ESTIMATION OF STRESS VULNERABILITY BASED ON SELECTED PHYSIOLOGICAL VARIABLES

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Abstract

The study was conducted on 50 subjects with a purpose to estimate the stress vulnerability by their selected physiological variables. The variables selected for the study were Systolic Blood Pressure, Diastolic Blood Pressure, Resting Heart Rate and Resting Respiratory Rate. To estimate the stress vulnerability by their selected physiological variables, Product Moment Method of Correlation, Multiple correlation and Regression Equation were used. It was concluded that: there exist a significant relationship between all selected physiological variables and stress vulnerability. Significant relationship between criterion variables (stress vulnerability) and independent variables (Systolic Blood Pressure, Diastolic Blood Pressure, Resting Heart Rate, and Resting Respiratory Rate) was found. To estimate the stress vulnerability by their selected physiological variables regression equation was also framed.

INTRODUCTION

Stress vulnerability is defined as individual's ability related to:

1. Unprotected to stress
2. Unguarded to stress
3. Helpless to stress
4. Defenseless to stress
5. At risk to stress
6. Thin skinned to stress
7. Touchy to stress

OBJECTIVE OF THE STUDY

The purpose of the study was to estimate the stress vulnerability by their selected physiological variables.

METHODOLOGY SUBJECTS

For the purpose of the study, total of 50 subjects were selected. Age of the subjects was ranging from 18 to 25.

TEST FOR STRESS VULNERABILITY

Stress vulnerability scale developed by Lyle H.Miller and Alma Dell Smith, Bosten University Medical Center was adopted to collect data for Stress Vulnerability.

VARIABLES

The following Physiological Variables were selected:

1. Systolic Blood Pressure
2. Diastolic Blood Pressure
3. Resting Heart Rate
4. Resting Respiratory Rate

STATISTICAL ANALYSIS

To estimate the Stress Vulnerability by their selected Physiological Variables, Product Moment Method of Correlation, Multiple correlation and Regression Equation were used.

Findings

The data was analyzed using product moment method of correlation to find out relationship of Selected Physiological Variables to Stress Vulnerability, the results pertaining to the relationship of Selected Physiological Variables to Stress Vulnerability are presented in Table-1.

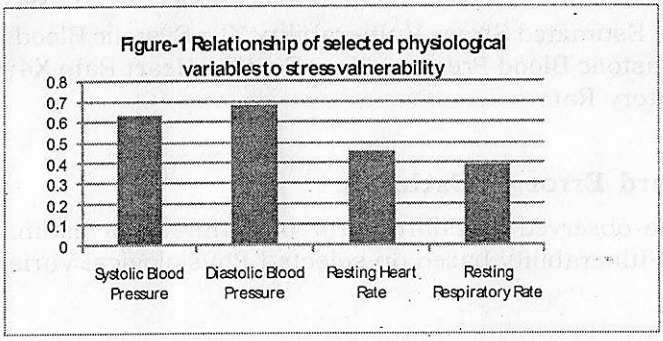
Table 1

Relationship of Selected Physiological Variables to Stress Vulnerability

Variables	Correlation coefficient
Systolic Blood Pressure	0.6347*
Diastolic Blood Pressure	0.6837*
Resting Heart Rate	0.4601*
Resting Respiratory Rate	0.3967*

* Significant at .05 level r.05 (48) = .27

Table -1 clearly indicates that there exist a significant relationship between all selected Physiological Variables and Stress Vulnerability as the correlation coefficient value were found greater than the tabulated value .27 at .05 level of significance.



Combined contribution of Selected Physiological Variables to Stress Vulnerability is presented in Table -2

Table -2

Combined contribution of Selected Physiological Variables to Stress Vulnerability

Criterion Variables	Independent variables	Coefficient of multiple correlation
Stress vulnerability(C)	Systolic Blood Pressure	0.7720*
	Diastolic Blood Pressure	
	Resting Heart Rate	
	Resting Respiratory Rate	

* Significant at .05 level. r.05 (48) = .27

Table-2 indicates that significant relationship was found between criterion variables (Stress Vulnerability) and independent variables (Systolic Blood Pressure, Diastolic Blood Pressure, Resting Heart Rate and Resting Respiratory Rate) as coefficient of multiple correlation was found 0.7720 which is higher than the tabulated value 27.

Multiple Regression Analysis;

The multiple regression equation for predicting Stress Vulnerability on the basis of relative contribution of selected Physiological Variables resulted in the following: Y = -57.4625 +0.51986 Xi +0.3408 X2 + 0.13366 X3 -0.8827 X4 Where,

Y = Estimated Stress Vulnerability X] = Systolic Blood Pressure Xa = Diastolic Blood Pressure Xs = Resting Heart Rate X4= Resting Respiratory Rate

Standard Error of Estimate

The observed standard error of estimate for estimating the Stress Vulnerability based on selected Physiological Variables was 3.0171.

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A STUDY OF FREQUENCY OF INJURIES IN FOOTBALLERS OF HIMACHAL PRADESH, INDIA

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Key Words: Sports injuries. Footballers.

INTRODUCTION

Football is the world's biggest team ball game and attracts people tremendously. In January 2007, there were 207 associations affiliated to FIFA (Federation of International Football Associations). Playing football is associated with a certain risk players in England and showed that the overall injury risk was approximately 1000 higher than high risk industrial occupations. The incidence of sports injury is usually expressed as the number of injuries per 1000 hours of player exposure (van Mechelen et al., 1992; Inklaar, 1994 and Dvorak and Junge 2000). Their studies reported that the injury incidence for adult male players ranged between 1.8-7.6 injuries per 1000 training hours. Hagglund et al. (2003, 2005, 2006 and 2007) extensively studied the frequency of injuries in footballers. In fact, the findings are used in the safety measures of footballers. In the present study an attempt has been made to estimate the frequency of injury in the footballers and to provide adequate information to the sports administrations, coaches and players about the patterns of sports injury in this ball game in order to avoid injuries.

MATERIALS AND METHODS

The samples for the present study were collected from the Inter-College Football Competition, held in Dharmsala, Himachal Pradesh, India, between 27-31 October, 2007. There were 30 teams participated in that competition, comprising 16 footballers in each team. So the total number of footballers participated in the competition were 480. During the competition, all injuries were recorded and a pre-tested semi-structured questionnaire was administered to all the injured footballers to gather necessary information. Types of injury were identified by medical officer deputed for the competition and the information was subsequently collected by JA. For the analyses of data, simple frequency estimation was done with the calculator.

Table 1: –

Frequency of injuries in state and national level footballers.

Injuries	State (n=22, 4.58%)	National (n=120, 25.0%)	Total (n=142, 29.58%)
	Abs.No. (%age)	Abs. No. (%age)	Abs. No. (%agre)
Knee injury	15(3.12)	5(1.04)	20(4.17)
Soft tissue injury	14 (2.92)	-	14(2.92)
Bone injury	14 (2.92)	1 (0.21)	15(3.12)
Fractures	3 (0.62)	-	3 (0.62)
Ankle injury	28 (5.83)	9(1.87)	37(7.71)
Shoulder injury	5 (1.04)	4 (0.83)	9(1.87)
Muscle injury	41 (8.54)	7(1.46)	48 (10.00)
Ligament injury	29 (6.04)	5 (1.04)	34 (7.08)
Skin injury	32 (6.67)	7(1.46)	39(8.12)
Total	182 (37.92)	38 (7.92)	220 (45.83)

Table 2 – Distribution of injuries according to the habitat of the injured footballers

Injuries	Defenders (n=45,	Mid-fielders	Forwards (n-49, 10.21%)	Goal keepers	Total (n=142,
	Abs.No. (%age)	Abs. No. (%age)	Abs.No. (%age)	Abs.No. (%age)	Abs.No. (%age)
Knee injury	7(1.46)	7 (1.46)	10 (2.08)	3 (0.62)	27 (5.62)
Soft tissue injury	3 (0.62)	4 (0.83)	6(1.25)	1 (0.20)	14 (2.92)
Bone injury	6(1.25)	2 (0.42)	5(1.04)	3 (0.62)	16(3.33)
Fractures	-	-.	2 (0.42)	1 (0.20)	3 (0.62)
Ankle injury	1 1 (2.29)	1 1 (2.29)	12 (2.50)	3 (0.62)	37(7.71)
Shoulder injury	2 (0.42)	4 (0.83)	1 (0.20)	1 (0.20)	8(1.67)
Muscle injury	15(3.12)	1 1 (2.29)	15(3.12)	5(1.04)	46 (9.58)
Ligament injury	12 (2.50)	8(1.67)	8(1.67)	4 (0.83)	32 (6.67)
Skin injury	9(1.87)	13(2.71)	1 1 (2.29)	4 (0.83)	37(7.71)
Total	65(13.54)	60(12.50)	70 (14.58)	25(5.21)	220 (45.83)

Table 3

Distribution of injuries according to the habitat of the injured footballers

Injuries	Rural (n=1 03, 21.46%)	Urban (n=39, 8.12%)	Total (n=142, 29.58%)
Knee injury	15(3.12)	7(1.46)	22 (4.58)
Soft tissue injury	1 1 (2.29)	3 (0.62)	14(2.92)
Bone injury	8(1.67)	7(1.46)	15(3.12)
Fractures	2 (0.42)	2 (0.42)	4(1.87)
Ankle injury	25(5.21)	9(1.87)	34 (7.08)
Shoulder injury	8(1.67)	2 (0.42)	10(2.08)
Muscle injury	29 (6.04)	17(3.54)	46 (9.58)
Ligament injury	25 (5.21)	10(2.08)	35 (7.29)
Skin injury	30 (6.25)	10 (2.08)	40 (8.33)
Total	153(31.87)	67(13.96)	220

RESULTS AND DISCUSSION

Table 1 shows the frequency of injuries in state and national level footballers. In state level players, the maximum frequency of injuries was recorded in muscle injury (8.54%) followed by skin injury (6.67%), ligament injury (6.04%), ankle injury (5.83%), and the minimum frequency was found in fractures (0.62%). In national level footballers, the maximum frequency of injury was registered in ankle injury (1.87%), followed by muscle and skin injuries (1.46% each), knee and ligament injuries (1.04% each), and the minimum in soft tissue injury where no injury was recorded. When the total number of injured footballers was considered, the maximum frequency was found in muscle injury (10.00%), followed by skin injury (8.12%), ankle injury (7.71%), ligament injury (7.08%), and the minimum in fractures (0.62%).

The distribution of injuries according to the playing positions of the footballers was shown in Table 2. The defenders had the maximum frequency of injury was recorded in muscle injury (3.12%), followed by ligament injury (2.50%), ankle injury (2.29%),

knee injury (1.46%), and the minimum in fractures where no injury was recorded. In the mid-fielders, the maximum frequency of injury was found in skin injury (2.71%), followed by ankle and muscle injuries (2.29% each), ligament injury (1.67%) and the minimum, once again, in fractures with no injury. The forwards had the maximum frequency of injury in muscle injury (3.12%), followed by ankle injury (2.50%), skin injury (2.29%), knee injury (2.08%) and the minimum in shoulder injury (0.20%). The goal keepers had the maximum frequency of injury in muscle injury (1.04%), followed by ligament and skin injuries (0.83% each), knee, bone and ankle injuries (0.62% each) and the minimum in soft tissue, fractures and shoulder injuries (0.20% each). Muscle injury had the maximum frequency (9.58%) in over all injured footballers, followed by ankle and skin injuries (7.71%), ligament injury (6.67%), knee injury (5.62%) and the minimum in fractures (0.62%). The Forwards had the maximum frequency of injury (14.58%), followed by defenders (13.54%), mid-fielders (12.50%) and the goal keepers (5.21%).

Table 3 gives the distribution of injuries according to the habitat of the injured footballers. The injured footballers residing at the rural areas had the maximum frequency of injury in skin injury (6.25%), followed by muscle injury (6.04%), ankle and ligament injuries (5.21% each), knee injury (3.12%), and the minimum in fractures (0.42%). The urban injured footballers had the maximum frequency of injury in muscle injury (3.54%), followed by ligament and skin injuries (2.08% each), ankle injury (1.87%), knee and bone injuries (1.46% each), and the minimum in fractures (0.42%). The rural injured footballers had predominantly higher frequency of all injuries (31.87%) than their urban counterparts (13.96%). Predisposing factors, in general, are subdivided into two categories: intrinsic, related to individual biological or psychosocial characteristics of a person such as age, joint instability, muscle strength asymmetry, previous injuries, inadequacy of rehabilitation or fitness, stress, and extrinsic, related to environmental variables, such as the level of play, exercise load, position played, standard of training, equipment, playing field conditions, rules and fouls. The injury risk in male elite footballers has been reported considerably (Lewin, 1989; Engstrom et al., 1990; Luthje et al., 1996 and Walden et al., 2005).Muscle injury has been reported as the most frequent injury in the footballers studied. In fact, muscle conditioning, and particularly resistance training, constitutes a significant part of football training, especially during the pre-season preparation period. Strengthening the muscle and connective tissues is believed to result in fewer muscle injuries.

Reduced muscle strength or muscle imbalance is commonly proposed risk factors for injury.

The distribution of frequency of injury playing position-wise showed that mid-fielders had the maximum frequency of injury. The reasons might be severe aggressiveness towards scoring the goal. Flexibility might be another reason as decreased range of motion (ROM) in hip abduction is reported to predispose to adductor strains. In fact, poor flexibility has been found to be a risk factor for hamstring and quadriceps strains.

Rural footballers were reported to have more frequency of injury than their urban counterparts. Inadequate training facility, playing conditions, injury rehabilitation might be the reasons behind this. Use of improper protective devices is another factor of injury. In rural areas this facility might not be available always. The findings of the present study may be useful as the safety measures of footballers, will provide adequate information to the sports administrations, coaches and players about the patterns of sports injury in order to avoid injuries.

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CONSTRUCTION OF KNOWLEDGE TEST ON RULES OF SQUASH FOR PHYSICAL EDUCATION STUDENTS

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Abstract

The purpose of the study was to construct a knowledge test to measure the knowledge of the rules of the Squash game of students of School of Physical Education, Devi Ahilya University, Indore.

After setting the objectives and contents, a test blueprint was prepared. As the subjects were from different classes of School of Physical Education, intensive instructional classes were conducted for the subjects cover various aspects of the squash game. This includes the rules and their interpretation, terminology's modern trends, and international and national governing bodies. Then 188 item objective test, subjected to careful analysis by the experts, was administered. All the subjects were given ample direction before completing the test within the allotted time of ninety minutes. Answers of the test were subjected to item analysis consisting of the difficulty rating and index of discrimination. Item Analysis was used to make decision about individual test item within the test as well as the worthiness of the test as a whole. For analyzing this difficulty rating and index of discrimination were employed. Difficulty Rating was determined by the percentage of students who have chosen the correct responses for a particular test item. The formula used was: DR = P / N.

Index of Discrimination was used to provide information about the high and low performance. On a specific test who answered each team item correctly. For index of discrimination the scores from the top and bottom 27% of the students, who appeared in the test were used.

The formula used was: ID = Cu - Cl / Nu

A total of 99 questions were deleted depending upon the results of item analysis.

The reliability of the test was established by using Split-Halves method, which was 0.546 or half of the test. Then the Spearman-Brown-Prophecy-Formula was used to predict reliability of the entire test, which was 0.706. The test was significant at 0.05 level of the confidence.

Introduction

Squash is a single or double game played in a 4 -wall court with a long-handled racket and a rubber ball that can be hit off any number of walls. Squash is an international game that is governed by the World Squash Federation.

In any game, be it indoor or outdoor, to have complete command, perfection is needed. This perfection comes out through certain skills and techniques. It is apparently clear that if a sportsman wants to declare his mastery over any game, he will have to be well equipped with the knowledge of rules, skills and strategy of that particular game.

Evaluation in physical education cannot be completed without the use of knowledge tests. The measurement of knowledge of physical education activity classes is just as important as knowledge measurement in other subject areas.

This study may be useful for the physical education teachers and coaches of squash to evaluate the knowledge of their students/ trainees and to improve the instructional program accordingly. It may provide an appropriate objective knowledge test on the rules of squash for grading students of physical education colleges in India.

Fifty subjects of School of Physical Education, Devi Ahilya University, Indore were randomly selected to serve as subjects. The age of the subjects ranged between 18 to 25 years. All the subjects had regular theoretically classes during which different aspects of Squash were theoretically explained.

Materials and Methods

The knowledge test consisted of 188 objective type questions on rules of squash with its interpretations. The preliminary form of the test was circulated to the squash experts and test items were refined.

Before administering the test intensive instructional classes were conducted for the subjects to be well acquainted with the subject matter. Each explanation was taught with due explanation of the diagrams (wherever necessary).

Objective knowledge test was first administered to ten subjects to determine the clarity of question items and on that basis question items were refined. Then a trial run of the test was administered to all the subjects, which they answered in the allotted time of 90 minutes. These response sheets were then evaluated.

On the basis of the response scores, the question items were further subjected to careful item analysis. The items, which were found unsatisfactory after analyses were either be rejected or modified.

There were 188 objective type questions in the initial test. All the students were given example direction before administrating the test. The answers to be written in blank were provided with each question. All questions carried equal marks and maximum marks were 188. One point was awarded for each correct response. The sum of the total number of correct responses was the final score of each subject.

The range of scores for fifty examinees was 70 to 170. The mean score was 118.4.

Statistical Procedure

Item Analysis was used to make decision about individual test item within the test as well as the worthiness of the test as a whole. For analyzing this difficulty rating and index of discrimination were employed.

Difficulty Rating was determined by the percentage of students who have chosen the correct responses for a particular test item.

The formula used was : DR = P / N Where

DR = Difficulty Rating

P = Number of students answered an item correctly.

N = Number of students appeared for the test.

Index of Discrimination was used to provide information about the high and low performance. On a specific test who answered each team item correctly. For index of discrimination the scores from the top and bottom 27% of the students, who appeared in the

test were used. The formula used was:

ID = Cu -Cl /Nu

Where

ID = index of discrimination.

Cu = Number of correct response in the upper 27 %

Cl = Number of correct responses in the lower 27%

Nu = Total number of students in the upper group.

The reliability of the test was established by using split halves method, correlating between the correct odd and correct even number of items. Spearman-Brown-Prophecy- Formula was used.

rwt = 2 rht / 1 + rht Where

rwt = Reliability of whole test, rht = Reliability of half of the test.

Results

Forty-two items were eliminated on the basis of difficulty rating, which contained items answered correctly by the students above 80 percent and below 20 percent.

Eighty- items were discarded on the basis of index of discrimination in which poor students did well or better than upper group. (Value below than 30 %).

The revised test contained 89 objectives type questions in squash for college students of School of Physical Education.

Discussions

The findings of the study indicated that the degree of difficulty in rating for knowledge for the test questions ranged from 0.08 to 1.00. The mean of difficulty was 0.633. Those questions, which were answered correctly by more than 80 percent of subjects were judged to be too easy and answered correctly by less than 20 percent were considered too difficulty. A total of 42 test items were eliminated from the test.

Index of discrimination indicated those questions in which poor students did well or better than the subjects of the upper group and value is below than 0.30. Such items were also excluded from the test because such items failed to discriminate the abilities of good and poor subjects. A total of 80 questions were eliminated for this reason.

Thus a total of 99 items were discarded.

The value of coefficient of correlation of odd even number with 188 test items was 0.564, which yielded a reliability coefficient of 0.706 for the entire test. The coefficient of correlation by test - retest method with selected test items on 20 randomly selected students was 0.960.

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A CRITICAL ANALYSIS AND ASSESSMENT OF CARDIO- VASCULAR AND MOTOR FITNESS ABILITIES OF INTER - UNIVERSITY PLAYERS OF UNIVERSITY OF RAJASTHAN

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INTRODUCTION

LONG AGO PLATO OBSERVED

"The body needs to be vigorous in order to obey the Soul; a good servant ought to be revert. The weaker the body, the more it commands, the stronger it is, the better it obeys..... In order to think, we must exercise our limbs, our organs, which are the instrument of our intelligence. In order to derive all the advantage possible from these in instrument, it is necessary that the body which furnished them should be robust and sound.

An individual is a basic unit of the society. In the society he has to live cooperating with the others . A physically fit member of society, instead of being a burden on it, will be able to contribute his greatly in the achievement of its goals and objectives. A physically fit individual can prove a better worker, technician, doctor, engineer of a parent and can contribute towards the betterment of self, family or the institution where he works. Physical fitness is the natural outcome of a rich programme of physical education. It is the sum total of the condition of one's body judged in terms of age, height, weight and chest expansion absence of defects, defects, disease, constitution deflection or bodily infirmity. Full physically development, Vigour, vitality and radiant health should be seen in one who is physically fit. A great deal of confusion, vagueness and misconception exists in defying exactly and accurately the measuring of the term 'physical fitness'. The views on the subject can broadly be out fewer than three categories occupation, medical and physiological. From an occupational paint

of view 'physical fitness' is defined as the degree of ability to execute a specific physical task under specific conditions. Here physical fitness in any sphere is reflected the following words of Shri Ramakrishan:

"He who is soft and weak minded like the putted rice soaked in milk is good to nothing. He cannot achieve anything great. But the strange and virile one is heroic. He is the accomplisher in life."

METHODOLOGY

The present investigation was undertaken on inter-university players of the University of Rajasthan, Jaipur in the age range of 20-25 years. All subjects had different training programme (according to his/her game) for performance enhancement prior to this study.

To subjects were tested in motor fitness and physiological variables pre and post-intervention.

1. **Muscular Endurance** - Ability of a muscles or muscle group to repeat muscular contractors against a force or to sustain a contraction for time.
2. **Muscular Strength** - Maximum amount of force that can be exerted by a muscle or muscle group against a resistance during a single contraction.
3. **Cardio-** Vascular Endurance - Maximum functional capacity of the cardio - respiratory system to sustain work as physical activity involving large muscle group over an extended period.
4. **Flexibility-** Range of movement possible at a joint or joint.
5. **Agility** - Ability to change direction rapidly with control.
6. **Balance** - Ability the maintain equilibrium while stationary or moving.
7. **Power** - Ability to produce force at a fast speed, a combination of strength and speed usually applied during a short period.
8. **Speed** - Ability to move the body quickly.
9. **Reaction Time** - Time elapsed between the administration of a stimulus and the body's response to the stimulus.
10. **Co-ordination** - Ability to execute movement smoothly and efficiently.

RESULTS AND DISCUSSIONS

TABLE -1

Comparison of Cardio -Vascular Endurance of Individual and Team Game Players of University of the Rajasthan

12-Min. Run/Walk Test

Groups	N	Mean	S.D.	M.D.	SED	't' value
Ind. Game	60	49.98	9.97	0.11	1.28	0.01
Team Game	60	49.99	9.98		1.29	

* Significant at .05 levels.of (onzidlnce)

't' value at .05 (df-118)= 1.96

Table 1 reveals that in cardiovascular individual game, there is insignificant difference in the cardiovascular on individual game v/s team game, as the obtained value of 't' (0.01) was more less than the value of 1.96 required for 't' test to be insignificant at 0.05 level with 118 degree of freedom.

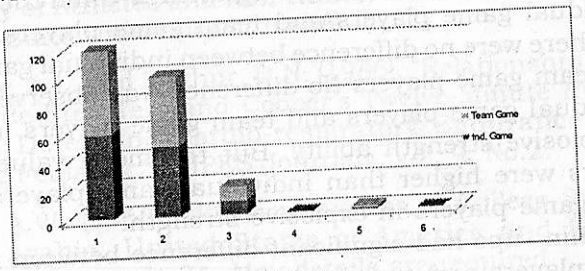

TABLE -2

Comparison of Vertical Jump, Chin - ups, Shuttle Run and Total Score (HC+R) Individual and Team Game Players of University of the Rajasthan in J.C.R. Test.

S.No.	J.C.R. Test	Group	N	Mean	S.D.	M.D.	SED	't'
1	Vertical jump (Score in Nos.)	Ind.Game	60	49.99	9.99	-0.1	1.29	-0.06
		Team Game	60	50.09	1.01		1.3	
2	Chin-ups (Score in Nos.)	Ind. Game	60	49.98	9.99	0.01	1.29	0.01
		Team Game	60	49.98	10.02		1.29	
3	Shuttle Run (Score in Sec.)	Ind. Game	60	49.98	9.98	0.21	1.27	-1.1
		Team Game	60	50.05	9.98		1.28	
4	Total Score J+C+R	Ind. Game	60	144.81	19.42	0.34	2.03	-0.01
		Team Game	60	150.15	14.68		2.52	

S. No.	Parameter	Control Value	
		Males	Females
1	Stroke Volume (ml)	79.5 + 13.6	56.5 + 14.32.
2	Cardiac Output (l/m)	6.56 +1.24	5.20 + 1.16

TABLE - 1

Level of significance between the Pre-test and Post-test of the Experimental Group in Cardiac Output (Lit./Min)

Experimental Group	N	Mean	S.D.	S.E., Mean	't' Value
Pre-test	30	7.327	4.7658	0.8701	-7.10**
Post- test	30	10.37	5.789	1.0569	

** Significant at 0.01 level of confidence Tabulated value at 0.01 level of significance at degree of freedom 29 is 2.75. Minus sign means in post test the particular variable was increased and vice-versa.

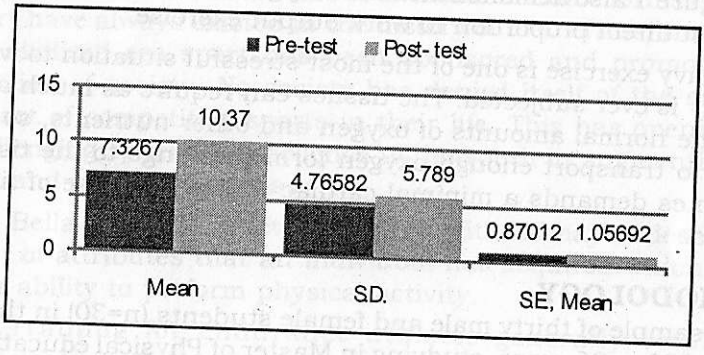

Fig. 1.1

Pre-test and Post-test mean scores of Cardiac Output in experimental group.

The pre-test and post-test mean differences in cardiac output for experimental group were 7.3267 and 10.37 respectively. The significance of difference between the pre-test and post-test score in cardiac - output were analyzed by applying 't' test for statistical significance.

Table 1.1 indicated that experimental group improved in the cardiac -output. Therefore, indicating that experimental group showed a significant increased in the cardiac - output score after 10 week training programme.

DISCUSSION AND FINDINs OF CARDIO-VASCULAR RESULTS

The experimental group showed a significant increase in Cardiac Output. The amount of blood pumped by the heart per minute (cardiac output) depends on the heart rate and stroke volume. It has been shown that the resting cardiac -output after aerobic training. This is mediated through inoculation of sympathovagal interplay in favour of the vagal tone which enhances performed endurance.

CONCLUSION

Within the limitations imposed by the subjects and the experimental conditions, the following conclusions were considered appropriate.

Interval training based on heart rate training zones is an effective method in developing CARDIO-VASCULAR, respiratory system, endocrine system and immune system of the sports men and women, in the age group of 22-26 years. The group which performed jogging, walking, running produced better results.

In brief, the present investigation evaluated the effects of interval training programme on cardio-vascular variables CO and SV of sports persons. By measuring all the variables before and after interval training, it was found that there was a significant difference in all the variables. This part needs elaborate discussion.

RECOMMENDATIONS:

In the light of the results of this study it is recommended that:-

1. Interval training based on heart rate zones may be employed as an effective method for developing cardio-vascular system, respiratory system, endocrine system and Hemato-Immunological functions for sports men. A research may be conducted in this area.
2. During the relief interval in interval running method, jogging in combination with Brisk - Walking and Jogging may be performed for achieving better results in developing cardio-respiratory endurance and related variables. A study may be conducted in area.
3. Additional research should be conducted, using beat-by-beat technology, in determining the factors that influence cardiac output, blood flow, RHR, SBP, DBP and TWBC, platelets Hemoglobin responses to incremental exercise.

4. A similar study may also be conducting by selecting other training programme.
5. It is strongly recommended that further research be conducted a larger scale to design, document and validate the results and findings of the present study.
6. A study may be undertaken to find out

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COMPARATIVE EFFECT OF RESISTANCE RUNNING METHODS ON DIFFERENT FORMS OF ENDURANCE

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ABSTRACT

The aim of the study was to investigate the comparative effects of resistance running methods of different forms of endurance. The present study deals with the improvement of basic endurance, strength endurance and speed endurance, strength endurance and speed endurance. The study was conducted on one hundred boys of 14-18 of years age group. Four experimental and one control group of 20 students in each group were randomly selected. Sand running, up hill running, Drag running and Running with weight - Jacket these four types of resistance running methods were used. The training was given for ten weeks three alternate days in each week. The six criterion measures were selected for the study i.e. fifty 1.5 mile run, six hundred yards run, chin ups, push ups and fifty yards run. To find out and compare the data 't' ratio and ANOVA were used. It was found that up hill running and sand running methods are more significantly useful to develop the Basic endurance, where as sand running and Drag running methods are most useful to develop speed endurance. The drag running methods have shown significant improvement for development of anaerobic capacity.

INTRODUCTION

Physical fitness is one's richest possession; it cannot be purchases, it has to be earned through a daily routine of physical exercises. It is self - evident that the fit citizens are a nation's best assets and the weak ones its liabilities. It is, therefore, the responsibility of every country to promote physical fitness of its citizens because physical fitness is the basic requirement for most of the tasks to be undertaken by a individual in his daily life. If a person's body is under-developed or grous soft or inactive and if he fails to develop his/her physical progress, he/she is undermining his /her capacity for thought and for work, which are of vital importance to one's own life and society in a welfare state.

OBJECTIVE

To study the effect of different resistance running methods to improve the basic endurance, speed endurance and strength endurance, the object was to find out the most appropriate method for developing the different forms of endurance.

METHODOLOGY

SELECTION OF SUBJECTS

One hundred male students of 9th to 12th Standard (14 to 18 years of age group) of Vidya Asharam School Jaipur (Raj). Were randomly selected as subjects of the study. These subjects were regular in games and sports activities, every day in the evening at the school playgrounds .

These one hundred subjects were divided into five groups by using random number table. Next , these groups were to be randomly assigned to experimental groups Group-1 sand running, Experimental Group -2 Up hill running, Experimental Group-3 Drag running, Experimental Group -4 Running with Weight Jacket and Group - V Control group.

S.No.	Pre-Test	Post – Test
1	Sand running (20)	Sand running (20)
2	Up hill running (20)	Up hill running (20)
3	Drag running (20)	Drag running (20)
4	Running with weight jacket	Running with weigh jacket (20)
5	Control Group (20)	Control Group (20)
	Total =100	**Total =100**

SELECTION OF CRITERIA

The following criterion measures were chosen for the investigation

1. 1.5 mile run (2414 Mts. run) for basic endurance
2. Six hundred yards run (550.46 Mts. run) for speed endurance
3. Sit ups for strength endurance
4. Chin ups for strength endurance
5. Push-ups for strength endurance
6 Fifty yards (45.87 Mts.) run-for speed and Anaerobic capacity

EXPERIMENTAL DESIGN

The present study is an experimental research project for which a random group method group method was used and five groups were formed.

The performances of all five groups were recorded at the beginning and at the completion of the experimental period of ten weeks' training.

STATISTICAL ANALYSIS

In order to nullify the hypothesis, analyses of variance were used as a statistical tool to find out most effective resistance running method. The levels of significance were set at. 05 for the precision of findings, for which the following statistical devices were used to analyze the data:-

1. T-test
2. ANOVA

RESULTS

The statistical analyses of data were collected on five groups of twenty subjects each. The four experimental groups were I sand running, II Uphill running, III Drag running, IV Running with weight Jacket and V acted as control group.

FINDINGS AND DISCUSSION

The mean differences of initial and final scores of the four experimental groups and a control group were tested by 't' test for finding out the significance of differences exhibited by the groups during the experimental period of six weeks under the given treatments.

The analysis of data of t test in the case of all the five groups employed in this study is presented in the table 1.

TABLE 1

VALUE OF T-TEST

S.No.	Variables	Training Methods				
		Sand Running	Up Hill Running	Drag Running	Running with weight Jacket	Control Group
1	1.5 mile run	**2.68**	**5.77**	**2.18**	1.91	0.01
2	600 yds run	4.38	3.91	4.37	2.85	0.03
3	Sit Ups	0.32	0.74	0.83	0.02	0.05
4	Chin ups	3.21	0.53	1.12	0.44	0.15
5	Push Ups	1.78	0.72	0.82	0.32	0.35
6	50 Yds run	1.78	0.03	6.7	4.22	0.31

Mean scores of t-test are shown in the table I and the level of significance at .05, t-tabulated value is 1.96 The up hill running, sand running and Drag running training methods are most significant for 1.5 mile run for the development of the basic endurance, where as all four training methods have shown positive response for six hundred yards run. The order of the training methods in respect of their effectiveness are sand running, Up hill running, Drag running and lastly running with weight jacket. For the improvement of strength endurance. Only Sand running training has shown significant result for chin ups for the development of strength endurance.

The Drag running and running with weight jacket have shown significance improvement for fifty yards run for the improvement of anaerobic capacity.

The explanation of the above mentioned fact to some extent may be found in Miller's (1993) statement that resistance running is one form of strength training used by middle distance runners that may enable the athletes to improve strength, anaerobic capacity, and endurance capacity.

Almost all the sports experts agree that the capacity of the heart will definitely improve by doing endurance running or by practising different resistance running methods.

The different resistance running methods effective for the improvement of endurance are:-

TABLE -2

COMPARISON IN MEAN SCORES OF PRE AND POST TEST OF DIFFERENT RESISTANCE RUNNING METHODS

S.N.	Variables		Sand Running	Up Hill Running	Drag Running	Running with weight Jacket	Control Group
1	1.5 mile run	Pre	10.876	12.595	11.262	12.08	12.392
		Post	9.912	11.045	10.335	11.302	12.395
2	600 yds run	Pre	1.739	1.699	1.737	1.781	1.695
		Post	1.466	1.477	1.496	1.581	1.697
3	Sit Ups	Pre	33.2	29.6	47.15	41.35	52.15
		Post	34.35	32	49.35	41.45	52.1
4	Chin ups	Pre	5.7	5.85	6.15	6.5	6.35
		Post	7.45	6.6	7	6.8	6.25
5	Push Ups	Pre	23.6	23,700	26.7	25.8	21.1
		Post	27.05	25,500	28.15	26.4	21.95
6	50 Yds run	Pre	6.739	6,439	6.658	6.688	6.722
		Post	6.555	6.427	6.182	6.33	6.69

From the summary of ANOVA table 2 we find that sand running training is most effective for 1.5 mile run for the development of basic endurance. The other effective training methods in order of efficacy are drag running phill running and running with weight jacket, while the sand training is most effective for improvement of speed endurance the other training methods are Uphill running and running with Weight Jacket. The drag running method is the most effective resistance running method for the development of strength endurance for push ups.

Conclusions

Within the limitations of the present study, the following conclusions may be drawn:-

1. Up hill running and Sand running methods are most significantly useful to develop the basic endurance.
2. The Sand running and Drag running methods are most significantly useful for the development of speed endurance.
3. The drag running method has shown significant improvement for anaerobic capacity.
4. The Sand running method is most significantly useful for the development of strength endurance in chin ups.

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COMPARISON OF AEROBIC AND ANAEROBIC CAPACITY OF SPRINTERS, JUMPERS AND THROWERS.

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ABSTRACT

The purpose of the study was to compare the aerobic and anaerobic capacity of sprinters, jumpers and throwers. The subjects were 30 male (10 each from sprints, jumps and throws) of the Inter-University level randomly selected from Track and Field match practice group of Lakshmibai National Institute of Physical Education , Gwalior .The subjects were tested on two Physiological variables i.e. aerobic capacity and anaerobic capacity. It was hypothesized that aerobic and anaerobic capacities have significant differences between sprinters, jumpers and throwers.

To test the aerobic capacity 12-minutes cooper run -walk test was conducted and scoring was done in meters and nearest to 25 meters. Anaerobic capacity was assessed by 50- meter dash and scores were obtained in 1/10th of a second. To compare the aerobic and anaerobic capacity among the groups the analysis of variance was used at .05 level of significance. The one- way analysis of variance showed that there was no significant difference among sprinters, jumpers and throwers in relation to aerobic capacity as f-ratio was found to be 1.61 is less than tabulated value 'f' value 3.54. However anaerobic capacity showed significant difference among the three groups as the f-ratio 8.14 was greater than the tabulated 'f' value 3.54 at .05 level. After the post-hoc test it was observed that there was no significant difference between sprinters and jumpers but jumpers and throwers showed significant difference in relation to their anaerobic capacity. The study is helpful in assessment of aerobic and anaerobic capacity of sprinters, jumpers and throwers. Also planning of the training programme for various groups could be done specially in the base creation phase of the early training years

INTRODUCTION

Aerobic capacity is the ability to mobilize energy for continuous performance of specific movement for prolonged time i.e. capacity for prolonged physiological functioning under continuous supply of required oxygen under conditions of required oxygen completely available. The glucose molecule is completely broken down to CO2 and H20, and energy is made available as needed.

Anaerobic capacity is the ability to mobilize energy during activities of intensive nature i.e. executing intensive work with explosive action in short duration of time, such as, kicking the football faster and for explosive take off in jumps, maximum rate for about two to three minutes under water swimming

The capacity for prolonged physiological functioning demanding cardiovascular endurance depend upon Aerobic capacity i.e. energy metabolism under continuous supply of oxygen to the organism. Intensive burst of activities i.e. executing high load of work with explosive action and of short duration of time, such as kicking the football faster and far, explosive take off in jumps, throwing an implement etc. depend upon Anaerobic capacity i.e. efficiency in energy production in the absence of oxygen supply, though the oxygen would be taken up later during the recovery period after the cessation of activity.

Both Aerobic and Anaerobic capacities play an important role in influencing the performance in various games and sports. In activities which involve working with maximal intensity for shorter period of time, such as, Sprinting, Weight lifting, kicking of Football fast, explosive jumping etc. Where anaerobic capacity play an important role. In games and sports where a sportsman has to resist fatigue relatively for longer period without effecting skill proficiency, for example, long distance running, swimming, cycling, rowing and even some team sports such as football and hockey, Aerobic capacity of individual plays an important role.

The human body obtains energy from two sources, Anaerobic and Aerobic metabolism of foodstuffs. Anaerobic metabolism deals with the break down of carbohydrates to lactic acid with a release of small quantity of energy in the form of Adenosine Triphosphate (ATP) and heat. Since these processes do not require oxygen; the term Anaerobic (without oxygen) applies. Aerobic metabolism includes processes that releases large amount of energy in the form of A.T.P, when any or all the three foodstuffs are burnt with the aid of oxygen, hence the term is Aerobic. The ability of an individual to perform well in given activity depends of many variables the most significant of which is the magnitude of one's energy supply and the type of energy needed.

Three energy systems have been identified. The first two are Anaerobic and third is Aerobic: 1) Adenosine Triphosphate - Phosphocreatine (ATP-PC) system; 2) lactic acid system; and 3) oxygen system. The determination of predominant energy source is based on the duration of the activity and whether the activity is continuous or intermittent, because energy sources as the listed above are sequential, that is, we utilize the ATP-PC system first, the lactic acid system next and last the oxygen system.

Objective: The purpose of this study was to compare the Aerobic and Anaerobic capacity of Sprinters, Jumpers and Throwers.

METHODOLOGY

The subjects for this study were randomly selected from track and field match practice groups of sprints, jumps and throwing of events of Lakshmibai National Institute of Physical Education, Gwalior.A total number of 30 male athletes, 10 each from sprints, jump and throws were selected. The age of the subject range from 18-25 years.

The selected variables for the study were as follows:

1. Aerobic capacity
2. Anaerobic capacity

Aerobic capacity was measured by 12-minute cooper run and walk test. The scoring will be in meters and nearest to25 meters. Anaerobic capacity was measured by 50-meter dash. The score was that time elapsed in the nearest 1/10th of a second.

RESULTS

Table-1

ONE-WAY ANALYSIS OF VARIANCE OF AEROBIC CAPACITY OF SPRINTERS, JUMPERS AND THROWERS

Source of treatments	Df	Sum of squares	Mean squares	f ratio
Between group	2	232666.7	116333.3	1.61
Within group	27	1953500	72351.85	

Significant at 0.05 level of confidence, F 0.05 (2,27) = 3.54

It appears from the table-1 that Aerobic capacity comparison between Sprinters, Jumpers and Throwers. Which was not significant as 'f' ratio was found to be 1.61 is less than the tabulated 'f' value 3.54

comparison of aerobic capacity of sprinters,jumpers and throwers

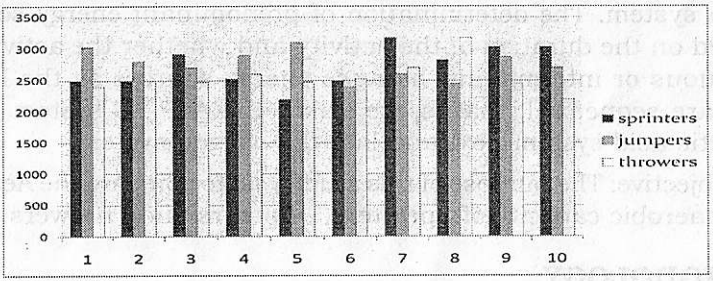

Table-2

ONE-WAY ANALYSIS OF VARIANCE OF ANAEROBIC CAPACITY OF SPRINTERS, JUMPERS AND THROWERS.

Source of treatments	Df	Sum of squares	Mean squares	F ratio
Between group	2	2.8	1.4	8.14
Within group	27	4.65	0.17	

*Significant at 0.05 level of confidence

F.05 (2,27) =3.54

The table-2 Indicates Anaerobic Comparison between Sprinters, Jumpers and Throwers, which is significant as calculated f-ratio 8.14 was greater than tabulated 'F'value 3.54

Table-3

POST HOC TEST FOR ANAEROBIC CAPACITY OF SPRINTERS, JUMPERS AND THROWERS.

Mean of different groups			Mean difference	Critical difference
Sprinters	Jumpers	Throwers		0.38
6.27sec.	6.49sec.		0.22	
6.27sec.		7.00sec.	0.73	
	6.49sec.	7.00sec.	0.51	

Above table-3 indicates that there were no significant difference between sprinters and jumpers as mean difference 0.22 is less than critical difference 0.38. However there were significant differences between Jumpers and Throwers as mean difference 0.51 is higher than critical difference 0.38. Sprinters and Jumpers have high anaerobic capacity and sprinters have got the highest among all.

AEROBIC CAPACITY

The statistical findings of the present study revealed that there were no significant differences in Sprinters, Jumpers and Throwers in relation to Aerobic capacity. This can be attributed to the quantum of aerobic training done in preparatory phase. The aerobic training helps in improvement of oxygen supply to the muscles. It increases blood volume and raises the level of oxygen carrying hemoglobin in red blood cells. The improved delivery and use of oxygen results, increased energy production and so, the trained athletes of sprints, jumps and throws showed insignificant difference in relation to aerobic capacity. Also the increased lung volume of the sprinters, jumpers and throwers enhanced movement of oxygen from lungs to blood and aerobic training done by the groups' results in increased myoglobin content and oxidation of carbohydrates so, there is no significant difference among them. The Sprinters, Jumpers and Throwers undergo almost similar type of aerobic training and endurance workout during base creation phase, so they all posses almost same amount of aerobic capacity.

ANAEROBIC CAPACITY

The statistical findings revealed that there were significant differences among Sprinters, Jumpers and Throwers in relation to anaerobic capacity. By the help of post-hoc test it was found that there was a significant difference in anaerobic capacity of jumpers and thrower. Whereas there was no difference between sprinters and jumpers as they posses almost similar and higher anaerobic capacity. This difference can be attributed to the nature of the activity done by these groups. The sprinters and jumpers continuously perform the activity with high explosiveness for pretty longer period of time then throwers. The nature of the test 50m-dash was also favorable to sprinters and jumpers as they go for sprinting activities during their workout. Whereas throwers normally don't run so much during their skill performance.

In general any activities from metabolic support point of view are classified as Aerobic and Anaerobic muscular activity. All the three groups come under anaerobic type of muscular activity. This

three groups come under anaerobic type of muscular activity. This might be the reason for statistical insignificant difference of the three experimental groups as far as their aerobic potentiality is concerned. But in case of experimental subjects used in the study though they are anaerobic based sprinters and jumpers require both speed endurance and explosive strength in specific, whereas the throwers requires strength. For which out of the various metabolic support first two groups are using both A.T.P/ CP system as well as partly lactic acid system. Whereas the throwers who are using their maximum strength and power in a quickest possible time are basically requiring high potentiality of utilizing of A.T.P/ CP only

CONCLUSION

Within the limitation of the study following conclusions may be drawn.

1 In relation to aerobic capacity no significant difference was found between sprinters, jumpers and throwers.

2 There was significant difference among sprinters, jumpers and throwers in relation to anaerobic capacity.

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RELATIONSHIP BETWEEN PHYSIQUE AND PHYSICAL FITNESS AMONG THE TWINS

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INTRODUCTION

"Two individuals are not alike" is the, basic concepts that have been accepted by physiologist, psychologist and other related scientist dealing with human beings. Twins who are expected to be identical in outward appearance have attracted the research mind to study them in depth. Twins have been defined by oxford dictionary as "Twins: each of closely related or associated pair especially of children or animals born at a birth". The structure of the human forms before birth through a process called morphogenesis. Twins are simultaneously born two or more children of the same mother from one pregnancy, twins occur about once in 85 pregnancies. They can develop in two ways. Dizygotic twins develop from two zygotes resulting from two spermatozoa fertilizing two ova in the same ovulation. Monozygotic (identical) twins form a single zygote.

Approximately, 2/3 of the twins are dizygotic (Fraternal). Dizygotic may be of the same sex or different sexes and are not any alike than brothers and sisters bora at different times. Monozygotiojares of the same sex and genetically identical.

When twins children are difficult to distinguish from each other there is 95% chance that they are monozygotes. If they differ from a genetically determined trait such as eye colour they are almost certainly dizygotic. Another basic of diagnosis of mono or dizygosity is the dermatographics

Several authors have used a comparison of variance between monozygous and dizygous twins to demonstrate a significant influence of inheritance on skeletal (Tanner, 1962. Hunt, 1966) and sexual maturations (Hiernaux et al. 1962), with resultant impact on body dimensions of the adolescent (Vanderberg, 1962).

Tests were carried out in twins who had been reared together and also in twins who had been reared apart; heritability estimates for body mass were 0.87 and 0.80 under the two conditions and for height 0.82 to 0.96 respectively (Shields, 1962; Jenson, 1968).

From the above information it appears that physique and performance potentiality are directly related to heredity and environment. Since the monozygotic twins are more possibly of the same genetic inheritance are expected to be identical in many of the anthropometric characteristics as well as motor performance on the other hand dizygotic twins may be of different physical characteristic and performance potentialities. So the present researchers in a very humble way attempted to look into two aspects physique and performance potentiality of male, female and different sex twins.oto

Purpose of the study

The purpose of the present study was to look into the following aspects:

1. To observe the physique of the twins and their degree of similarities.
2. To observe the performance potentialities of the identical and fraternal twins in respect of physical fitness.

Methodology

Since this study was restricted to twins only, 26 pairs of twins (age group 9-12 years) were divided into three groups. The subjects were selected from Domjur Block of Howrah district of West Bengal, India. First group consisted of 8 pairs of twins of male of which 4 pairs are monozygotic, second group consisted of 12 pairs of twins of female of which 9 pairs are monozygotic and third group consisted of 6 pairs of twins of different sexes (male & female). Samples had been chosen purposively and primarily snowball sampling technique was adopted.

Criterion Measures

1. **Physique:** Physique was assessed by physical measurement of six selected variables (viz., height, weight, % of fat, lean body weight, fat weight and body 5 mass index).
2. **Physical Fitness:** Physical fitness was measured by AAHPER youth fitness test (six items test battery viz, pull ups for body and Hexed arm hang for girls, sit-ups shuttle run, standing broad jump, 50 yurds dash, 600 yards run and walk).

Standard instruments and procedures were followed to measure the variables for this study.

- Physique: All the measurements had been taken following (Weiner and Lonric, 1981).
- Calculation of % of fat, Lean Body weight and fat weight: All the measurements had been taken following Lohman, 1987, Slaughter, Lahman, Boileau, 1968.
- Calculation of Body Mass Index (B.M.I.) (in Kg/m2) following Shetty and James (1994), determined by the ratio of the Wt. in kg and Height2 in m as the formula bears:
- B.M.I.= Weight (in Kg)/ (Height in m)}2

Physical fitness: AAHPER youth fitness six test battery. The test protocols and measurements used in the study following Clarks, 1945, Mathew and Fox, 1976 Barrow, 1979.

Analysis:

- ANOVA for comparison between several
- Comparison between two groups Scheffe test was adopted,
- Paired 't' test for looking variation between twins

Results & Discussions

Table No. -1 Comparison of physique among the boys, girls and different sex twins.

Variables	Twin							
	Boys (N- 16)		Girls (N-24)		Different sex (N-12)			
	Mean	SD	Mean	SD	Mean	SD	F	Sig.
HEIGHT	135	13	128.4	7.42	135.21	5.4	3.44	0.04*
WEIGHT	31.09	12.28	23.23	4.17	27.58	3.78	5.28	0.01**
% OF FAT	14.74	6.41	15.84	3.58	14.45	3.46	0.47	0.63
LB WT	26.48	8.93	19.46J	3.07	23.59	3.36	7.79	0.00**
FAT WT	5.37	4.34	3.77	1.35	4.04	1.14	1.86	0.17
BMI	16.43	3.46	14	1.53	15.04	1.51	5.35	0.01**

* Significant

** Significant at 0.01 level

Table No. 1: Shows comparison of physique between the boys, girls and different sex twins. Mean and SD of six variables and the ANOVA results were presented as 'F1 value. From the table significant difference at 0.05 level in height and at 0.01 level in weight, lean body weight and body mass index among the groups were found.

Table No. 1.1 Schefe test of physique within boys, girls and different sex twins.

Variable	Significant		
	Boys Vs girls	Boys Vs diff. sex	Girls Vs diff. sex
HEIGHT	0.09	1	0.12
WEIGHT	0.01**	0.49	0.28
LB WT	0.00**	0.41	0.12
BMI	0.01**	0.3	0.45

** Significant at 0.01 level

Table No. 1.1: Shows Scheffe test on physique within boys, girls and different sex twins. This test had been done to find out as to where the difference exactly existed. From the table it appeared that the difference was in weight, lean body weight and body mass index between the boys and girls twins.

From the above tables it was found that out of 26 pairs of twins Boys twins and different sex twins appeared identical in their height and % of fat. It was also noticed that boys twins were higher in their lean body weight, fat weight and body mass index and statistically significant at 0.01 level in comparison with different sex twins and girls otwins.

Table :2 Comparison of physique between the MZ & DZ of boys & girls twins.

Variables	Pairs	Boys twin (n-8 & 8)				Girls twin (n-18-6)			
		Mean	SD	T	Sig.	Mean	SD	T	Sig.
HEIGHT	MZ	134.25	8.4	0.22	0.83	127.25	7.59	1.33	0.2
	DZ	135.75	17.04			131.83	6.2		
WEIGHT	MZ	31.63	9.84	-0.17	0.87	23.08	4.69	0.29	0.77
	DZ	30.56	15.03			23.67	2.21		
% OF FAT	MZ	16.6	6.47	-1.18	0.26	15.87	3.25	-0.07	0.94
	DZ	12.87	6.17			15.75	4.8		
LB WT	MZ	27.13	8.09	-0.28	0.78	18.91	2.72	1.57	0.13
	DZ	25.83	10.22			21.12	3.73		
FAT WT	MZ	6	4.01	-0.57	0.58	3.67	1.28	0.59	0.56
	DZ	4.73	4.84			4.05	1.63		
BMI	MZ	17.14	3.61	-0.82	0.43	14.12	1.61	-0.65	0.52
	DZ	15.71	3.37			13.65	1.34		

Table No.-2: Indicates the comparison of physique between Monozygotic and Dizygotic pairs of body and girls twins and their mean, SD and't' value for sex variables significant differences were not found in any variables between the MZ & DZ pairs of twins.

Table : 3 Comparison of physique among the pair of boys, girls and different sex twins.

Variable	Pairs	Boys twin (n-16)				Girls twin (n-24)				Different sex twin (n-12)			
		Mean	SD	T	Sig.	Mean	SD	T	Sig.	Mean	SD	rr	Sig.
HEIGHT	1st	135.8	11.2	0.24	0.81	128.67	7.35	0.18	0.9	136.4	5.1	0.99	0.4
	2nd	134.2	15.4			128.13	7.8			133.7	5.7		
WEIGHT	1st	31.06	10.5	-0	0.99	23.25	3.61	0.02	1	28.58	3.1	0.91	0.4
	2nd	31.13	14.6			23.21	4.82			26.58	4.4		
0% OF FAT	1st	15.05	6.08 j	0.19	0.85	15.86	4.03	0.03	1	13.95	4.6	-0.5	0.6
	2nd	14.42	7.12			15.82 j	3.26			14.96	2.1		
LB WT	1st	26.59	7.89	0.05	0.96	19.46	2.37	-0	1	24.6	3	1.04	0.3
	2nd	26.37	10.4			19.47	3.76			22.59	3.6		
FAT WT	1st	5.35	3.81	-0	0.99	3.79	1.46	0.09	0.9	4.04	1.4	-0	1
	2nd	5.38	5.09			3.74	1.3			4.05	1		
BMI	1st	16.43	3.42	0	1	13.97	1.12	-10	0.9	15.28	1.3	0.51	0.6

Table No: 3 : Indicates the comparison of physique among the pairs of boys, girls and different sex twins their mean SD, and 't' value for sex variables. It was also noticed that significant differences were not found in any variables between the pairs of twins.

From the table no. 2 it appeared that MZ boys were higher from mean difference in all variables in comparison with DZ boys except in height. (Tanner, 1962. Hunt, 1966), (Hiernaux et al., 1962, 1975) (Vanderberg, 1962) found variance between MZ & DZ twins in physique variables which they opined as genetic influence on skeletal and sexual maturation with a resultant impact on body dimensions of the adolescent.

On the other hand, DZ girls were better in height, weight lean body weight and fat. weight than MZ girls except in fat weight.

From table no.3 it was observed that in all variables boys twins Ist pair and 2nd pair and girl twi'ns 1st pair & 2nd pair were identical except in different sex twins.

Variation was observed in different sex twins Ist pair and 2'" but was restricted with narrow range

Table No. and 3 indicated that statistical significant result was not found in all c:>ses.

Table- 4 Comparison of physical fitness among the boy's and girls and different sex twins.

Variable	Twins							
	Boys (n- 16)		Girls (n-240		Different sex (n-12)			
	Mean	SD	Mean	SD	Mean	SD	F	Sig.
PU/FAH	71.56	14.23	53.33	23.02	41.67	12.31	9.44	0.00**
SBJ	63.5	9.54	51.71	6.22	65.1	8.03	16.78	0.00**
SIT UPS	16.06	6.83	10.79	5.91	12.83	7.7	3.03	0.06
SR	10.8	0.64	11.84	0.44	11.33	0.65	16.63	0.00**
SOY DASH	8.59	0.66	9.78	0.89	8.69	0.74	13.52	0.00**
600Y R&W	2.67	0.58	2.96	0.45	2.78	0.41	1.77	0.18

** Significant at 0.01 level

Table -4.1 Scheff test of physical fitness within boys, girls and different sex twins.

Variable	Significant		
	Boys Vs Girls	Boys Vs Diff. Sex	Girls Vs diff. sex
PU/FAH	0.01**	0.00**	0.22
SBJ	0.00**	0.87	0.00**
SR	0.00**	0.05*	0.05*
SOY DASH	0.00**	0.95	0.00**

'Significant at 0.05 level ** Significant at 0.01 level

Table No. 4 indicates the comparison of physical fitness among boys, girls and different sex twins and table also depicts mean. SD and F values. Significant differences were found at 0.01 level in pull tips, flexed arm hang, standing broad jump, shuttle run, 50 yard dash among the groups.

From Scheffe test it was found that significant differences at 0.05 existed in pull up, flexed arm hang, standing broad jump, shuttle run and 50 yards dash between the boys and girls twins.

From table no. 4.1 differences! were observed in pull up, flexed arm hang shuttle run, 50 yards dash between girls and different sex twins.

It was observed from the above table that performances of physical fitness variables of boys twins were higher in all variables than girls and different sex twins.

The difference in respect of physique and performances are due to differences in the prevailing social system which is affecting the twins. Most of the Hindu society there is a pre-conceived idea that boys are generally get extra care than the girls and in many

studies researcher have shown that females are relatively deprive a in respect of gelling basic childhood cares.

Table -5 Comparison of physical fitness between the MZ & DZ of boys & girls twins.

Variable	Pairs	Boys twin (n-8&8)				Girlstwin(n-18&6)			
		Mean	SD	T	Sig.	Mean	SD	T	Sig.
PU/FAH	MZ	2.75	1.75	1.4	0.18	5.7	4.79	-0.25	0.81
	DZ	4.13	2.17			5.14	5.18		
SBJ	MZ	62	10.94	0.62	0.55	50.5	6.43	1.72	0.1
	DZ	65	8.38			55.33	4.03		
SIT UPS	MZ	13.13	4.79	1.86	0.08	11.72	6.11	-136	0.19
	DZ	19	7.56			8	4.65		
SR	MZ	10.91	0.71	-0.68	0.51	11.97	0.34	-2.89	0.01**
	DZ	10.7	0.58			11.45	0.5		
50Y DASH	MZ	8.24	0.51	2.39	0.03*	9.97	0.85	-1.92	0.07
	DZ	8.93	0.64			9.21	0.83		
600Y R&W	MZ	2.68	0.46	-0.09	0.93	2.84	0.41	2.22	0.04*
	DZ	2.65	0.72			3.28	0.45		

** Significant at 0.01 level *Significant at 0.05 at level

Table No. 5. shows the comparison of physical fitness between MZ & DZ pair of boys and girls twins and mean SD and 't' value of sex variables. Significant differences were not found between MZ and DZ pairs of boys twins in any variables except 50 yard dash which has statistically significant at 0.05 level.

MZ & DZ pairs of girls twins differ significantly at 0.01 level respectively in shuttle run and 600 yard run and walk.

Performance of all the cases DZ pairs of boy twins were better than MZ pairs of boys. Same result was found from DZ pairs of girls twins.

Table -6 Comparison of Physical fitness among the pair of boys, girls and different sex twins.

Variable	Pairs	Boys twin (n-16)				Girls twin (n-24)				Different sex twin (n- 1 2)			
		Mean	SD	T	Sig.	Mean	SD	T	Sig.	Mean	SD	T	Sig.
PU/FAH	1st	6.99	6.09	-0.1	0.92	3.63	2.26	-1.28	0.24	2.67	2.07	-208	0.09
	^nd	7.11	6.69			4.63	2.82			3.96	2.3		
SBJ	1st	64	8.85	0.2	0.84	52	6.49	0.23	0.82	66.2	8.61	0.46	0.66
	TIKI	63	10.78			5142	6.2			64	8.05		
SIT UPS	1^	15.38	4.84	-0.39	0.7	10.17	6.59	-51	0.62	13.83	9.17	0.43	0.67
	*->nd	16.75	8.68			11.42	5.37			11.83	6.62		
SR	1st	10.69	0.68	-0.73	0.48	11.7	0.48	-1.56	0.13	11.25	0.74	-0.44	0.67
	^nd	10.92	0.61			11.97	0.36			11.42	60		
SOY DASH	1st	8.56	0.52	-0.18	0.86	9.83	0.99	0.27	0.79	8.56	0.58	-0.58	0.57
	^nd	8.62	0.82			9.73	0.83			8.82	0.92		
600Y R&W	1st	2.63	0.45	-0.25	0.81	2.95	0.37	-0.06	0.95	2.68	0.46	-0.87	0.4
	2nd	2.7	0.72			2.96	0.54			2.89	0.37		

Table No. 6: from the table it was found that performance level of both the pairs (boys' twins, girls twins & different sex twins) were mostly identical. Variables were found in different sex twins but restricted in narrow range.

Conclusion

Within the limitations of the present study, the following conclusions may be drawn.

1. Three groups of twins were not equal among themselves in their height, weight LBM, BMI
2. Out of 26 pairs boys twins were higher in L.B. Wt., F. Wt., and BMI than different sex twins and girls twins.
3. While comparing the physique between MZ & DZ no significant differences were observed in physique variables.
4. No sigiiificant difference was observed in physique variables when comparison of each pair of twins was made.
5. Three groups of twins were found significant different from other in all the four physical fitness test.
6. Boys twins were significant higher in fitness test than girls twins.,
7. In P.U. and SR only boys twins were significantly higher than different sex twins.
8. "Different sex twins were higher than girl twins in SBJ, SR, 50 yard dash.
9. When comparison was made between DZ and MZ only significant difference was observed in 50 dash test.
10. In case of girls MZ & DZ were significant different in SR amd 600 yard Run &- Walk test.
11. Twins were not significantly different among themselves in any of the fitness tests and is true for all the three groups.

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