



BHARATHIAR NATIONAL JOURNAL OF
PHYSICAL EDUCATION AND EXERCISE SCIENCES
BNJPEES

DOUBLE – BLIND REFERRED JOURNAL



From the Editors' Desk

Whilst we are striving hard to manage the new normal post Covid pandemic, there is a great realisation on health fitness and wellness. The department of Physical Education, Bharathiar university with societal responsibility publishes this 10th volume of 'The Bharathiar National Journal of Physical Education and Sports Sciences'. In spite of the pandemic break the editorial team had put in tremendous efforts to bring out this volume of research works and articles.

The Bharathiar National Journal of Physical Education and Exercise Science (BNJPEES) is an open access quarterly journal, double blind refereed journal with ISSN – 0976-3678 which publishes original articles, commentary, editorials, review articles and case reports covering recent innovative high quality researches on sports published by the Department of Physical Education, Bharathiar University Coimbatore since June 2010. The purpose of this journal is to enrich the field of physical education and sport with literary base dynamic latest research and articles. The field of sport and physical education with its dynamic nature needs a literary back up to keep the masses informed of the latest changes that are happening across this field. Since the Sports Climate is experiencing a wide range of change and is very much essential that we stretch ourselves to meet the key challenges on sports and games. Since the inception of the new editorial team from 2019, the journal has been upgraded online to increase the vicinity across the globe and provide a wider citation opportunity scaling up research heights. The journal has been indexed with google scholar, world cat, core and road.

We appreciate the research scholars for stepping forward to get their works published in our university journal. After thorough plagiarism check using Ithenticate and Turnitin, the articles are subjected to a double blind referee system for review. Based on the reviewers report the articles are accepted. Being We are also working hard towards quality control of the articles in par with the international standards.

From the editorial desk we submit to you that BNJPEES, with immense pleasure is working for the development of research in the field of Physical education and sports sciences which is the need of the hour. We encourage the authors to submit evidence based realtime research results which would benefit the society.



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Publisher's Desk

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Effect of Selected Footwork Drills on Motor Fitness Variables of Badminton Players

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Abstract

This study aimed to find out the effect of selected footwork drills on motor fitness components of school level badminton players. To achieve the purpose of the study thirty school level badminton players were selected from various badminton clubs at Coimbatore. Their age ranged between 12-16 years. They were divided into two equal groups consists of fifteen each. No attempt was made to equate the groups. Experimental Group was given Footwork drills (FWD) for the period of 8 weeks and Group II acted as control group (CG), the subjects in control group was not engage in any training programme other than their regular activity The motor fitness components, agility was assessed by 4x10mts shuttle run test and Reaction Time was assessed by Penney Cup Test The data collected from the subjects was statistically analyzed with 't' ratio to find out significant improvement if any at 0.05 level of confidence. The result of the agility and reaction time improved significantly due to effect of selected footwork drills with the limitations of (diet, climate, life style) status and previous training the result of the present study coincide findings of the investigation done by different experts in the field of sports sciences. Footwork drills significantly improved agility and reaction time of school level badminton players.

Keywords: Badminton, Agility and Reaction time.

INTRODUCTION

Badminton is a racket sport played by either two opposing player (singles) or two opposing pairs (doubles), who take position on opposite halves of a rectangular courts that is divided by a net. Player score points by striking a shuttlecock with their opponents 'half' of the court. A rally ends once the shuttlecock has struck the ground, and side may only strike the shuttlecock once before it

passes over the net. The shuttle (or shuttle) is a feathered projectile whose unique aerodynamic properties cause it to fly differently from the balls used in most racquet sports; in particular, the feather create much higher drag, causing the shuttlecock to decelerate more rapidly than a ball. Shuttlecocks have a much higher top speed, when compared to other racquet sports.

Because shuttlecock flight is affected by wind, competitive badminton is best played indoors. Badminton is also played outdoors as a casual recreational activity, often as a garden or beach game.

Since 1992, badminton has been an Olympic sport with five events: men's and women's doubles and mixed doubles, in which each pair consists of a man and a woman. At high levels of play, the sports demands excellent fitness: players require aerobic stamina, agility, strength, speed and precision. It also a technical sports requiring good motor coordination and the development of sophisticated racquet movement (**Sunil kumar¹, 2013**).

MATERIALS AND METHODS

EXPERIMENTAL APPROACH TO THE PROBLEM

In order to address the hypothesis presented herein, we selected thirty school level badminton players. Their age ranged between 12 and 16 years. The selected subjects were divided into two equal groups consisting of 15 each. No attempt was made to equate the groups. Experimental group I (n = 15) underwent footwork drills for a period of 6 weeks and group II (n = 15) acted as control group (CG), the subjects in control group were not engaged in any

training programme other than their regular work

DESIGN

The evaluated parameters were agility (4x10m shuttle run) and speed endurance (600 m dash).The parameters were measured at baseline after 6 weeks of FWD and the effects of the training were examined.

TRAINING PROTOCOL

In each training session the training was imparted for a period 45 minutes. The Footwork drills, which included 5 minutes warming up and 5 minutes relaxation procedure after training programme for six days per week for a period of 6 weeks.

STATISTICAL ANALYSIS

The collected data were analyzed with application of 't' test to find out the individual effect from base line to post-test if any. 0.05 level of confidence was fixed to test the level of significance.

RESULTS AND DISCUSSION

In the present study the footwork drills has improved the agility and speed endurance over respectively by finding significant differences in comparison from baseline to post test.

Table I: Summary of mean and 't' test for the pre and post tests on acceleration speed and multiple speed of control and experimental group

Variables	Pre – test	Pre – test S. D	Post – test	Post – test S. D	't' ratio
FWD Drills					
Agility	8.33	0.76	8.16	0.74	5.08
Reaction	0.42	0.19	0.29	0.20	5.35
Control Group					
Agility	13.56	1.97	13.56	2.00	0.14
Speed endurance	0.29	0.17	0.31	0.15	1.41

* Significant at 0.05 level of confidence (2.14), 1 and 14.

FIGURE – I Representation of Agility

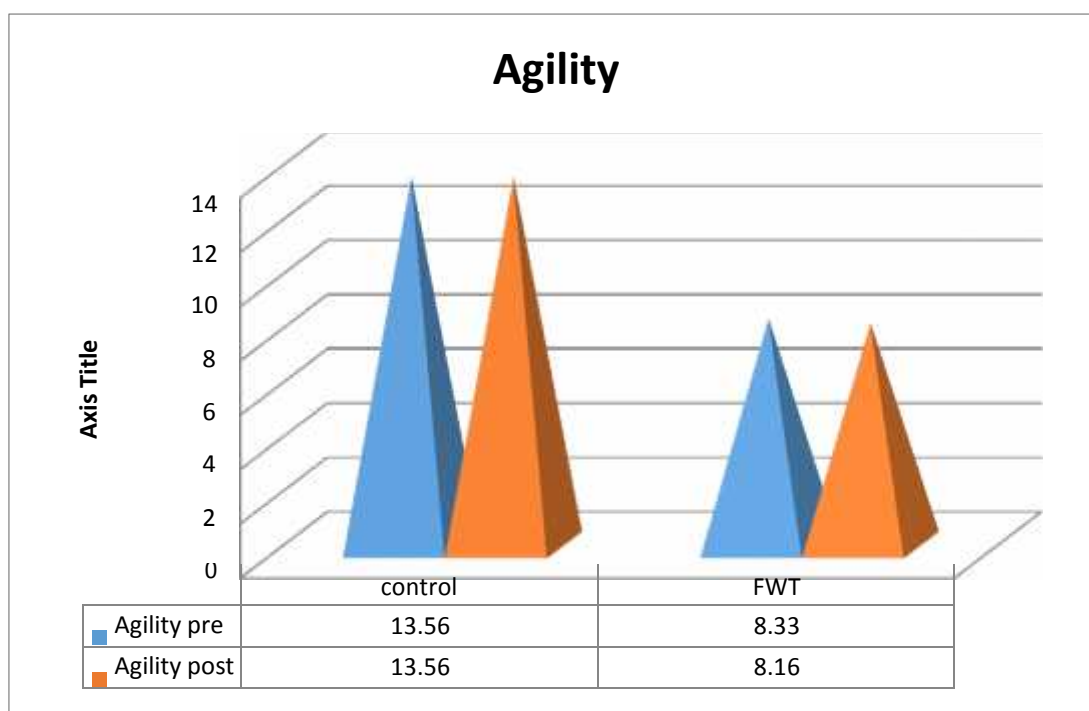
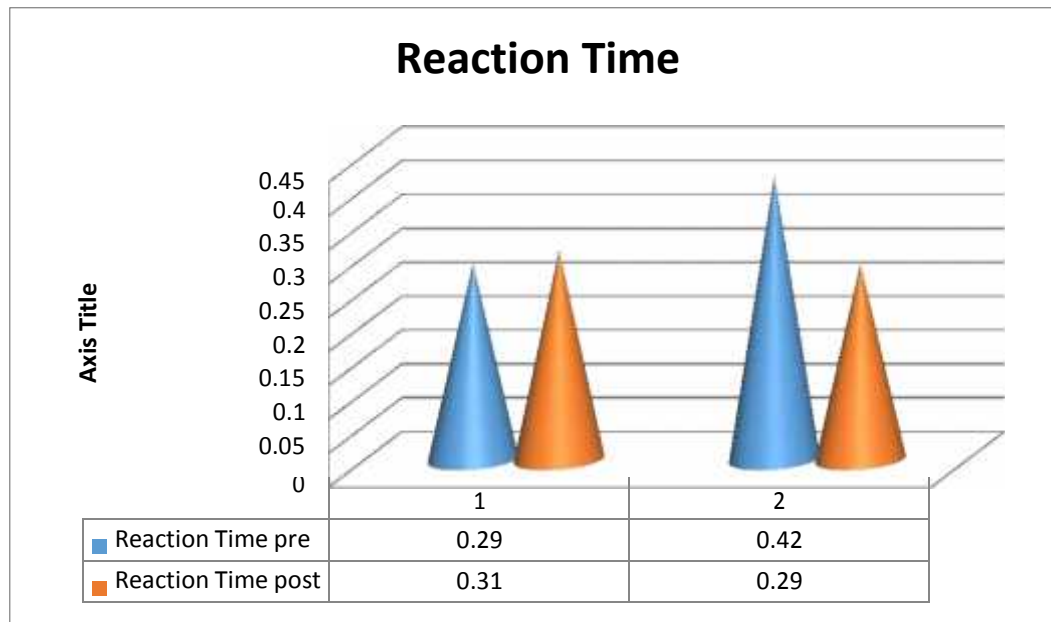


FIGURE II – Representation of Reaction Time

RESULTS AND DISCUSSION

In the present study the footwork drills has improved the agility and reaction time over respectively by finding significant differences in comparison from baseline to post test. The results of this study indicated that selected footwork drills is more efficient to bring out desirable changes over agility and reaction time of school level badminton players, the finding of the present study had similarity with the finding of the investigator referred in this study **Luiz de França Bahia Loureiro 2017** created to assess badminton players by simulating specific movements and conditions of uncertainty, is a specific agility test for badminton players given that the differences between badminton players and

other groups of athletes occur only when these athletes have their agility evaluated by the Badcamp agility test. Mehmet Fatih Yüksel **2017** can be said that shadow badminton training has positive effects on the physical performance parameters of 8-10 age group individuals. **Lanuezi et.al. (2008)** who determined the effects of exercise in motor fitness of elderly subjects undergoing two different exercise programs and the results of the study were showed statistically significant improvement of motor fitness group as compared to non-specific exercise group. **K Azmi et al., 2018** indicated that there was a significant improvement had exhibited by experimental group cricketers on motor fitness variables after exposed to 12 weeks

specific conditioning programme. **Eng Hoe Wee 2017** suggest no particular advantage for higher intensity multi – shuttle training model except some improvement for few variables of Experimental Group.

CONCLUSION

Based on the result of the study it was concluded that the 8 weeks of selected footwork drills have been significantly improved agility and Reaction time among school level badminton players. From the finding it is postulated that selected footwork drills is suitable mode to bring out desirable change over agility and Reaction time among badminton players.

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Effect of Medicine Ball Training on Selected Physical Fitness Variables among Inter Collegiate Level Men Kabaddi Players

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Abstract

The purpose of the study was to find out the effect of medicine ball training on selected physical fitness variables among inter collegiate level kabaddi players for this study 30 inter collegiate level men kabaddi players were selected from CMS College of Arts and Commerce, Coimbatore, Sri Ramalinga Sowdanbigai college of Arts and Commerce, Coimbatore. The selected subjects were divided into two groups namely Experimental Group - I Medicine Ball Training and control group. Each group consists of 15 subjects. The age of the subjects ranged from 18-25 years. The Experimental Group-I underwent eight weeks medicine ball training on weekly three days. The control group did not undergo any training other than the regular work. Data were collected from each subjects before and after the eight weeks of training .The collected data were analyzed statistically by using depended't' test. It was found that there was a significant improvement due to the medicine ball training on selected physical fitness variables among inter collegiate level kabaddi players.

Keywords: Medicine ball, training, physical fitness

INTRODUCTION

A player with good health and physique can become a good and outstanding player in any game. And in the game like kabaddi, where no other equipment other than the player is used, players should be full fit and have sound physique. Coaches concentrate on improving the physical fitness and motor abilities of player, i.e. speed, strength endurance flexibility. Improving the physical fitness of a player is called conditioning. A sound conditioning

programme forms the most important part of training any players.

METHODOLOGY

The study was to find out the effect of medicine ball training on selected physical fitness variables among inter collegiate level men kabaddi players. To achieve the purpose of the study, thirty inter collegiate level kabaddi players were randomly selected from CMS College of Arts and Commerce, Coimbatore, Sri Ramalinga

Sowdanbigai college of Arts and Commerce, Coimbatore, whose age ranged between 18 to 25 years. The subjects were divided into two groups of fifteen in each. Experimental Group I was given medicine ball training and Group II was acted as Control Group. The experimental group underwent eight weeks of medicine ball training weekly three days for a period of eight weeks. The control group did not undergo any training other than the regular work. Data were collected from each subject before and after the eight weeks of training.

SELECTION OF VARIABLES

INDEPENDENT VARIABLE

- Medicine Ball Training

DEPENDENT VARIABLES

Physical Fitness Variables

- Muscular Strength and Endurance
- Leg Explosive Power

SELECTION OF TESTS

The test items were designed for this study after a thorough investigation on literature reviews consultation with experts of this field of study,

physical education personals and medical experts as well. The criterion variables are presented in Table-I

STATISTICAL TECHNIQUES

The collected data were analyzed statistically by using dependent 't' test. An examination of that the Medicine Ball Training Group (MBTG) obtained 't' ratio were 15.72, 11.28 for Muscular Strength Endurance and Leg Explosive Power respectively. The obtained 't' ratios on muscular strength endurance and Leg Explosive Power were found to be greater than the required table value of 2.14 at 0.05 level of significance. It was found to be statistically significant. An examination of that the Control group obtained 't' ratio were 0.24, 1.43 for muscular strength endurance and Leg Explosive Power respectively. The obtained 't' ratios on muscular strength endurance and Leg Explosive Power were found to be less than the required table value of 2.14 at 0.05 level of significance. so it was found to be statistically insignificant.

Table – I Criterion Measurements

S. No	Variables	Test items	Unit of measurements
1.	Muscular Strength and Endurance	Bent knee Sit-ups	In Counts
2.	Leg Explosive Power	Standing Broad Jump	In Meters

Table – II MEDICINE BALL TRAINING PROGRAMME

week	Exercise	Weight	Rep	Set	Rest in between sets (In Seconds)	Rest in between Exercise (In Seconds)
1-4 Weeks	Stretching	10 minutes				
	Reverse Lunge Pass Under	2 kg	10-12	3	30	1 min
	Medicine ball lunge with twist	2 kg	10-12	3	30	1 min
	Medicine ball squats	2 kg	10-12	3	30	1 min
	Single leg squat	2 kg	10-12	3	30	1 min
	Medicine ball overhead throws	2 kg	10-12	3	30	1 min
	Sit up with chest press	2 kg	10-12	3	30	1 min
	Medicine ball crunch	2 kg	10-12	3	30	1 min
	Russian Twist With Med Ball	2 kg	10-12	3	30	1 min
	Med Ball Toe Touch	2 kg	10-12	3	30	1 min
	Straight leg sit- ups	2 kg	10-12	3	30	1 min
	Squat throw	3 kg	8-10	3	30	1 min
	Walking Lunge, Twist, Slam	2 kg	10-12	3	30	1 min
	Butterfly Bridge	2 kg	10-12	3	30	1 min
	Warm down	15 minutes				
	Stretching	10 minutes				
	Reverse Lunge Pass Under	3 kg	8-10	4	30	1 min
	Medicine ball lunge with twist	3 kg	8-10	4	30	1 min
	Medicine ball squats	3 kg	8-10	4	30	1 min
	Single leg squat	3 kg	8-10	4	30	1 min
	Medicine ball overhead throws	3 kg	8-10	4	30	1 min
	Sit up with chest press	3 kg	8-10	4	30	1 min
	Medicine ball crunch	3 kg	8-10	4	30	1 min
	Russian Twist With Med Ball	3 kg	8-10	4	30	1 min
	Med Ball Toe Touch	3 kg	8-10	4	30	1 min
	Straight leg sit- ups	3 kg	8-10	4	30	1 min
	Squat throw	3 kg	8-10	4	30	1 min
	Walking Lunge, Twist, Slam	3 kg	8-10	4	30	1 min
	Butterfly Bridge	3 kg	8-10	4	30	1 min
	Reverse Lunge Pass Under	3 kg	8-10	4	30	1 min
	Warm down	10 minutes				

Table II
Computation of 't' Ratio on Selected Physical Fitness Variables Of Medicine Ball Training Group And Control Group

Groups	Variables	Pre Test Mean	Post Test Mean	Mean Difference	SEM	't'-Ratio
Medicine Ball Training Group (MBTG)	Muscular Strength Endurance	39.80	45.60	5.80	0.53	15.72*
	Leg Explosive Power	2.02	2.08	.06	0.005	11.28*
Control Group (CG)	Muscular Strength Endurance	39.40	39.26	0.13	0.55	0.24
	Leg Explosive Power	2.04	2.05	0.01	.006	1.43

Figure - I

Graphical Representation Showing the Pre-Test and Post-Test Mean Values of Experimental Groups and Control Group on Muscular Strength and Endurance

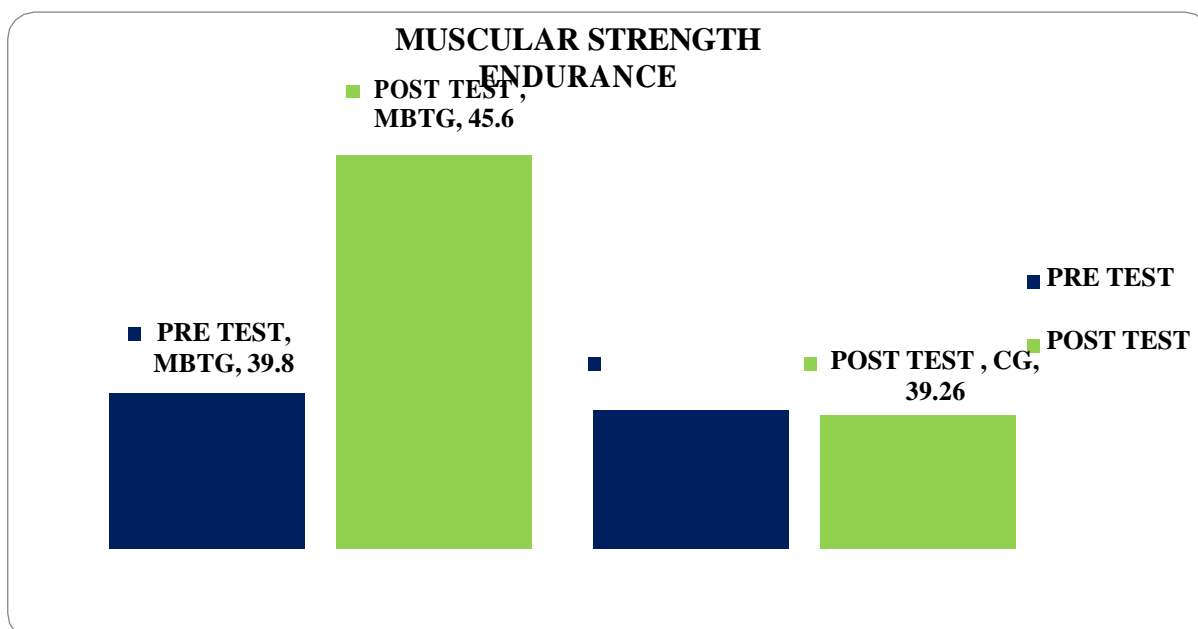
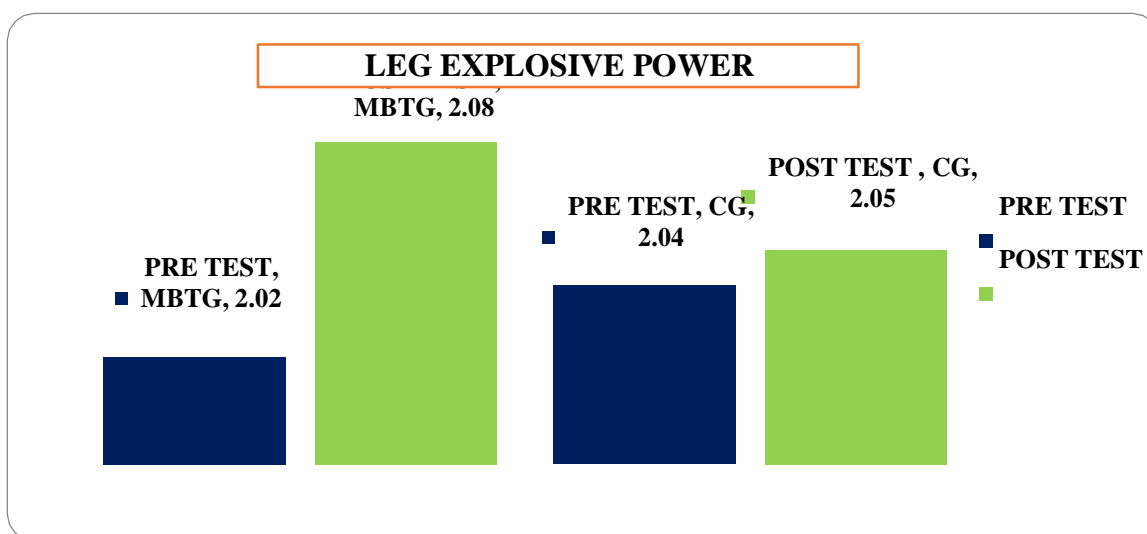


Figure - II
Graphical Representation Showing the Pre-Test and Post-Test Mean Values of Experimental Groups and Control Group On Leg Explosive Power



CONCLUSION

1. It was concluded that the medicine ball training Group (MBTG) has produced significant improvement from pre to post test on muscular strength and endurance among inter collegiate level kabaddi players.
2. It was concluded that the medicine ball training Group (MBTG) has produced significant improvement from pre to post test on leg explosive power among inter collegiate level kabaddi players.

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**BHARATHIAR NATIONAL JOURNAL OF
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The Effect of Fitness Training and Nutritional Psychological Counseling on Tension, Depression, T3, T4 and TSH in Middle Aged Ladies with Hypothyroidism

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Abstract

Objectives - TSH becomes elevated despite the fact that the T4 and T3 should still be at intervals the normal vary. TSH are adequate to stay the conventional endocrine gland functioning properly. This aim of the study was to evaluate the effect of 8 weeks of fitness training and nutritional psychological counseling on the tension, depression, T3, T4 and TSH in middle aged ladies with hypothyroidism. **Materials and Methods** – To fulfill the aim of the study, completely 65 hypothyroid middle aged ladies subjects were willing to participate, however the investigator has chosen solely 45 subjects who were enough to undergo the experimental training, They were hand-picked from the organization of Thyroid Care Centers, Coimbatore, Tamilnadu,India. They were clinically and bio -chemicals confirmed, cases of hypothyroid disease and their age ranged between forty and fifty years. The subjects with other complications of thyroidism were excluded. Solely the thyroid disease subjects were willing to participate within the experimental study were enclosed during this study. The study was developed as a real cluster style consisting of pretest and post test. The subjects (N=15) were randomly assigned to three equal groups of fifteen among middle aged women with hypothyroidism- the experimental group I, experimental group II and control group respectively. Pre test was conducted for all the 45 subjects on selected health related fitness and psychology and biochemical variables. Blood samples were collected after 8 weeks training first in order to evaluate tension, depression, T3, T4, and TSH the pre test and post test scores were subjected to applied statistically analysis of variance (ANCOVA) to seek out the importance among the mean variations, whenever the 'F' radio for adjusted test was found to be significant. Altogether cases 0.05 level of significance was fixed to test hypotheses. **Results** – The tension and depression confusion were significantly improved by both forms of experimental groups namely the fitness training programme and nutritional counseling with psychological counseling and fitness training programme and nutritional counseling without psychological counseling group among middle aged ladies with hypothyroidism. There was no significant improvement in the selected biochemical variables such as T3, T4 due to both forms of experimental groups among middle aged women with hypothyroidism. **Conclusion** - The fitness training programme and nutritional counseling with psychological counseling recommended as complementary therapy for middle aged ladies hypothyroidism.

Keywords: Fitness Training, Nutritional Counseling, Psychological Counseling, T3, T4,

INTRODUCTION

Our body is a blessing from God, he advances us and it's our sole duty to oversee and deal with it well. At the point when God made man, he made him with an ideal solid body. In any case, man, as a result of his unfavorable way of life has demolished that ideal wellbeing by ill-advised nourishment, absence of activity, impeding propensities like smoking, drinking, sedate maltreatment and so forth. This has lead to the reason for a few dangerous sicknesses like circulatory strain, diabetes, heart maladies, thyroid glitch and so on. Thyroid is a vast ductless organ in the neck which secretes hormones controlling development and improvement through the rate of digestion, thyroid capacity and extensive ligament of the larynx, a projection of which shapes the Adam's apple in people. It is a butterfly-molded organ and is made out of two cone-like projections or wings, lobus dexter or right flap and lobus sinister or left flap, associated through the isthmus. The organ is arranged on the front side of the neck, lying against and around the larynx and trachea, coming to posteriorly the throat and carotid sheath. It begins cranially at the slanted line on the thyroid ligament or Adam's apple and stretches out poorly to roughly the fifth or 6th tracheal ring. It is hard to delineate the organ's upper and lower outskirts with

vertebral dimensions since it moves position in connection to these amid gulping. The thyroid organ is secured by a dainty stringy sheath, the capsula glandulae thyreoideae, made out of an inward and outer layer. The outside layer is anteriorly nonstop with the pretracheal belt and back along the side consistent with the carotid sheath. The organ is secured anteriorly with infra thyroid muscles and along the side with the sternocleidomastoid muscle otherwise called stern mastoid muscle. On the posterior side, the gland is fixed to the cricoid and tracheal cartilage and cricopharyngeus muscle by a thickening of the fascia to form the posterior suspensory ligament of thyroid gland also known as Berry's ligament (Yalçın and Ozan, 2006).

1.1 T3 and T4 regulation

The production of thyroxine and triiodothyronine is regulated by thyroid-stimulating hormone (TSH), released by the anterior pituitary. The thyroid and thyrotropes form a negative feedback loop, TSH production is suppressed when the T4 levels are high. The TSH production itself is modulated by thyrotropin-releasing hormone (TRH), which is produced by the hypothalamus and secreted at an increased rate in situations such as cold exposure to stimulate thermogenesis. TSH production is blunted by

somatostatin (SRIH), rising levels of glucocorticoids and sex hormones namely estrogen and testosterone, and excessively high blood iodide concentration. An additional hormone produced by the thyroid contributes to the regulation of blood calcium levels. Parafollicular cells produce calcitonin in response to hyper-calcemia. Calcitonin stimulates movement of calcium into bone, in opposition to the effects of parathyroid hormone (PTH). However, calcitonin seems far less essential than PTH, as calcium metabolism remains clinically normal after removal of the thyroid (thyroidectomy), but not the parathyroid's (Johannes, 2002).

1.2 Hypothyroidism

Hypothyroidism is the underproduction of the thyroid hormones T3 and T4. Hypothyroid issue may happen because of inborn thyroid anomalies, immune system issue, for example, Hashimoto's thyroiditis, iodine inadequacy more probable in more unfortunate nations or the evacuation of the thyroid after medical procedure to treat extreme hyperthyroidism and thyroid disease. Commonplace indications are unusual weight gain, tiredness, hairlessness, cold narrow mindedness, and bradycardia. Hypothyroidism is treated with hormone substitution treatment, for example, levothyroxine, which is ordinarily required for whatever remains of the patient's life. Thyroid hormone treatment is given under the

consideration of a doctor and may take half a month to wind up powerful. Negative input components result in development of the thyroid organ when thyroid hormones are being created in adequately low amounts, as a methods for expanding the thyroid yield; in any case, where hypothyroidism is brought about by iodine inadequacy, the thyroid can't deliver T3 and T4 and therefore, the thyroid may keep on developing to frame a non-dangerous goiter. It is named non-poisonous as it doesn't create harmful amounts of thyroid hormones, in spite of its size.

1.3 Nutritional Counseling

Sustenance is the science that deciphers the connection of supplements and different substances in nourishment in connection to support, development, propagation, wellbeing and malady of a creature. It incorporates sustenance consumption, ingestion, absorption, biosynthesis, catabolism and discharge. Nourishment directing is a continuous procedure in which a wellbeing proficient, more often than not an enrolled dietitian, works with a person to survey his or her standard dietary admission and distinguish zones where change is required. The sustenance advisor gives data, instructive materials, support, and follow-up to support the individual make and keep up the required dietary changes.

Nourishments that are wealthy in iodine are exceptionally prescribed in the battle to avert hypothyroidism. The following is a sorted rundown of good sustenance sources. A portion of the Iodine-Rich Foods for Hypothyroidism incorporates Iodized Salt, Seaweeds and Sea sustenance's and Salt Water Fish. A portion of the Selenium-Rich Foods for Hypothyroidism is Meat, Chicken, Salmon, Tuna, Whole Unrefined Grains Brazil nuts, dairy items, garlic and onions. The thyroid organ needs iodine; along these lines for an underactive thyroid organ needs expanded iodine consumption in the eating regimen. A very much adjusted eating regimen that incorporates iodine can help in reducing the side effects that experience with the condition.

1.4 Psychological Counseling

Advising brain science is a mental forte that envelops inquire about and connected work in a few wide spaces directing procedure and result; supervision and preparing; profession improvement and guiding; and counteractive action and wellbeing. Some bringing together topics among advising therapists incorporate an attention on resources and qualities, person-condition connections, instructive and profession advancement, brief collaborations, and an emphasis on unblemished identities (Gelso and Fretz, 2001).

Transference can be depicted as the customer's mutilated view of the advisor. This can greatly affect the helpful relationship. For example, the advisor may have a facial element that helps the customer to remember their parent. Due to this affiliation, if the customer has noteworthy negative/positive emotions toward their parent, they may extend these sentiments onto the specialist. This can influence the remedial relationship in a couple of ways. For instance, if the customer has a solid bond with their parent, they may see the advisor as a dad or mother figure and have a solid association with their specialist. This can be tricky on the grounds that as a specialist, it isn't moral to have a more than "proficient" association with a customer. It can likewise be something worth being thankful for, in light of the fact that the customer may open up extraordinarily to the advisor. In another way, if the customer has a negative association with their parent, the customer may feel negative emotions toward the advisor. This would then be able to influence the remedial relationship too. For instance, the customer may experience difficulty opening up to the advisor since he/she needs trust in their parent or anticipating these sentiments of doubt onto the specialist (Levy and Scala, 2012).

2. METHODS:

2.1 Treatment

The motivation behind this investigation was to discover the effect of fitness training programme and nutritional psychological counseling on tension, depression, T3, T4 and TSH among middle aged ladies with hypothyroidism. The investigator randomly selected totally sixty five hypothyroid middle aged female subjects as certified by endocrinologist who were willing to participate, but the investigator chose only forty five subjects with hypothyroidism who were fit enough to undergo the experimental training treated as subjects. They were selected from the organization of Thyroid care Centers, Coimbatore, Tamil Nadu, India. They were clinically and bio chemically confirmed cases of hypothyroidism and their age ranged between 40 and 50 years.

The selected subjects were assigned in to three equal groups. Each group consisted of fifteen (15) subjects. Group I acted as Experimental Group I – (fitness training programme and nutritional counseling with psychological counseling), Group II acted as Experimental Group II – (fitness training programme and nutritional counseling without psychological counseling) and Group III acted as Control Group. The study was formulated as a true random group design consisting of a pre-test and post test. The subjects (N=15) were randomly assigned to three equal groups of fifteen among middle aged women

with hypothyroidism- the experimental group I, experimental group II and control group respectively. Pre test was conducted for all the 45 subjects. The experimental groups participated in the respective training for five days per week for a period of 8 weeks programme. The control group did not participate in any of the experimental training programme. After the experimental treatment, all the forty five subjects were measured on the tension, depression, T3, T4, and TSH. The final test scores formed as post test scores of the subjects.

2.2 Experimental Design

The study was formulated as a pretest and posttest random group design, in which sixty female people with hypothyroidism as certified by the endocrinologists were randomly assigned in to three groups namely Experimental group-I fitness training programme and nutritional counseling with psychological counseling , Experimental group-II fitness training programme and nutritional counseling without psychological counseling, and as Control Group (CG). Each group consists of 15 subjects. No attempt was made to equate the groups. The selected subjects were initially tested on criterion variables used in this study and this was considered as the pre-test. After assessing the pre-test, the subjects belonging to Experimental Groups underwent respective training for a period of 12 weeks. Group III

acted as control group (CG), the subjects in control group were not engaged in any experimental training programme other than their regular work. The subjects were free to withdraw their consent in case of feeling any discomfort during the period of their participation but there was no dropout during the study. After twelve weeks of their training programme again the subjects were tested on the same criterion variables as such in the pre-test and considered this as the post-test.

2.3 Statistics

The pre test and post scores were subjected to statistical analysis of Covariance (ANCOVA) to find out the significance among the mean differences, whenever the 'F' ratio

for adjusted test was found to be significant. In all cases 0.05 level of significance was fixed to test hypotheses.

3. RESULTS

The statistical analysis comparing the initial and final means of experimental group I, experimental group II and control group on Tension is presented in (table 1). The pre test scores of experimental group I, experimental group II and control group on tension were 61.53, 62.13 and 63.67 respectively. The post test scores of experimental group I, experimental group II and control group on tension were 53.20, 59.47 and 61.40 respectively.

TABLE-1 COMPUTATION OF ANALYSIS OF TENSION

Test	Mean			S V	Sum of Square s	df	Mean Square s	Obtaine d F
	Experimenta I Group- I (FTPNCWPC)	Experimental Group - II (FTPNCWOPC)	Contro I Group (CG)					
Pre test	61.53	62.13	63.67	B	36.31	2	18.16	2.07
				W	368.80	4 2	8.78	
Post test	53.20	59.47	61.40	B	551.24	2	275.62	37.62*
				W	307.73	4 2	7.33	
Adjuste d	53.68	59.63	60.76	B	407.99	2	203.99	40.76*
				W	205.19	4 1	5.00	

Mean gain	8.33	2.67	2.27	
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Table-1 F – ratio at 0.05 level confidence for 3 and 42(df) = 3.22, 3 and 41 (df) = 3.23

*Significant

The ordered adjusted mean scores of experimental group I, experimental group II and control group on tension were 53.68, 59.63 and 60.76 respectively. The mean gain in the experimental group I, experimental group II and control group on tension were 8.33, 2.67 and 2.27 respectively. The obtained F value on pre test scores 2.07 was less than the required F value of 3.22, 3.23 to be significant at 0.05 level. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups. The post test scores

analysis proved that there were significant differences between groups, as the obtained F value 37.62 was greater than the required F value of 3.22, 3.23. This proved that the differences between the post test means of the subjects were significant. Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value of 40.76 was greater than the required F value 3.22, 3.23. This proved that there was a significant difference among the means due to the experimental training on tension.

TABLE-2 COMPUTATION OF ANALYSIS OF DEPRESSION

Test	Mean			S V	Sum of Square s	df	Mean Squar es	Obtaine d F
	Experiment al Group- I (FTPNCWP C)	Experimental Group - II (FTPNCWOP C)	Contro l Group (CG)					
Pre test	85.60	81.20	85.00	B	170.80	2	85.40	1.22
				W	2950.00	42	70.24	
Post test	55.40	66.47	83.33	B	5936.13	2	2968. 07	30.43*
				W	4096.67	42	97.54	
Adjuste d	55.71	65.95	83.53	B	5939.40	2	2969. 70	30.50*
				W	3992.63	41	97.38	

Mean gain	30.20	14.73	1.67	
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Table-2 F – ratio at 0.05 level confidence for 3 and 42(df) = 3.22, 3 and 41 (df) = 3.23

*Significant

The statistical analysis comparing the initial and final means of experimental group I, experimental group II and control group on Depression is presented in (table 2). The pre test scores of experimental group I, experimental group II and control group on depression were 85.60, 81.20 and 85.00 respectively. The post test scores of experimental group I, experimental group II and control group on depression were 55.40, 66.47 and 83.33 respectively. The ordered adjusted mean scores of experimental group I, experimental group II and control group on depression 55.71, 65.75 and 83.53 respectively. The mean gain in the experimental group I, experimental group II and control group on tension were 30.20, 14.73 and 1.67 respectively. The obtained F value on pre test scores 1.22 was less than the required F value of 3.22, 3.23 to be significant at 0.05 level. This proved that there were no significant deference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups.

TABLE-3 COMPUTATION OF ANALYSIS OF T3

Test	Mean			S V	Sum of Square s	df	Mean Square s	Obtaine d F
	Experiment al Group- I (FTPNCWP C)	Experimental Group - II (FTPNCWOPC)	Contro l Group (CG)					
Pre test	0.9000	0.8980	0.9007	B	0.00006	2	0.00003	0.48
				W	0.00253	4 2	0.00006	
Post test	0.8973	0.8967	0.8993	B	0.00006	2	0.00003	0.33
				W	0.00372	4 2	0.00009	
Adjusted	0.8969	0.8983	0.8981	B	0.00002	2	0.00001	0.48

				W	0.00083	4	0.00002	
						1		
Mean gain	0.0027	0.0013	0.0013					

Table F – ratio at 0.05 level confidence for 3 and 42(df) = 3.22, 3 and 41 (df) = 3.23 *Significant

The post test scores analysis proved that were significant differences between groups, as the obtained F value 30.43 was greater than the required F value of 3.22, 3.23. This proved that the differences between the post test means of the subjects were significant. Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value of 30.50 was greater than the required F value 3.22, 3.23. This proved that there was a significant difference among the means due to the experimental training on depression.

The statistical analysis comparing the initial and final means of experimental group I, experimental group II and control group on T3 is presented in (table 3). The pre test scores of experimental group I, experimental group II and control group on T3 were 0.90, 0.90 and 0.90 respectively. The post test scores of experimental group I, experimental group II and control group on T3 were 0.90, 0.90 and 0.90 respectively. The ordered adjusted mean scores of experimental group I, experimental group II and control group on T3 were 0.90, 0.90 and 0.90 respectively. The mean gain in

the experimental group I, experimental group II and control group on T3 were 0.0027, 0.0013 and 0.0013 respectively. The obtained F value on pre test scores 0.48 was less than the required F value of 3.22, 3.23 to be significant at 0.05 level. This proved that there were no significant deference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups. The post test scores analysis proved that were significant differences between groups, as the obtained F value 0.33 was less than the required F value of 3.22, 3.23. This proved that the differences between the post test means of the subjects were no significant. Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value of 0.48 was less than the required F value 3.22, 3.23. This proved that there was a no significant difference among the means due to the experimental training on T3.

The statistical analysis comparing the initial and final means of experimental group I, experimental group II and control group on T4

is presented in (table 4). The pre test scores of experimental group I, experimental group II and control group on T4 were 6.62, 6.64 and 6.64 respectively. The post test scores of experimental group I, experimental group II and control group on T4 were 6.66, 6.66 and 6.65 respectively. The ordered adjusted mean scores of experimental group I, experimental group II and control group on T4 were 6.66, 6.66 and 6.64 respectively. The mean gain in the experimental group I, experimental group II and control group on T4 were 0.0400, 0.0160 and 0.0033 respectively. The obtained F value on pre test scores 1.37 was less than the required F value of 3.22, 3.23 to be significant at 0.05 level. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups. The post test scores analysis proved that there were significant differences between groups, as the obtained

F value 0.30 was less than the required F value of 3.22, 3.23. This proved that the differences between the post test means of the subjects were no significant. Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value of 0.46 was less than the required F value 3.22, 3.23. This proved that there was no significant difference among the means due to the experimental training on T4.

The statistical analysis comparing the initial and final means of experimental group I, experimental group II and control group on TSH is presented in (table 5). The pre test scores of experimental group I, experimental group II and control group on TSH were 7.29, 7.30 and 7.32 respectively. The post test scores of experimental group I, experimental group II and control group on TSH were 7.32, 7.32 and 7.33 respectively.

TABLE-4 COMPUTATION OF ANALYSIS OF T4

Test	Mean			S V	Sum of Square s	df	Mean Square s	Obtaine d F
	Experimenta I Group- I (FTPNCWPC)	Experimental Group - II (FTPNCWOPC)	Contro I Group (CG)					
Pre test	6.62	6.64	6.64	B	0.0075	2	0.0037	1.37
				W	0.1142	42	0.0027	
Post test	6.66	6.66	6.65	B	0.0013	2	0.0006	0.30
				W	0.0892	42	0.0021	

Adjusted	6.66	6.66	6.64	B	0.0019	2	0.0009	0.46
				W	0.0844	41	0.0021	
Mean gain	0.0400	0.0160	0.0033					

Table F – ratio at 0.05 level confidence for 3 and 42(df) = 3.22, 3 and 41 (df) = 3.23

*Significant

TABLE-5 COMPUTATION OF ANALYSIS OF TSH

Test	Mean			S V	Sum of Square s	df	Mean Square s	Obtain ed F
	Experimenta I Group- I (FTPNCWPC)	Experimental Group - II (FTPNCWOPC)	Contro I Group (CG)					
Pre test	7.29	7.30	7.32	B	0.0061	2	0.0030	1.83
				W	0.0700	42	0.0017	
Post test	7.32	7.32	7.33	B	0.0014	2	0.0007	2.00
				W	0.0142	42	0.0003	
Adjusted	7.33	7.32	7.33	B	0.0006	2	0.0003	1.10
				W	0.0112	41	0.0003	
Mean gain	0.0333	0.0233	0.0147					

The ordered adjusted mean scores of experimental group I, experimental group II and control group on TSH were 7.33, 7.32 and 7.33 respectively. The mean gain in the experimental group I, experimental group II and control group on TSH were 0.03, 0.02 and 0.02 respectively. The obtained F value on pre test scores 1.83 was less than the required F value of 3.22, 3.23 to be significant at 0.05 level. This proved that there were no significant difference between the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects to groups. The post test scores

analysis proved that were significant differences between groups, as the obtained F value 2.00 was less than the required F value of 3.22, 3.23. This proved that the differences between the post test means of the subjects were no significant. Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value of 1.10 was less than the required F value 3.22, 3.23. This proved that there was a no significant difference among the means due to the experimental training on TSH.

4. DISCUSSION

The results presented in (table 1) showed that obtained adjusted means on tension among fitness training programme and nutritional counseling with psychological counseling group was 53.68 followed by Physical fitness training programme and nutritional counseling without psychological counseling group was 59.63 and control group with mean value 60.76. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F value were 2.07, 37.62 and 40.76 respectively. It was found that obtained F value on pre test scores were not significant at 0.05 level of confidence as these were lesser than the required table F value of 3.22, 3.23 and the obtained F values on post test and adjusted means were significant at 0.05 level of confidence as these were greater than the required table F value of 3.22, 3.23.

The results presented in (table 2) showed that obtained adjusted means on depression among fitness training programme and nutritional counseling with psychological counseling group was 55.71 followed by Physical fitness training programme and nutritional counseling without psychological counseling group was 65.75 and control group with mean value 83.53. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were

statistically treated using ANCOVA and F value were 1.22, 30.43 and 30.50 respectively. The obtained F values on pre test were not significant at 0.05 level of confidence as these were lesser than the required table F value of 3.22, 3.23 and the obtained F values on post test and adjusted means were significant at 0.05 level of confidence as these were greater than the required table F value of 3.22, 3.23.

The results presented in (table 3) showed that obtained adjusted means on T3 among fitness training programme and nutritional counseling with psychological counseling group was 0.90 followed by Physical fitness training programme and nutritional counseling without psychological counseling group was 0.90 and control group with mean value 0.90. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F value were 0.48, 0.33 and 0.48 respectively. The obtained F values on pre test, post test and adjusted means were not significant at 0.05 level of confidence as these were lesser than the required table F value of 3.22, 3.23.

The results presented in (table 4) showed that obtained adjusted means on T4 among fitness training programme and nutritional counseling with psychological counseling group was 6.66 followed by Physical fitness training programme and

nutritional counseling without psychological counseling group was 6.66 and control group with mean value 6.64. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F value were 1.37, 0.30 and 0.46 respectively. The obtained F values on pre test, post test and adjusted means were not significant at 0.05 level of confidence as these were lesser than the required table F value of 3.22,3.23.

The results presented in (table 5) showed that obtained adjusted means on TSH among fitness training programme and nutritional counseling with psychological counseling group was 7.33 followed by Physical fitness training programme and nutritional counseling without psychological counseling group was 7.32 and control group with mean value 7.33. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F value were 1.83, 2.00 and 1.10 respectively. The obtained F values on pre test, post test and adjusted means were not significant at 0.05 level of confidence as these were lesser than the required table F value of 3.22,3.23.

5. CONCLUSION

The tension, depression, were significantly improved by both forms of experimental groups namely the fitness

training programme and nutritional counseling with psychological counseling and fitness training programme and nutritional counseling without psychological counseling group among middle aged ladies with hypothyroidism.

There was no significant improvement in the selected biochemical variables such as T3, T4 and TSH due to both forms of experimental groups among middle aged ladies with hypothyroidism

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Impact of aerobic exercise and massage with yogic training on systolic and diastolic blood pressure among women breast cancer survivors

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Abstract

The purpose of the study was to find the effects of aerobic exercise and massage with yogic training on systolic and diastolic blood pressure among women breast cancer survivors. To achieve the purpose, forty women breast cancer survivors were randomly selected as subjects. They were divided into two equal groups namely experimental group and control group. Experimental group underwent aerobic exercise, massage and yoga training and control group was not given any specific programme. They assessed before and after the training periods of twelve weeks. The following criterion variables were chosen namely systolic and diastolic blood pressure. The 't' ratio statistical tool was used to analyze the study. The study revealed that systolic and diastolic blood pressures were significantly improved due to the influence of the aerobic exercise, massage with yogic training. The exercise should be structured programme for cancer survivors.

Keywords: Aerobic, Yoga, Blood pressure, breast cancer

1. Introduction

Today woman holds the highest position in the society in all aspect of life. She is found to identify herself as an achiever in all fields of life. At this juncture, the very symptom of breast cancer nullifies all the hopes in her and she loses confidence. She almost concludes that life is meaningless. On the contrary, woman has to know the truth that she can continue to be happy even after medical treatment for breast cancer. Woman has to be exposed to the fact that there are ways that could be habituated to remain healthy. Most importantly physical exercises can be of great help to regain their energy and their confidence too.

Blood Pressure

Blood present within the arteries give a lateral pressure on the wall of the artery this is known as blood pressure (Moni, 2006). Blood pressure may be classified into three categories they are systolic pressure, diastolic pressure, and pulse pressure. Systolic pressure: This is due to the contraction of the ventricles. Normal systolic pressure is 90-120mm.of mercury. Diastolic

pressure: This is due to the dilation of the ventricles. Normal diastolic pressure is 60-80mm.of mercury. Pulse pressure: This is due to difference between the systolic and diastolic pressure. Pulse pressure = $120-80=40$ mm.of mercury (Moni, 2006).

According to medical science, if the pressure of blood exceeds 155 mm Hg, it is termed High Blood Pressure and if it falls below 110 mm Hg, it is called Low Blood Pressure. Usually the pressure in a normal healthy person can be obtained by adding one-fifth of his age with 120mm. According to others half of age added to 100 mm will give the normal pressure. According to the normal blood pressure in a man of sixty should be $120 + 60 / 5 = 132$ mm Hg, while in the other method it should be $100 + 60 / 2 = 130$ mm Hg.

Blood pressure of women after breast cancer

Many studies have shown that overweight and obesity are associated with a modest increase in risk of postmenopausal breast cancer.

Obese people are also at higher risk of

coronary heart disease, stroke, high blood pressure, diabetes, and a number of other chronic diseases. The increased risk of postmenopausal breast cancer is thought to be due to increased levels of oestrogen in obese women. After menopause, when the ovaries stop producing hormones, fat tissue becomes the most important source of oestrogen. Because obese women have more fat tissue, their oestrogen levels are higher, potentially leading to more rapid growth of oestrogen-responsive breast tumours (**National Cancer Institute, 2012**). Based on study, exercises may reduce a women's cumulative exposure to oestrogen by delaying menarche, lowering levels of serum oestrogen and increasing the frequency of an ovulation. During women's premenopausal and post-menopausal years, exercises may reduce hormonal exposure through weight maintenance (**Carpenter et al., 1999**).

Aerobic Exercise

Aerobic exercise also known as cardio is physical exercise of relatively low intensity that depends primarily on the aerobic energy-generating process (**Sharon et.al., 2007**).

Aerobic activities strengthen the heart and lungs, making them more efficient and durable, improving quality and quantity of life. Exercise not only extends our life, but also gives us more energy to live it to the fullest.

Massage

Massage is a systematic therapeutic friction, stroking or kneading of the body. The application of diverse manual techniques of touch and stroking to muscles and soft tissue to achieve relaxation and to improve the client's well-being (**Jonas, 2005**). Breast cancer patients receiving massage therapy showed improved blood pressure, respiration, and heart rate measurements (**Cassileth et.al.,2008**). Massage therapy relaxes the patient, reducing pain, anxiety and gastrointestinal symptoms of chemotherapy and radiation side effects. For breast cancer patients undergoing radiation, massage therapy reduces side effects of treatment itself and can help dissolve radiation-induced fibrosis months

and years after treatment has finished (**MacDonald et al., 2001**).

Yoga

The word yoga is derived from the Sanskrit root Yuj, which means to join or to yoke. In philosophical terms, yoga refers to the union of the individual self with the universal self (**Iyengar, 1995**).

Yoga interventions for cancer patients shown positive effects on a variety of outcomes, including sleep quality, mood, stress, cancer-related distress, cancer related symptoms, and overall quality of life, as well as functional and physiological measures (**Julienne, 2005**). Yoga, which is designed to be a calming exercise, strengthens and tones the body without raising the heart rate (**Betsy, 2008**).

A structured group exercises programme during adjuvant treatment is a safe, well tolerated and effective way of providing physical, physiological and psychological health benefits to people during treatment and also appropriately powered analyses of some variables of exercise create interest and favoured relatively economical for people after breast cancer (**Campbell et al., 2005**). A Structured exercise intervention undertaken by breast cancer patients undergoing chemotherapy can lead to reduction in treatment-related symptoms (**Andersen et al., 2006**).

Objective

To find out the impact of aerobic exercise and massage with yogic training on systolic and diastolic blood pressure among women breast cancer survivors.

Hypotheses

1. It was hypothesized that the aerobic exercise and massage with yogic training would have significant effects on systolic and diastolic blood pressure among women breast cancer survivors in Experimental group.
2. It was hypothesized that there is no significant difference between pre-test and post-test of women breast cancer survivor in control group in systolic and diastolic blood pressure.

Methodology

Experimental design was adopted for the study.

Samples

Forty women mastectomies (who have undergone surgical removal of the breast) were randomly selected at Breast club from G. Kuppuswamy Naidu Memorial Hospital, Coimbatore, Tamilnadu. Their age ranged between thirty five to forty five years. They were divided into two equal groups namely experimental group and control group each consist of twenty women mastectomies.

Procedure of the study

Pre-test was conducted for Experimental group and Control group to measure systolic and diastolic blood pressure. After conducting pre-test, Experimental group underwent aerobic exercise and massage with yogic training for six days per week for twelve weeks and control group was not given any specific programme. After the treatment period, Post-test was conducted for both the groups.

Variables

Systolic and diastolic blood pressures were selected as criterion variables.

Tool:

Systolic and Diastolic blood pressure were measured by Sphygmomanometer and the measurement was recorded in mm hg (**Fox and Mathews, 1981**).

Statistics

t-test was used to find out the effectiveness of aerobic exercise and massage with yogic training.

Results and Discussion

The table shows that the obtained 't' – ratio values of pre test and post test mean values of systolic and diastolic blood pressure of experimental group and control group among women breast cancer survivors. The obtained 't' –

ratios were 8.13 for systolic blood pressure , 7.98 for diastolic blood pressure for experimental group and 0.68 for systolic blood pressure , 0.12 for diastolic blood pressure for Control group.

The obtained 't' – ratios on systolic and diastolic blood pressure were greater than the critical value of 2.09 it was found to be statistically significant at 0.05 level of confidence for df 19 for experimental group. Hence it was observed that the twelve weeks practice of aerobic exercise and massage with yogic training showed significant improvement in systolic and diastolic blood pressure of experimental group.

The obtained 't' – ratios on systolic and diastolic blood pressure were lesser than the critical value of 2.09 it was found to be statistically insignificant at 0.05 level of confidence for degrees of freedom 19 for Control group. It was observed that control group did not show any significant improvement in systolic and diastolic blood pressure.

The aerobic exercise and massage with yogic training programme has produced a significant improvement in systolic and diastolic blood pressure. The control group has not produced a significant improvement on systolic and diastolic blood pressure among the women breast cancer survivors. Therefore it is concluded that after attending aerobic exercise and massage with yoga training programme there was a significant improvement in their systolic and diastolic blood pressure. It was observed that the aerobic exercise and massage with yogic training group produced significant development effect on systolic and diastolic blood pressure variables used in the study whereas in the case of control group it was found to be insignificant.

In testing the significance of mean difference on pre-test between the two groups namely Aerobic exercise and massage with yogic training group and Control group the result indicates that the mean differences on systolic and diastolic blood pressure variables used in the study before the respective treatment was insignificant. Thus, this analyses confirms that the random assignment of subjects into two groups were successful.

Table 1.1. Difference between pre-test and post-test of Experimental group in systolic and diastolic blood pressure

Variables	Pre-test	Post-test	Diff	SE	t-ratio
Systolic blood pressure	140.85±7.46	131.95±7.42	8.90	1.09	8.13*
Diastolic blood pressure	87.85 ± 2.64	84.35 ± 3.00	3.50	0.44	7.98*

*Significant at 0.05 level of confidence

Table 1.2. Difference between pre-test and post-test of Control group in Systolic and diastolic blood pressure

Variables	Pre-test	Post-test	Diff	SE	t-ratio
Systolic blood pressure	140.45 ± 10.16	141.10 ± 8.70	0.65	0.95	0.68
Diastolic blood pressure	86.20 ± 2.74	86.25 ± 3.16	0.05	0.41	0.12

*Significant at 0.05 level of confidence

Conclusions

In the present study the effects of Aerobic exercise and massage with yogic training has produced significant improvement on the criterion variables among women breast cancer survivors. Thus the logical combination of this method of trainings will be useful to women breast cancer survivors in developing their physical health and mental health.

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Combined Effects of Aerobic and Anaerobic Training on Red Blood Cells among Hockey Players

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Abstract

The purpose of this study was to find out the combined effect of aerobic and anaerobic training on red blood cells among hockey players. To achieve the purpose of the study, 60 male hockey players who played at district level were selected from Tirunelveli district, Tamil Nadu, India. The selected subjects were randomly assigned in to four groups of (n=15) each, such as experimental and control groups. Experimental group I served as aerobic training group, Group - II, served as anaerobic training, Group III served as combined aerobic and the group IV served as control group. The pre and post test randomized control group design was use as experimental design. The collected data from the four groups prior to and immediately after the training programme on selected criterion variables were statistically analyzed with dependent't' test to find out the significant improvement between pre and post test means of the both groups and analysis of co variance (ANCOVA) was used to find out the significant difference between experimental and control groups

Keywords: Training, Aerobic, Anaerobic, Red blood cells, Hockey players

1. Introduction

The word aerobic meaning with oxygen to represent idea. Even so the dynamics of the idea are more complicated than implied by the definition. Aerobic can be viewed as an intricate system of bodily supply and demand. That is the body needs energy for any kind of activity and the need is filled by burning off the foods that eat. Oxygen is the spark the fuel needs to burn regardless aerobics is the word in general use. The fact is that cooper codified and organized what fitness means to many people. He is generally credited with being one of the main forces of the current fitness craze. The majority medical opinion is that aerobic programs strengthen heart muscle, increase the efficiency of lungs and offer other wonderful benefits.

Anaerobic exercise is used by athletes in non-endurance sports to build power and by body builders to build muscle mass. Muscles that are trained under anaerobic conditions develop biologically differently giving them greater

performance in short duration-high intensity activities.

Hockey is indeed said to be the oldest of all games played with a ball and stick. It has the thrill of a romantic journey travelling around the world in search of a home where it would be accorded the respect it deserves. It has become a reality in India; Hockey is one among the fastest team sports.

Methodology

To achieve the purpose of the study, 60 male hockey players from the Sports Hostel, Tirunelveli were randomly selected as subjects and their age were 14-16 years. They were assigned into four groups, namely, experimental group I, experimental group II, experimental group III and control group. Experimental group I served as aerobic training group, Group - II, served as anaerobic training, group III served as

combined group of aerobic and anaerobic training, and the fourth group served as control group.

The study was formulated as a true random group design consisting of a pre-test and post test. The subjects (N=60) were randomly assigned to four groups of fifteen male hockey players. They were assigned into four groups, namely, experimental group I, experimental group II, experimental group III and control group.

Experimental group I served as aerobic training group, Group - II, served as anaerobic training group, group III served as combined group of aerobic and anaerobic training and the fourth group served as control group. Pre tests were conducted for all the 60 subjects on red blood cells. After the experimental period of 12 weeks post test were conducted and the score was recorded. Red blood cells were assessed by Laboratory – Test (Haemocytometer) in numbers. The pre and post test randomized control group design was use as experimental design. No attempt was made to divide the groups in any manner. The collected data from the four groups prior to and immediately after the training programme on selected criterion variables were statistically analyzed with dependent.

'T' test to find out the significant improvement between pre and post test means of the both groups and analysis of co variance (ANCOVA) was used to find out the significant difference between experimental and control groups. Whenever the 'F' ratio for adjusted test was found to be significant, the Scheffe's test was applied as post-hoc test to find out paired mean difference. In all the cases 0.05 level of significant was fixed to test the hypothesis.

Results and Discussion

Experimental Approach to the Problem

Table 1 presents per and post test means, standard deviations and dependent 't' test values on red blood cells of experimental and control groups.

Table 1 indicates that, they obtained t-test value of aerobic, anaerobic and combined training groups are 15.33,4.41and 12.79respectively which are greater than tabulated t- value of 2.14 with df 14 at .05 level of confidence. This means that the aerobic, anaerobic and combined training groups had effects on participants' red blood cells. However control group did not show any significant improvement on red blood cells because they did not undergo any special Training.

Table 1: Scores Mean, Standard Deviation and Dependent 'T' Test Values on Red Blood Cells among Experimental and Control Groups

Tests	Aerobic Training		Anaerobic Training		Combined Training		Control Group	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre Test	4.34	0.38	4.47	0.37	4.47	0.38	4.46	0.30
Post Test	4.42	0.37	4.61	0.42	4.58	0.29	4.46	0.30
T - Test	15.33*		4.41*		12.79*		1.87	

*Significant at 00.05 level. The table value required at 00.05 level with df 14 is 2.14.

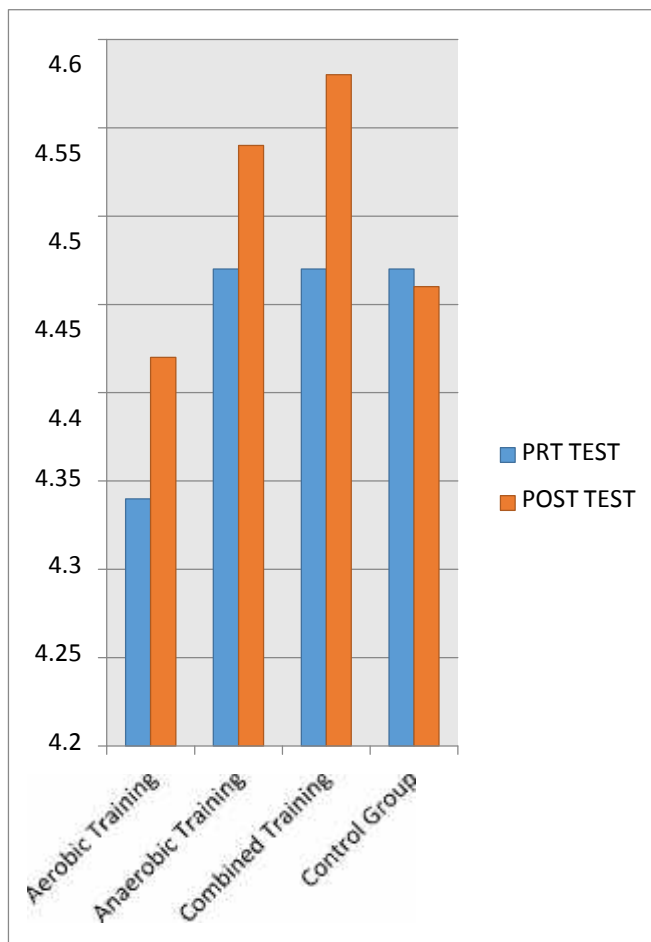


Figure 1: Bar Diagram Illustrates Mean Values of Pre And Post Test of Aerobic, Anaerobic, Combined Training and Control Group on Red Blood Cells Among Hockey

Adjusted Post Test Means				Sources of variance	sum of square	df	Mean squares	F ratio
Aerobic Group	Anaerobic Group	Combined Group	Control Group					
4.51	4.56	4.55	4.43	Between	0.16	3.	0.05	119.21*
				within	0.02	55	0.00	

*Significant at 00.05 level. The table value required at 00.05 level with df 3 & 55 is 2.78.

Figure 1 illustrate pre and post-test means aerobic, anaerobic and combined training groups and control group on red blood cells of hockey players.

The statistical analysis comparing the initial and final means of due to red blood cells combined effect of aerobic and anaerobic training presented in Table 2.

Conclusions

The following conclusions were derived from the present study.

1. The control group did not showed any significant improvement on any of the red blood cells among Tirunelveli district players.
2. The aerobic training group had shown significant improvement on red blood cells among district level Hockey players.
3. The anaerobic training group had shown significant improvement on red blood cells, among district level hockey players.
4. The combined group of aerobic and anaerobic training group had shown significant improvement on red blood cells among district level hockey players.

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Physiological Parameter Response to the Aerobic Training on Obese Boys

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Abstract

This study investigated physiological parameter response to the aerobic exercise on obese boys. To achieve the purpose of the study 30 obese boys were selected from Coimbatore district and their aged ranged between 14 to 17 years. The subjects were randomly assigned to two equal groups (n=15). Group- I underwent aerobic exercise group (AEG) and Group - II was acted as control group (CG). The aerobic exercise was given to the experimental group for 3 days per week (Monday, Wednesday and Friday) for the period of twelve weeks. The control group was not given any sort of training except their routine work. The physiological parameters were vital capacity was assessed by wet spirometer and the unit of measurement was in ml, resting pulse rate were assessed by radial pulse the unit of measurement was in numbers assessed before and after training period of 12 weeks the data collected from the subjects was statistically analysed with 't' test to find out significant improvement if any at 0.05 level of confidence. The result of the vital capacity and resting pulse rate speculated significant improvement due to influence of aerobic exercise with the limitations of (diet, climate, life style) status and previous training. The result of the present study coincide findings of the investigation done by different experts in the field of sports sciences. Influence of aerobic exercise significantly improved vital capacity and resting pulse rate of obese boys.

Keywords: Aerobic exercise, Vital capacity, Resting pulse rate and Obese.

1. Introduction

Obesity and overweight are defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), a person's weight (in kilograms) divided by the square of his or her height (in metres). A person with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is considered overweight.

Obesity and overweight are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. Once considered a problem only in high income countries, overweight and obesity are now dramatically on the rise in low- and middle-income countries, particularly in urban settings. It is widely accepted that increase in obesity results from an imbalance between energy intake and expenditure, with an increase in positive energy

balance being closely associated with the lifestyle adopted and the dietary intake preferences. However, there is increasing evidence indicating that an individual's genetic background is also a factor in determine obesity risk.

Aerobic exercise has the ability to use the maximum amount of oxygen during exhaustive work. Major health benefits of aerobic exercise, such as gaining more efficient lungs by maximizing breathing capacity, thereby increasing ability to ventilate more air in a shorter period of time. As breathing capacity increases, one is able to extract oxygen more quickly into the blood stream, increasing elimination of carbon dioxide. One of the major benefits of aerobic exercise is that body weight may decrease slowly; it will only decrease at a rapid pace if there is a calorie restriction, therefore reducing obesity rates.

Aerobic Exercise

Aerobic exercise (also known as cardio) is physical exercise of low to high intensity that depends primarily on the aerobic energy-generating process. "Aerobic" means "relating to, involving, or requiring free oxygen", and refers to the use of oxygen to adequately meet energy demands during exercise via aerobic metabolism. Generally, light-to-moderate intensity activities that are sufficiently supported by aerobic metabolism can be performed for extended periods of time. What is generally called aerobic exercise might be better termed "solely aerobic", because it is designed to be low-intensity enough so that all carbohydrates are aerobically turned into energy. When practiced in this way, examples of cardiovascular or aerobic exercise are medium to long distance running or jogging, swimming, cycling, and walking. With aerobic exercise the heart becomes more efficient at functioning, and blood volume, hemoglobin and red blood cells increase, enhancing the ability of the body to transport oxygen from the lungs into the blood and muscles. Metabolism will change and enable consumption of more calories without putting on weight. Aerobic exercise can delay osteoporosis as there is an increase in muscle mass, a loss of fat and an increase in bone density. With these variables increasing, there is a decrease in likelihood of diabetes as muscles use sugars better than fat. One of the major benefits of aerobic exercise is that body weight may decrease slowly; it will only decrease at a rapid pace if there is a calorie restriction, therefore reducing obesity rates.

Methodology

Experimental Approach to the Problem

In order to address the hypothesis presented herein, we selected 30 obese boys were selected from Coimbatore district and their aged ranged between 14 to 17 years. The subjects were randomly assigned to two equal groups (n=15). Group- I underwent aerobic exercise group (AEG) and Group - II was acted as control group (CG). The aerobic exercise was given to the experimental group for 3 days per week (Monday, Wednesday and Friday) for the period of twelve weeks. The control group was not given any sort of training except their routine work.

Design

The evaluated physiological parameters were vital capacity was assessed by wet spirometer and the unit of measurement was in ml, resting pulse rate were assessed by radial pulse the unit of measurement was in numbers. The parameters were measured at baseline after 12 weeks of aerobic exercise were examined

Training Programme

The training programme was lasted for 45minutes for session in a day, 3 days in a week for a period of 12 weeks duration. These 45 minutes included 10 minutes warm up, 25 minutes aerobic exercise and 10 minutes warm down. Every three weeks of training 5% of intensity of load was increased from 65% to 80% of work load. The equivalent in specific training is the length of the time each action in total 3 day per weeks (Monday, Wednesday and Friday).

Statistical Analysis

The collected data before and after training period of 12 weeks on the selected variables due to the effect of specific training was statistically analyzed with 't' test to find out the significant improvement between pre and post test. In all cases the criterion for statistical significance was set at 0.05 level of confidence. ($P < 0.05$).

Table I reveals the computation of mean, standard deviation and 't' ratio on selected physiological parameters namely vital capacity and resting pulse rate of experimental group. The obtained 't' ratio vital capacity and resting pulse rate catch were 8.48 and 6.56. The required table value was 2.14 for the degrees of freedom 1 and 14 at the 0.05 level of significance. Since the obtained 't' values were greater than the table value it was found to be statistically significant. Further the table the computation of mean, standard deviation and 't' ratio on selected physiological parameters namely vital capacity and resting pulse rate of control group. The obtained 't' ratio vital capacity and resting pulse rate catch were 0.71 and 0.82. The required table value was 2.14 for the degrees of freedom 1 and 14 at the 0.05 level of significance. Since the obtained 't' values were greater than the table value it was found to be statistically not significant.

Group	Variables	Mean	N	Std. Deviation	Std. Error Mean	‘t’ ratio
Experimental Group	Pre test	70.73	15	2.12	0.54	8.48*
	Post test	68.26	15	1.43	0.37	
	Pre test	5.12	15	0.31	0.08	6.56*
	Post test	5.62	15	0.29	0.07	
Control Group	Pre test	72.73	15	2.12	0.54	0.71
	Post test	72.73	15	2.44	0.63	
	Pre test	5.27	15	0.29	0.07	0.82
	Post test	5.26	15	0.42	0.10	

*significant level 0.05 level degree of freedom (2.14,1 and 14)

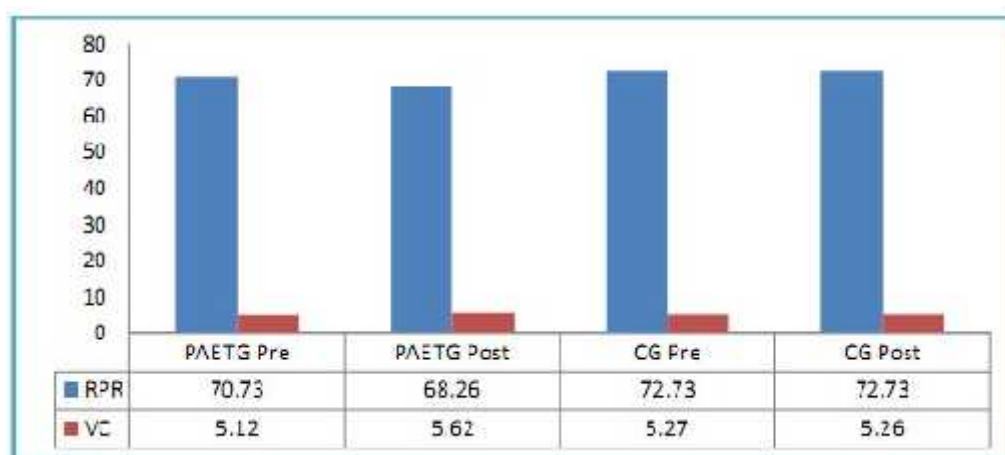


Figure – I Bar diagram showing the mean value on physiological parameters of obese boys on experimental group and control group (Scores in numbers)

Discussion and Findings

The present study experimented the impact of twelve weeks aerobic exercise on the selected physiological parameters of obese boys. The results of this study indicated that aerobic boys is more efficient to bring out desirable changes over the vital capacity and resting pulse rate of male cricket players.

In the present study, aerobic exercise improved alternate vital capacity and resting pulse rate by over 16.15% and 131 by findings

significant difference when comparison between baseline and post line. However, there were no statistically significant changes in vital capacity and resting pulse rate of control group.

The finding of the present study had similarity with the findings of the investigators referred in this study. Harsoda et al., (2016) the longitudinal purposeful physical exercises significantly improve the cardiorespiratory efficiency in sedentary persons amongst different modes of aerobic exercises. Umang et al., (2015) concluded from the present study that there is a

significant increase in vital capacity and physical domain of health related quality of life in asymptomatic individuals with sedentary lifestyle as an effect of moderate intensity aerobic exercises. Guner et al., (2018) found that long-term aerobic exercise and core strength exercises in sedentary women developed RHR and VO₂max capacities and FEV and FEV₁ respiratory parameters. It has also been found that aerobic capacity and forced vital capacity have developed parallel with each other. For this reason, both exercise types can be recommended to sedentary women to improve their aerobic and vital capacities.

Conclusions

Based on the findings and within the limitation of the study it is noticed that practice of SAQ with specific skill training helped to improve selected physiological parameters of obese boys. It was conducted that the significant improvements in the alternate vital capacity and resting pulse rate of obese boys due to the influence of aerobic exercise. Further, it also conducted that the eight weeks of aerobic exercise significant improvement in the selected physiological parameters of obese boys.

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Effect of Circuit Training on Selected Physical Fitness Variables among Athletes

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Abstract

The purpose of the study was to find out the impact of circuit training on selected physical fitness variable among athletes. A total of thirty athletes from Virudhunagar district schools were selected randomly as subjects. The age of the students ranged from 14 to 16 years. The selected subjects were divided into two groups namely circuit training group and control group, Group A underwent circuit training for eight weeks of two days per weeks. Group B acted as control group, who were not engaged in any special activities other than their daily routine. The Selected performance related fitness variable namely speed and power were measured by 50 yards dash and vertical jump test. The data were collected from each subject before and after the training period and statistically analyzed by dependent 't' test which is used to find out the significant improvement on selected criterion variables and Analysis of Covariance (ANCOVA) was used to find out the significant difference between the experimental and control groups on each variables separately, All the cases 0.05 level of confidence was fixed as a level of confidence to test the hypotheses. It was found that there was a significant improvement in circuit training group on selected performance related fitness variable among athletes. It was found that there was a significant difference between the circuit training and control groups on selected performance related fitness variable.

Keywords: Circuit Training, Speed, power and athletes.

1. Introduction

A variety of training regimens are commonly used to improve power and work output of the athlete. Whether in sprinting, jumping, or throwing, the ability of the athlete to accelerate one's own body, an opponent, or an implement is crucial to sport performance. Circuit training is a type of training that involves a series of low- to high-intensity workouts interspersed with rest or relief periods. The high-intensity periods are typically at or close to anaerobic exercise, while the recovery periods involve activity of lower intensity.

Methodology

Subjects and Variables

A total of thirty athletes from virudhunagar district schools were selected randomly as subjects. The age of the students ranged from 14 to 16 years. The selected subjects were divided into two groups namely circuit training group and control group, Group A underwent circuit training

for eight weeks of two days per weeks. Group B acted as control group, who were not engaged in any special activities other than their daily routine. The Selected as criterion variable namely speed and power were measured by 50 yards dash and vertical jump test.

Training Programme

The training program was scheduled for one session a day each session lasted between forty five minutes to one hour approximately. Training programme was administered to the athletes for eight weeks with two training units per week. The circuit training exercises are squat, push-ups, jumping jack, push ups, lunges, plank and side lifts.

Statistical Technique

The data were collected from each subject before and after the training period and

statistically analyzed by dependent 't' test which is used to find out the significant improvement on selected criterion variables and Analysis of Covariance (ANCOVA) was used to find out the significant difference between the experimental and control groups on each variables separately. All the cases 0.05 level of confidence was fixed as a level of confidence to test the hypotheses.

Analysis of The Data

The analysis of dependent 't' test on the data obtained for speed and power of the pre-test and post-test means of circuit training and control groups have been analysed and presented in table I.

The Table-I show that the pre-test mean value of performance related fitness variable namely speed and power in circuit training group and control group are 7.55 & 7.621 and 42.93 & 41.8 respectively and the post test means are 7.45 & 7.622 and 49.13 & 41.6 respectively. The obtained dependent t-ratio values between the pre and post test means of speed and Power in circuit training group are 7.26 and 8.19. The obtained dependent t-ratio values between the pre and post test means of speed and Power in control group are 0.07 and 0.31 respectively. The table value required for significant difference with df 14 at 0.05 level is 2.145.

However, the control group has not improved significantly because the obtained 't' value is less than the table value, as they were not subjected to any specific training. The analysis of covariance on speed and Power of circuit training and control groups have been analysed and presented in Table II.

The table II shows that the adjusted post test means of speed and agility of circuit training and control groups are 7.48 & 7.58 and 48.64 & 42.09 respectively. The obtained 'F' ratio value of speed and agility are 35.35 and 25.08 which are higher than the table value of 4.21 with df 1 and 27 required for significance at 0.05 level. Since the value of F- ratio is higher than the table value, it indicates that there is significant difference among the adjusted post test means of circuit training and control groups on selected performance related fitness variable namely speed and power. The results of the study showed that there was a significance difference between the adjusted post test mean of circuit training group and control group on speed and power among athletes. The pre, post and adjusted post test mean value on Speed and power are graphically presented in figure- I & II.

S.No	Variable	Test	Circuit Training group	Control group
1.	Speed	Pre test mean	7.55	7.621
		Post test mean	7.45	7.622
		't' test	7.26*	0.07
2	Power	Pre test mean	42.93	41.8
		Post test mean	49.13	41.6
		't' test	8.19*	0.31

* Significant at 0.05 level. (The table value required for .05 level of significance with df 14 is 2.145).

Since, the obtained 't' ratio value of experimental group is greater than the table value, it is understood that circuit training group had significantly improved the speed and Power.

S.No	Variable	Adjusted post test mean		Source	SS	df	MS	F
		DJT	CON					
1.	Speed	7.48	7.58	SSB	0.08	1	0.08	35.35*
				SSW	0.06	27	0.0022	
2.	Power	48.64	42.09	SSB	319.85	1	319.85	49.34*
				SSW	175.04	27	6.48	

*Significant at .05 level of confidence (The table values required for significance at .05 level of confidence with df 1 and 27 is 4.21)

Fig-1 Mean Values of Interval Training Group and Control Group on Speed

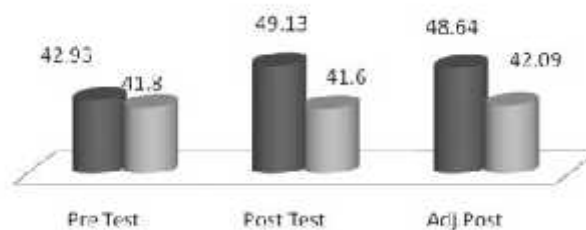
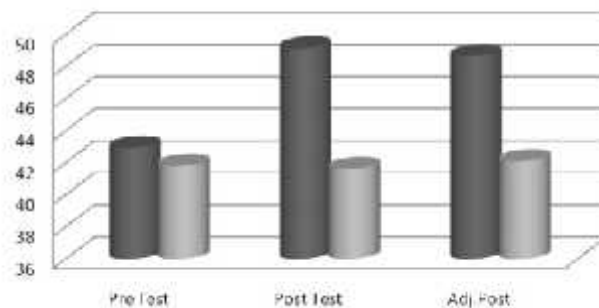


Fig-1 Mean Values of Interval Jump Training Group and Control Group on Power



Discussion

A wide variety of training studies shows that circuit can improve performance in vertical jumping, long jumping, sprinting and sprint cycling. It also appears that a relatively small amount of circuit training is required to improve performance in these tasks. Just one or two types of circuit exercise completed 1-3 times a week for 6-12 weeks can significantly improve motor performance (Blackey & Southard, 1987; Gehri et al., 1998; Matavulj et al., 2001).

In addition, several studies on circuit training have demonstrated that a significant increase in vertical jump height of ~10% was accompanied with similar increase in sport-specific jumping (Bobbert, 1990; Little, Wilson & Ostrowski, 1996) sprinting (Chimera et al., 2004; Kotzamanidis, 2006) and distance-running performance. Also consistent with previous studies Abass (2009) found that circuits exercises (BWT) with depth jumping and rebound jumping characteristics

are best used in developing muscle strength of the lower extremities.

Conclusion

There was a significant improvement on speed and power due to the effects of the circuit training among athletes. There was a significance difference between circuit training group and control group on speed and power among athletes.

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Conflict of interest

None of the authors have any conflicts of interest to declare.

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Effects of Transcutaneous Electrical Nerve Stimulation and Massage on Delayed Onset Muscle Soreness Among College Men

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Abstract

Delayed onset muscle soreness also sometimes called muscle fever was the pain or discomfort often felt 24 to 72 hours after exercising and subsides generally within two to three days. It was commonly thought to be caused by lactic acid buildup; however, lactic acid disperses fairly rapidly; it could not explain pain experienced days after exercise, and some concentric-only exercises produce lactic acid, but rarely result in delayed onset muscle soreness. The study was to find out the effects of transcutaneous electrical nerve stimulation and massage on delayed onset muscle soreness among college men. Forty-five subjects were selected from the various sports teams, Ayya Nadar Janaki Ammal College, Sivakasi, Virudhunagar District. To achieve the purpose of this study, the investigator creating the delayed onset muscle soreness for the subjects and equally divided into three groups, namely Control group, Experimental group I, Experimental group II. Experimental group I was given transcutaneous electrical nerve stimulation treatment for three days. Experimental group II was given massage treatment for three days. The dependent variables selected for this study were pain and flexibility. The researcher creates the delayed onset muscle soreness for the subjects under study. After creating delayed onset muscle soreness the experimental period was restricted to three days. The collected data from the three groups prior to and immediately after the training programme on selected criterion variables were statistically analyzed with analysis of covariance (ANCOVA). The result showed significant differences due to the effects of transcutaneous electrical nerve stimulation and massage on reducing the pain and improving flexibility of the school boys.

Keywords: Transcutaneous Electrical Nerve Stimulation (TENS), Massage, Delayed Onset Muscle Soreness (DOMS), Pain and Flexibility.

1. Introduction

Now a day's most of the college players are suffered by delayed onset muscle soreness due to lack of warm up and warm down. Delayed onset muscle soreness also sometimes called muscle fever was the pain or discomfort often felt 24 to 72 hours after exercising and subsides generally within two to three days. It was commonly thought to be caused by lactic acid buildup; however, lactic acid disperses fairly rapidly; it could not explain pain experienced days after exercise, and some concentric-only

exercises produce lactic acid, but rarely result in delayed onset muscle soreness.

Delayed onset muscle soreness describes a phenomenon of muscle pain, muscle soreness or muscle stiffness that was felt 12-48 hours after exercise, particularly at the beginning of a new an exercise program, after a change in sports activities or after a dramatic increase in the duration or intensity of exercise. The delayed onset muscle soreness was generally at its worst within the first two days following the activity and subsides over the next few days. Delayed onset

muscle soreness was quite common and quite annoying, particularly for those beginning an exercise program or adding new activities.

Delayed onset muscle soreness is thought to be a result of microscopic tearing of the muscle fibers. Any movement or physical activity weren't used can lead to delayed onset muscle soreness, but eccentric muscle contractions (movements that cause muscle to forcefully contract while it lengthens) seem to cause the most soreness. Examples of eccentric muscle contractions include going down stairs, running downhill, lowering weights and the downward motion of squats and push-ups. In addition to small muscle tears there can be associated swelling in a muscle which may contribute to soreness.

Transcutaneous (through the skin) electrical nerve stimulation sends a painless electrical current to specific nerves. The current may be delivered intermittently. The mild electrical current generates heat that serves to relieve stiffness, improve mobility and relieve pain. The treatment was believed to stimulate the body's production of endorphins or natural pain killers.

In all types of massage, the therapist has specific aims in mind and in sport they focus on the individual needs of the athlete. With the ever growing number of people taking part in sport, combined with the increasing competitiveness and intensity of physical exercise, the demand for sports massage was also increasing and becoming more and more recognized as a skill which may aid recovery and enhance performance.

Independent Variables:

- Transcutaneous Electrical Nerve Stimulation
- Massage

Dependent Variables:

- Pain
- Flexibility

Methodology

The purpose of the study was to find out the effects of transcutaneous electrical nerve stimulation and massage on delayed onset

muscle soreness among college men. Forty-five subjects were selected from the various sports teams, Ayya Nadar Janaki Ammal College, Sivakasi, Virudhunagar District. To achieve the purpose of this study, the investigator creating the delayed onset muscle soreness for the subjects and equally divided into three groups, namely Control group, Experimental group I, Experimental group II. Experimental group I was given transcutaneous electrical nerve stimulation treatment for three days as experimental intervention to find out the effect of transcutaneous electrical nerve stimulation on delayed onset muscle soreness. Experimental group II was given massage treatment for three days as experimental intervention to find out the effect of massage on delayed onset muscle soreness. The dependent variables selected for this study were pain and flexibility. The researcher creates the delayed onset muscle soreness for the subjects under study. After creating delayed onset muscle soreness the experimental period was restricted to three days. The collected data from the three groups prior to and immediately after the training programme on selected criterion variables were statistically analyzed with dependent 't' test and analysis of covariance (ANCOVA). In all the cases 0.05 level of significant was fixed.

Results and findings

1. Pain

The summary results for the pre and post tests on pain of experimental groups and control group were presented in Table – 1.

Figure 1 represent the pre and post test data of pain of transcutaneous electrical nerve stimulation group, massage group and control group. As compared to control group, there was a decrease in pain in experimental groups.

The results of the Analysis of Covariance scores on pain of experimental groups and control group were presented in Table – 2

Test	TENS Group	Massage Group	Control Group
Pre-Test Mean	8.26	7.73	8.33
Post-Test Mean	1.6	1.06	4.4



Figure 1 pre and post test data of pain of transcutaneous electrical nerve stimulation group, massage group and control group

Sources of Variance	DF	SS	MS	OF	T F
Total	N-1 45-1 44	SST_{YX} 134.80	3.063636364	8.400808573	3.22
Between	K-1 3-1=2 2	$SSBG_{YX}$ 38.51693374	19.25846687		
Within	N-K 45-3=42 42.00	$SSWG_{YX}$ 96.28306626	2.3		

Test	TENS Group	Massage Group	Control Group
Pre-Test Mean	56.06	56.13	56.06
Post-Test Mean	52.13	51.46	55.53

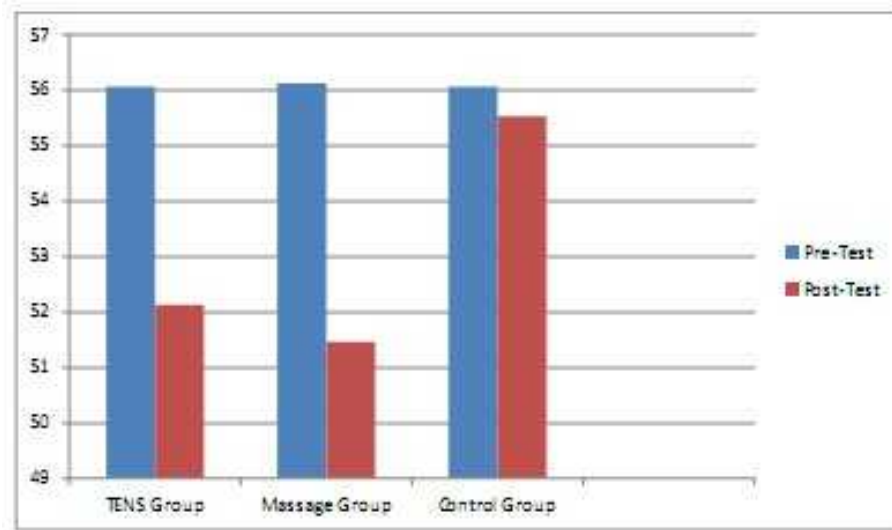


Figure 2 represent the pre and post test data of flexibility of transcutaneous electrical nerve stimulation group, massage group and control group

Table – 4 Results of analysis of covariance on flexibility among experimental and control groups

Sources of Variance	DF	SS	MS	OF	T F
Total	N-1 45-1 44	SST _{YX} 227.71	5.175155759	8.542683099	3.22
Between	K-1 3-1=2 2	SSBG _{YX} 65.84464523	32.92232262		
Within	N-K 45-3=42 42.00	SSWG _{YX} 161.8622081	3.9		
(The table value is 3.22 at 0.05 levels)					

Results of Pain

The obtained F-value is 8.40. Since the obtained F-ratio of 8.40 was higher than the required table value of 3.22 at 0.05 level of significance, so the transcutaneous electrical nerve stimulation and massage had definite effect to reduce the pain on delayed onset muscle soreness among the college men and a significant change was accepted.

2. Flexibility

The summary results for the pre and post tests on flexibility of experimental groups and control group were presented in Table - 3.

Figure 2 represent the pre and post test data of flexibility of transcutaneous electrical nerve stimulation group, massage group and control group. As compared to control group, there was a increase in flexibility in experimental groups.

The results of the Analysis of Covariance scores on flexibility of experimental groups and control group were presented in Table – 4

Results of Flexibility

The obtained F-value is 8.542. Since the obtained F-ratio of 8.542 was higher than the required table value of 3.22 at 0.05 level of significance, so the transcutaneous electrical nerve stimulation and massage had definite effect to increase the flexibility of joints among delayed onset muscle soreness for college men and a significant change was accepted.

Conclusions

On the basis of the interpretation of the data, the following conclusions have been made. Transcutaneous electrical nerve stimulation and massage were significantly reduced pain of the delayed onset muscle soreness among college men. Transcutaneous electrical nerve stimulation and massage has a significant effect in the improvement of the flexibility among the delayed onset muscle soreness for college men.

The result of the study also revealed that there were the significant desirable changes on pain and flexibility after the transcutaneous electrical nerve stimulation and massage. The pain of the subjects was significantly reduced after the three days treatments. The three days treatment program significantly improves the flexibility among the subjects

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Conflict of interest

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