among 1st year male sport science students of Maa Omwati College of Education. Twenty four male students from physical education department were selected randomly as subjects with age range of 22-25 years. Subjects were randomly assigned to experimental group (12) and control group (12). The experimental group participated in individualized and supervised progressive moderate intensity resistance training program 3 days/week for 12 weeks at 60%, 65% and 70% of 1RM for month one, two and three respectively. The control group did not participated in training program but the tests were conducted for both groups. The selected test batteries were: physical fitness (muscular strength, muscular endurance, cardio-respiratory endurance, muscular power and body composition) and cardiac variables (resting heart rate, SBP and DBP). Data were analyzed using One Way ANOVA. The result of the study found that there were significant improvement of mean difference at ($p<0.05$). 1RM tests were analyzed by paired sample T-test and it was found that leg extension, lat pull down, chest press, chest fly and biceps curl improved by mean difference of 35.5, 40.84, 25.83, 36.67 and 36.67 respectively. *There was no significant improvement observed in control group. This study proved that progressive moderate intensity resistance training program significantly improved most of the selected variables.*

KEYWORDS

1 RM, Cardiac variables, Physical fitness, Progressive Resistance training

1. INTRODUCTION

In order to gain optimum fitness and overcome challenges and obstacles human beings needs to engage in regular physical activity with advanced design and program. Therefore, community which needs to be healthy and fit should have to offered comprehensive training program containing aerobic activity, anaerobic training, resistance training and also participation in team sports. Fitness is the key for the overall performance of the athletes as well as sedentary individuals. Fitness is the product of exercise and training. Fitness is an important implication in the general health of the individuals (Kraemer *et al*., 2002, ACSM, 2008 and Azeem and Amer, 2013).

Resistance training, also known as weight training or strength training has gained great popularity in recent years, largely due to its appeal and positive impact on many diverse populations, such as athletic, recreational and clinical communities. Thus, resistance training programmes are used to achieve many different goals, such as performance improvement, injury rehabilitation, muscle tone improvement and strength improvement (ACSM, 2011).

Regular participation in resistance training results in the improvement of body composition, muscle strength, local power and endurance of muscles, increase bone mineral density, increase cardiorespiratory fitness, reduced blood pressure, enhance mental health and well-being and stimulate a more positive attitude towards a lifetime of physical activity (Ignjatovic *et al.*, 2009 and Shenoy *et al*., 2009).

Therefore, this study tried to explore out the effect of progressive moderate intensity resistance training on selected physical fitness and cardiac variables among first year male /students of Maa Omwati College of Education.

2. MATERIALS AND METHODS

2.1. Source of Population

The source of population consisted of Maa Omwati College of Education B.P.Ed first year male students. The subjects were from different socioeconomic background family and homogeneous in their academic status. The participants of the study were selected depending on their interest and the informed consent to involve in resistance training fitness program. In order to collect relevant data, primary data sources were used according to the nature of the study. The primary data were taken from the anthropometric measurements, physical fitness efficiency tests and cardiac variables which includes heart rate and blood pressure (systolic and diastolic blood pressure). Secondary data were also used from books, journals, periodical and websites.

2.2 Study Design and sampling technique

Pretest-posttest completely randomized experimental study design was used for this study. The samples of the study were consisted of 24 (12 experimental group and 12 control group)B.P.Ed first year male students of Maa Omwati College Of Education with the age range between 22-25 years old. All the subjects were male students. The researcher employed simple random sampling technique to select the groups and for treatment allotment.

2.3. Resistance Training Protocol

The resistance exercise training group took part in a supervised, progressive 12 week moderate intensity resistance training program, with 45–60 minute sessions three non consecutive days a week, they performed three sets of 60-70% of 1RM, 8-12 repetition with two minute active rest between sets. The subjects were trained at 60%, 65% and 70% of 1RM at month one, two and three respectively. One week before the start of training program, the subjects were familiarized with the training protocol. During the familiarization session, each subject was instructed for the use of resistance training machines and proper form of each exercise.

Each training session was consisted of four phases which were warm-up, stretching, conditioning (resistance training) and cool-down according to the recommendation by ACSM's (2005) Guidelines for Exercise Testing and Prescription

2.4. Methods and Procedures of Data Collection

Quantitative data were collected through standardized and appropriate anthropometric measurements, physical fitness tests and cardiac variable measures. All tests were performed at the same time of day for each subject to reduce the effect of any diurnal variations.

2.5 Physical Fitness Test

Physical fitness tests were conducted before the beginning of the training program, during the training program that means after 6 weeks of training and at the end of the 12 weeks. For fitness tests subject were told to restrain themselves from intake of caffeine as well as participation in physical activity 48 hours prior to the day at which the test was conducted.

1-RM test: 1-RM is defined as the highest resistance at which one repetition could be successfully completed with acceptable form (ACSM, 2011).

Push-up test- The push-up test was used to measure muscular strength of the subjects. Before starting the test participants were given warming up time and stretching exercise. The subjects being tested in prone position; putting their palms at the shoulder level on the ground, face down on the mat. On the signal go they were asked to raise their body upward until the arms were fully extended, then lowered until their elbows bent at 90 degrees. The maximal number of push-ups performed consecutively without rest was counted as the score (ACSM, 2009).

Sit-up Test- The abdominal muscular strength and endurance of the abdominals was assessed using sit-up test. To assure the starting position, the participant's was told to lie on his back with knees flexed, feet on floor with the hands on the opposite shoulders. A partner assisted by anchoring the feet to the ground. The student, by tightening his abdominal muscles, curls to the sitting position. Arm contact with the chest must be maintained. The chin should remain tucked on the chest. The sit-ups completed when the elbows touch the thighs. The numbers of correctly executed sit-ups performed in 60 seconds were the score (Kamyabnia *et al*., 2011).

One mile walk: The purpose of this test was to walk as fast as possible for 1 mile. The test measures the subjects' aerobic capacity. The students must not break into a run!

Vertical jump: Vertical jump test was used to examine the subject muscular power particularly lower muscles. For this test the subjects were asked to stand beside the wall and reaches up with the hand. Keeping the feet flat on the ground, the point of the fingertips was marked and recorded. The record was the standing reach. The best of three records was taken (Ashok, 2008).

Body mass index- it is method of evaluating body composition which evaluates weight in relation to height. Body Mass Index (BMI) is a ratio of the total body weight to height. BMI used most frequently is body mass (in kilograms) divided by height (in meters) squared [$WT \div HT^2 (kg/m^2)$]. (Plowman and Smith, 2011).

Cardiac Variable Measure

The measurement of cardiac variables such as resting systolic blood pressure, diastolic blood pressure and resting heart rate were taken by using digital tabletop upper arm blood pressure monitor. The measurements were taken in sitting position after the subjects were rested for about 10 minutes. All cardiac variables measure was taken three times (ACSM, 2008).

2.7 Methods of Data Analysis

One way ANOVA (Analysis of Variance) was used by the researcher to find out and determine which group show significant difference. To calculate the entire descriptive as well as ANOVA statistics SAS computer package software program version 9.1was used. Paired sample T-test was also used to analyse performance improvement of 1 RM tests. The level of significance was set at $p \leq 0.05$ for all analyses.

3. RESULTS AND DISCUSSIONS

3.1. Overview

The purpose of this study was to find out effects of progressive moderate intensity resistance training on selected physical fitness, anthropometric and cardiac variables. To achieve the objectives of the study 24 students were randomly selected as subjects. They were assigned into two groups, experimental group (resistance training) (12) and control group (12). The collected data were analyzed by using Analysis of variance (ANOVA). The results for all variables are discussed below.

3.2 .Effects of Resistance Training on Physical Fitness Variables

Table 1: Mean of leg extension, lat pull down, chest press, chest fly and biceps curl of 1 RM tests

Variables	Experimental group		Control group			
	PT	PoT	MD	PT	PoT	MD
LE	47.50± 7.53	83.33± 9.37	35.83± 7.92	50.00± 16.78	55.00± 14.14	5.00± 5.22
LPD	50.83± 9.00	91.67± 6.52	40.84± 7.92	50.83± 9.00	55.83± 7.92	5.00± 5.22
CHP	52.50± 10.55	78.33± 8.87	25.83± 7.92	48.33± 8.87	51.67± 10.73	3.34± 4.92
CHF	50.83± 9.96	87.50± 10.55	36.67± 7.78	45.83± 12.40	50.00± 11.68	4.17± 5.15
BC	30.83± 7.92	67.50± 8.66	36.67± 9.84	30.00± 7.98	35.83± 9.96	5.83± 5.15

LE=leg extension, LPD=lat pull down, CHP=chest press, CHF= chest fly, BC=biceps curl, PT=pre training, PoT=post training, MD= mean difference, values are mean ± SD

A positive mean difference was observed on 1RM test. The rationale behind the increase of 1 RM was the resistance training they took part in the gymnasium. Although both groups showed improvement, the change was better in the experimental group. However, the mean difference for experimental group was recorded as 35.5, 40.84, 25.83, 36.67 and 36.67 for Leg extension, lat pull down, chest press, chest fly and biceps curl respectively. Whereas, the means difference of control group was 5.00, 5.00, 3.34, 4.17 and 5.83 for leg extension, lat pull down, chest press, chest fly and biceps curl respectively. The finding of this study is in agreement with the results reported by Larose *et al*. (2012) entitled Comparison of strength development with resistance training and combined exercise training in type 2 diabetes;

Table 2 : Pre, post mean and mean difference values for muscular strength

Test	Experimental group	Control group	F Value	CV %	LSD
PT	17.83	15.75	0.49	43.43	6.16
PoT	29.17	19.67	12.67*	26.78	5.52
MD	11.34	3.92			

*PT= pre training, PoT= post training, MD= mean difference (PoT-PT), CV=coefficient of variance LSD=least significant difference, * Significant*

The mean difference for experimental group was 11.34 and 3.92 for control group was recorded. This showed that the resistance training group showed better improvement. Therefore, participation in progressive resistance training significantly improved the muscular strength of participants. The result of this study is consistent with the finding of Azeem and Amer (2013) who studied effect of weight training program on body composition, muscular endurance and muscular strength of males.

Table 3: Pre, post mean and mean difference values for muscular endurance

Test	Experimental group	Control group	F Value	CV %	LSD
PT	22.83	24.33	0.34	26.85	5.36
PoT	34.17	24.08	28.40*	15.91	3.92
MD	11.34	-0.25			

*PT= pre training, PoT= post training, MD= mean difference (PoT-PT), CV=coefficient of variance, LSD=least significant difference, * Significant*

As indicated in Table 3, there was significant difference among groups at post test. The post test means was 34.17 and 24.08 for experimental and control group while the mean difference was 11.34 and -0.25 respectively. Experimental group showed significant improvement due to the resistance training program in which they were engaged in.

Table 4: Pre, post mean and mean difference for cardiorespiratory endurance

Test	Experimental group	Control group	F Value	CV %	LSD
PT	33.61	32.44	0.81	9.59	2.68
PoT	45.36	33.41	59.41*	9.63	3.20
MD	11.75	0.97			

*PT= pre training, PoT= post training, MD= mean difference (PoT-PT), CV=coefficient of variance, LSD=least significant difference, * Significant*

Table 4 showed that the mean difference between post and pre test was 11.75 and 0.97 for experimental and control groups respectively. This proved that the difference between the groups was significant after they engaged in 12 weeks progressive resistance training program. The finding of this study also consistent with the result reported by Sentija *et al.* (2009) research entitled effects of strength training on some parameters of aerobic and anaerobic endurance.

Table 5: Pre, post mean and mean difference value for muscular power

Test	Experimental group	Control group	F Value	CV %	LSD
PT	43.33	37.00	4.06	19.15	6.50
PoT	52.83	36.67	27.12*	16.99	6.43
MD	9.5	-0.33			

*PT= pre training, PoT= post training, MD= mean difference (PoT-PT), CV=coefficient of variance, LSD=least significant difference, * Significant*

Table 5 showed that there was no significant difference between

groups at pre test. However, after undergoing 12 weeks of treatment significant difference existed.

Table 6: Pre, post mean and mean difference value for body composition

Test	Experimental group	Control group	F Value	CV %	LSD
PT	18.86	19.90	2.04	9.15	1.50
PoT	20.00	20.17	0.07	8.76	1.48
MD	1.14	0.27			

PT= pre training, PoT= post training, MD= mean difference (PoT-PT), CV=coefficient of variance, LSD=least significant difference

Table 6 showed that there was no significant difference between the experimental group and control group in pre and post-test. But if we observe the mean difference value there was slight difference in between the groups. Even if the subjects' post-test mean showed no significant difference the percentage improvement of BMI was better in experimental group than the control group. The improvement was recorded as 5.7% and 1.34% for experiment and control group respectively.

4.3. Effects of Resistance Training on Cardiac Variables

Table7: Pre, post mean and mean difference value for resting heart rate

Test	Experimental group	Control group	F Value	CV %	LSD
PT	76.50	77.33	0.14	7.16	4.66
PoT	67.50	75.50	13.50*	7.46	4.50
MD	-9	-1.83			

This above table showed that there was significant difference between the post test means of participants concerning their resting heart rate. The mean difference of experimental and control groups was -9 and -1.83 respectively. Percentage decrement of resting heart rate was recorded as 13.33% and 2.42% for experimental and control group respectively, which proved that the experimental group resting heart rate was significantly reduced as a result of their participation in 12 weeks of progressive moderate intensity resistance training.

The finding of this study is in agreement with the findings of Abebe and Balcha (2012) in which they reported significant decrement of resting pulse rate by 9.9% (p=0.002) after 12 weeks participation in progressive resistance training program.

Table 8: Pre, post mean and mean difference value for resting systolic blood pressure

Test	Experimental group	Control group	F Value	CV %	LSD
PT	125.00	124.00	0.24	4.04	4.25
PoT	120.00	122.00	2.84	3.19	3.28
MD	-5	-2			

This table 8 showed there is significant difference in the result.

Table 9: Pre, post mean and mean difference value for resting diastolic blood pressure

Test	Experimental group	Control group	F Value	CV %	LSD
PT	84.33	82.83	0.79	4.96	3.50
PoT	79.33	82.67	9.82*	3.22	2.20
MD	-5	-0.16			

*PT= pre training, PoT= post training, MD= mean difference (PoT-PT), CV=coefficient of variance, LSD=least significant difference, * significant*

As shown in Table 9 the calculated F value (0.79) was less than the tabulated F value for pre test . This proved that the mean resting diastolic blood pressure of both groups showed no significant difference at base line level. However, after 12 weeks of treatment significant difference existed between groups. This was proved by the calculated F value (9.82) which was greater than the tabulated F value as well as -5 and -0.16 mean differences for experimental and control group was recorded respectively. The experimental group showed significant mean decrement from 84.33 to 79.33 whereas, the control group showed very slight reduction from 82.83 to 82.67 mean values.

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1. Summary

The major objective of this study was to find out effects of progressive moderate intensity resistance training on selected physical fitness and cardiac variables among first year male sport science students of Maa Omwati College of Education. To achieve the purpose of the study 24 male students were selected.

4.2. CONCLUSIONS:

Within the limitations and delimitations of the study, the following conclusions were drawn:

- The training method also significantly improved physical fitness variables such as muscular strength, muscular endurance, cardio-respiratory endurance as well as muscular power of experimental group samples.
- Cardiac variables such as resting heart rate and resting DBP were significantly reduced after the subjects' undergone12 weeks of resistance training treatment.
- There was no significant improvement observed on control group.

4.3 Recommendations:

- Resistance training can be used by fitness programmers, coaches, athletic trainers and instructors to improve their trainees' physical fitness variables. Efforts should be made in advocating the importance of resistance training because it has enormous benefit. Studies should be conducted in the same area on different samples in terms of age and gender.

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