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Assessment of Physical Abilities and Competition Performance of Female Gymnasts

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INTRODUCTION

To attain high performance comparable to National & International standard, the sportsman has to follow a complex Training process and undergo rigorous programme which will guarantee improvement of performance. The important aspects of performance namely motor components, conditional & co-coordinative abilities, technique, tactics, psychological and sociological characteristics need to be optimally developed. Different motor abilities play decisive role in achieving top performance in different sport disciplines. In order to win an International Competition super physical fitness & best Training of the individual are important factors (Hirata, 1979).

Since the past few years level of interest in the effect of different activities on competitive performance has been on a rise. For the development of sports performance, there are multiple factors, which play a major role in the improvement of the level of conditioning requirements (strength, speed, Endurance, Flexibility etc.) in a number of sports disciplines.

As a sport, gymnastics is a supreme test of ability. At the highest level in the Olympic Games or the world championships the difficulty of performance makes all the other sports look easy. In the training hall it is a sport which, like no other, offers an unlimited range of activities to learn. Each simple skill is a building block which helps the gymnasts to construct complex movements. Firstly there is sports acrobatics, which contains the only section in which and women appear together as a team. Secondly, there is rhythmic gymnastics, which is only for women. But I am dealing here with Artistic gymnastics which for men includes floor exercise, exercise Pummeled horse, rings, Vaulting table, Parallel bars and the horizontal bar. For women as in addition to Vaulting Table and floor exercises there is also balancing beam and Un-even bars. Basic artistic gymnastics consists of endless variety of movement on different apparatuses.

Though gymnastics is a technical sport, in which performance is evaluated on the basis of the technique of different complicated elements on different apparatuses yet, performance of these technical elements depends, to a large extent, on the level of physical abilities. High levels of physical, physiological and psychological abilities are required for high advanced performance in gymnastics (Salmela, 1982).

Physical fitness, sports performance and achievement cannot be separated from each other. World's most advance nations in the field of sports are very much conscious of this fact and concentrate on the development of the general and specific physical fitness, its components and related aspects.

RESEARCH PROBLEM

Purpose of the study was to compare the physical abilities of elite, mediocre and low level Gymnasts as compared to their competitive performance. The investigator wanted to know that how much the competitive performance of different level of Gymnast depends on the physical abilities of the individuals.

RESEARCH PURPOSE

- Purpose of the present paper was to determine the role of different physical abilities with compare to competitive preference of Gymnasts of different level i.e. elite, mediocre and low level Gymnasts.
- Purpose of the study was also to know/determine that in which physical

abilities good performance Gymnast differ from the low and mediocre Gymnasts.

OPERATIONAL DEFINITION OF TERMS

To avoid any confusion, the definition and the implication of the technical terms used in the present study are given below:-

Physical Abilities: It is the ability of the individual in the element which underlines physical performance capacity such as muscular strength, muscular capacity, muscle endurance, speed, agility and balance etc. Physical ability refers to the level to which one has developed his/her innate capacity to learn. Physical abilities plays very important role in enhancing the performance of Gymnasts in the competitions. They are as follows:

- Strength
- Speed
- Flexibility
- Endurance

Strength: Strength is the ability to overcome resistance or to act against resistance.

Muscular strength: This can be defined as the amount of tension (kilograms or pounds) a muscle or a group of muscle can exert (Fukushima 1981).

Speed: Speed ability primarily signifies the ability to execute motor movements with high speed. These movements may be cyclic or acyclic in nature. Thesis and Schnabel (1987) has defined speed as a "performance prerequisite to do motor action under given conditions (movement task, external factors, individual Prerequisites) in minimum time."

Flexibility: Flexibility can be defined as the ability to execute movements with greater amplitude or range.

Endurance: "Endurance is the ability to do the sports movements, with desired quality and speed under the conditions of fatigue."

Performance: Thorndike and Hagen (1970) have defined performance as the efficiency with which the individual does an activity as a result of planned previous experience or training or due to biological characteristics of the organism. In short, performance is what the individual does in the field.

Gymnastics: According to Websters sports dictionary (1976) "Gymnastics is a sport in which individuals perform optional and prescribed feets which demonstrate strength, balance and body control. Gymnastics encompasses calisthenics and tumbling as well as work on apparatuses"

REVIEW OF THE RELATED LITERATURE

A close study of the literature has disclosed that very few studies have been conducted on the comparative study of physical abilities and competitive performance of Elite, Mediocre and Low Performance female Gymnasts of India. To the best of my knowledge, no such work has been done in India.

Leuise L; Holoff (1953) conducted a study to investigate the relationship, if any, between Kinesthesis and the learning rate of college women in certain motor skills. He has found a significant relationship of 0.42 between kinesthetic sense and learning rate, in certain motor skills.

Molley and Charles (1960) stated that the learner must have muscular strength adequate for the performance of the task. For example a person who lacks strength enough to pull himself up by his arms to flex the thigh forward on the trunk against the resistance of gravity and centrifugal force could not succeed in learning to perform difficult exercises on the Horizontal Bar, the parallel Bars, the horizontal ladder on the flying rings.

Logen (1964) has st000000ated that flexibility cannot to be used effectively without sufficient strength. One possible explanation why some times strength training results in decrease of flexibility is only that when the execution of strength exercises are done with restricted amplitude of movements it may result in residual muscle contraction or adopted shortening, thus, leading to decrease in flexibility.

Stuart (1964) states that current ratio of strength and weight i.e. relative strength helps in performing the appropriate movements in Gymnastics.

Bosco and James (1962) reached the conclusion that, since champion Gymnasts are shown to have lower heart rates and blood pressures and since this seems to be one of the outcomes of cardio-vascular fitness induced by interval training, the question arise as to the need for this type of training of by the beginner Gymnasts.

Yvan Giradin and Dale Banson (1967) conducted a study to find out the relationship between ability to perform tumbling; skills and ability to diagnose performance errors in the performance of the same skill and found a significant correlation of 49 between performance ability and ability to find out faults in the same skills.

Bosco (1973) reviewed the earlier studies and concluded that participation in Gymnastics will not improve circulatory fitness significantly. He further concluded that highly trained Gymnasts are not

noticeably superior to samples of untrained subjects in circulator fitness.

Black and Jonhson (1975) studied the effect of interval training programme on tumbling (Gymnastics Floor exercise) and concluded that muscular and cardio-vascular endurance is necessary to complete difficult routine successfully.

Jonh (1976) states that flexibility is one component of physical fitness that is often overlooked. Good flexibility of muscles and tendons allows them to respond properly to the stresses and strains of violent contractions.

Johnson (1977) states that what is essential for maximum efficiency in movement and protection from injuries is a strong complementation of both less superficial at a higher centre of gravity, more strength more flexibility, better balance, more agility, more explosive power, a faster reaction time, a lower heart ration and a lower blood pressure.

Martin (1979) also recommended a favorable mixture of strength and flexibility exercises. He states that on one hand the strength training exercises have active effect on the flexibility of joints i.e. vertebral column, hip and shoulders, on the other hand too much stretching again reduces the strength of the muscles. Some other scholars also have pointed out the danger of over flexibility.

MATERIAL AND METHODS

Subjects: The present study has been conduct on 40 female Gymnasts in the Punjab region during 2017-2018. Of the 40 female Gymnasts, who have been taken as subjects, 8 belong to High Performance Group, 16 girls belong to Mediocre Performance Group, and remaining 16 girls belong to Low Performance Group. Hence High Performance group has been designated as 'Group A'. The Mediocre Performance Group is designed as Group B', and Low Performance Group has been designated as 'Group C.'

Groups Formation and Evaluation of Competition Performance: The grouping has been made on the basis of the competition performance scores of the subjects. In competition I all the girl participate on all the 4 apparatuses. i.e. Vaulting Table, Un-even Bars, Balance Beam and Floor. The total of the scores obtained on each apparatus becomes the overall performance score of the girl gymnast. As per new code of points now capacity results on each apparatus performance is evaluated by Jury consisting of two panels i.e.

- A Panel
- B Panel
- C Panel

"A Panel": There are two judges in "A Panel" these judges give "A" score. A score on each apparatus comprises of three factors.

- Difficulty
- Composition / Bonus Points
- Special Requirement

"B" Panel: "B" Panel consists of 4 or 6 judges. For Olympic Games and World Championship there are 6 judges on "B" Panel. But for National level competition the number of judges on "B" Panel can also be 4 judges. During the 47th Senior National Gymnastics Championship "B" panel comprised of 4 judges. The 4 judges award scores for execution. Each judge award score independently out of a maximum of 10.00 scores.

The scores awarded by each Judge are sent to Chairperson who eliminates the maximum and minimum scores and takes the average of the two middle scores as final execution scores. Execution scores which are known as "B" scores are added to "A" scores awarded by "A" panel. The total of those two becomes the final score of a gymnast.

Final Score = "A" Scores + "B" Scores

The performance on each apparatus is evaluated by International or National qualified judges.

MEASUREMENT OF VARIOUS PHYSICAL ABILITIES

Tests for motor abilities were conducted from 10 A.M. to 1 P.M. and 5 P.M. to 8 P.M. Each test was properly demonstrated by the investigator. Each Gymnast was given two attempts for learning the course of the test. Sufficient time for Warm-up was provided before administering each test of strength, flexibility, speed and endurance. A proper recovery period was also provided in between the different tests.

The following tests were conducted to measure conditional abilities of each subject.

A. Measurement of Strength

- Pull-ups (Maximum Number)
- Sit-ups (Maximum Number)
- Back Lift from Vaulting Horse
- Standing Broad Jump

B. Measurement of Speed

- 50 m. Sprint

C. Measurement of Flexibility

- Trunk Flexion
- Trunk Extension (Back Bridge)

D. Measurement of Endurance

- (Cardio respiratory endurance)

1. Harvard Step Test

Tests: The following standard procedure for conducting different tests of motor abilities was adopted.

A. Strength Tests

1. Pull-ups on Uneven Bars (HB): Purpose was to measure the strength of the arms and shoulder muscles.

Equipment: Un-even bars, Magnesium Carbonate Powder

Procedure: The subject was instructed to hold the high Bar with both hands with over Grip at shoulder width and to assume a stationary hanging position. From this position, without bending and swinging her lower body she was instructed to pull herself upward till her chin was above the bar. The subject is then asked to lower her body downward till she assumes complete hang position. This constitutes one Pull up. In this manner, the subject executed as many pull ups as possible, without any pause in between the repetitions.

Scoring: Maximum number of pull ups performed by a Gymnast in one attempt was considered as her pull ups scores.

2. SIT UPS

Purpose was to test measures primarily the strength of the abdominal muscles.

Equipment: Mat.

Procedure: The subject was made to assume supine lying position on the mat with folded legs, heels touching to hips by keeping her hands behind neck. One person was asked to hold the subject from the feet. From this position the subject was asked to raise her upper body till her chest touched the thighs. Then the upper body was lowered to original position till both the shoulders touched the mat. This constituted one sit-up. The upper body was raised up for the next sit up without pause. The subject was asked to do sit ups with maximum speed.

Scoring: The total number of sit ups done was recorded for scoring purpose.

3. Back Lift from Vaulting Horse

Purpose was to test measures the strength of the lower back muscles.

Equipment: Vaulting Horse and Stop watch.

Procedure: The subject was made to lie down in prone position on thighs on the vaulting Horse with the trunk hanging down. The legs and the lower body were supported on the horse and the feet were securely held by another helper. The arms were folded behind the neck. The subject was told to raise (extend) the trunk at least up to the level of the horse top. This constituted one back lift. Every time after extension of the trunk it was lowered (flexed) to initial position and the movement was repeated without pause.
Scoring: Maximum number of times the trunk was extended upward, without any pause, was recorded as score of the subject.

4. Standing Board Jump

Purpose is to test the ability of the body to develop power to jump in horizontal direction was measured by this test. The test measures the explosive strength of the leg extensor muscles.

Equipments: Measuring Tape and Chalk

Procedure: The subject was instructed to stand with her toes just behind the takeoff line and jump from both feet, simultaneously with a free arm swing. The distance was measured from the nearest edge of the take-off line to the closest point of contact of foot or any other body part which was within the jumping area. The subject was allowed to make preparatory movement by bending knees and swinging arms. Jumping was performed forward without touching the take-off line. No double jump was allowed.

Scoring: Three trials were permitted in succession and the best distance in centimeters was taken as the subject's score.

B. Measurement of Speed

50 Meters Sprint

Purpose: The purpose of this test was to measure the sprint ability of the subject.

Instrument: Stop watches.

Procedure: The subject was asked to assume standing start position. Two subjects ran at a time. The starter, positioned behind the subjects, gave the command 'On your Marks', 'set' and clapped her hands above her head as a signal to start the sprint. The subject ran as fast as possible to the finish line which was marked at 50 meters away from starting line. The Time keepers, for each subject, stood on the side of the finishing line. They started their stop watches when they saw the starter clapping her hands and stopped the watches when the chest of the subject crossed the plane of the finishing line. Each subject was given two attempts. Better attempt was considered for scoring purpose.

Scoring: The time taken by a subject to cover a distance of 50 meters was recorded in seconds by 1/10 of a second.

C. Measurement of Flixiblity

1. Trunk Flexion

Purpose: This test measures the maximum range of forward trunk flexion and the stretch ability of the hamstring muscles.

Equipment: A box of 45 cm. height, fixed with measuring scale of 10cm. in upward direction and of 45cm. in downward direction.

Procedure: The subject was asked to stand bare footed on the box, toes of both the feet touching each other and extended to the edge of the box. The subject was asked to bend forward-downward along the scale as much as possible by keeping the knees absolutely-straight. Both the hands were kept parallel and brought at a maximum reach on the scale. The position was held for two seconds. The minimum reach, from the scale, was recorded as score of flexibility. Each subject was given two attempts, immediately one after the other. The better of the two was taken into consideration for scoring purpose.

Scoring: Distance was recorded from the scale in centimeters.

2. Trunk Extension (Bridge Test)

Purpose: The test measures the range of extension of the spine.

Equipment: Mats, measuring steel tape and Chalk.

Procedure: From standing position with legs apart on a straight line a Gymnast was asked to make bridge on the mat. The point where she touched the hands (fingers) was marked with chalk. The distance from the straight line, where she had placed the heels, to the middle finger was measured.

Scoring: The distance between heels and fingers was measured in centimeters for scoring purpose.

D. Measurement of Endurance

1. Harvard Step Test

Purpose: The test measures cardio-respiratory endurance. The physical fitness index was found through Harvard step Test.

Equipment: 1. Stop watch & 2. Stepping platform of 18 inches height was used for determination of P.F.I. [Physical fitness index].

Procedure: The performer was asked to step up and down 30 times per minute on a bench of 18 inches height. Each time the subject was made to step all the way up on the bench with the erect body. The stepping process was performed in four counts as follows:-

- One foot was placed on the bench.
- Other foot was placed on the bench and the subject stood erect for a moment.
- One foot was placed back on floor, and then
- Other foot was placed back on floor.

The performer was allowed to step down with either foot and after or change step as long as four counts rhythm was maintained. The stepping exercise was allowed to be continued exactly for five minutes unless the performer was forces to step sooner because of exhaustion. As soon as the exercise was over, the performer was made to sit on the chair quietly while pulse rate was counted for 1 to 1½, 2 to 2½ and 3 to 3½ minutes after exercise and second from carotid artery. The physical times (P.F.I) index was computed by using the following formula:

$$\text{P.F.I.} = \frac{\text{Duration of Exercise in Seconds} \times 100}{2\times \text{ sum of pulse counts in secondary}}$$

Statistical Procedure: The data obtained through different tests were statistically analysed. One way analysis of variance (ANNOVA) was applied to compute significance of difference in various variables among Groups i.e. High performance Group, Mediocre Performance Group and Low Performance Groups. The 'F' ratio was computed in all variables by applying one way analysis of variance, by this formula:

$$SST = \Sigma x^2 - \frac{(\Sigma x)^2}{N}$$

$$SSB = \frac{(\Sigma x_1)^2}{n} + \frac{(\Sigma x_2)^2}{n} + \frac{(\Sigma x_3)^2}{n} - \frac{(\Sigma x)^2}{N}$$

SSW = SST – SSB

Table for Analysis of Variance

Sources of Variance	*Degree Of Freedom*	*Sum of Squares*	*Mean Square Variance*	*'F' ratio*
Between Group				
Within Group				
Total				

$$F\ ratio = \frac{Msb}{Msw}$$

The Scheffe's test was used to find out the significance of difference and't' value of all the variables in respect of High Performance Group with Mediocre Performance Group, Mediocre Performance Group with Low Performance Group and Low Performance Group with High performance Group.

DISCUSSION ON FINDINGS

Application on One Way Analysis of Various (ANOVA) reveals significant differences in pull-up scores on uneven bars, sit-ups (Jack knife action) that is abdominal strength, back lift on vaulting horse i.e. back strength, 50 mtr. Spring i.e. sprinting ability, Harvard step test i.e. cardio respiratory endurance, trunk flexion and truck extension i.e. flexibility y of spine and competition performance among high mediocre and low performance groups strength, speed and strength endurance play dominant role in achieving high competition performance in Gymnastics. Non-significant differences in flexibility i.e. trunk flexion and trunk extension tests have also been observed from the results among the three groups too much flexibility in trunk region that is not contribute much for obtaining high competition performance in Women Gymnastics. In fact, active flexibility is required for getting higher performance. The two tests i.e. sit and reach for trunk flexion and bridge up test for trunk extension measures the passive flexibility.

The result of present investigation and their interpretation have been given in the above tables. Maximum number of pool-ups on uneven bar measures, strength endurance of arms and shoulders muscles. Women Artistic Gymnastics is a strength endurance dominating support discipline a girl has to perform about 10-12 Gymnastics elements, which need strength, on all apparatus except Vaulting Table performing 10-12 strength dominating elements against gravity requires lot of strength–endurance in arms and shoulder muscles. The high performance group has been found to have significantly higher arms and shoulders strength when compared mediocre performance group (t = 3.40; P<0.01). High performance has also been found to have significantly higher arms and shoulder strength when compared with Low Performance Group (t = 7:20; P<0.01) Debnath (1983) has also reported that high performs significantly possess greater arms and shoulders strength when compared with low performance group. She has also reported significant relationship between pull-up score and competition performance and women Gymnastics.

Sit ups (Jack Knife Action) test measures Abdominal strength. Abdominal strength plays important role in performing various bending and stretching movements in Gymnastics on apparatus and floor about 50% of the movements belonging to bending and stretching structure movement. High Performance Group has been found to have significantly higher amount of abdominal strength when compared with low performance group (t = 6.72; P<0.01) and mediocre performance group (t = 2.3; P<0.05). Mediocre Performance Group possess significantly greater abdominal strength when compared with low performance group (t = 5.40; P<0.01) similar results were reported by Debnath (1983). Backlift on vaulting horse measures the strength of the back muscles. Strength of back muscles is as important strength of abdominal strength. After performing the bending movement a Gymnasts has to stretch the body for stretching strength of back mussel is required. In the present investigation it has been found that high performance group possess significantly higher amount of back strength compare with low performance group (t = 11.47; P<0.01) and with Mediocre performance group (t = 4.86; P<0.01). While looking at the results it has also been found that Mediocre Performance Group is significantly higher in back strength when compared with the Low Performance Group (t = 8.13; P,0.01).

Sprinting ability is one of the important conditional abilities required to obtain high performance on vaulting table and floor. 50 mts sprint test has been administered on each subject to measure the sprinting ability to perform a vault on the table a girl Gymnasts run for about 25 mets. A good amount of speed is required a strong take off from the boat to perform different stunts on the table. In the present investigation non-significant difference in sprinting ability between high and mediocre, high and low and mediocre and low performance groups. The results of this investigation are contrary to the findings given by Debnath (1983).

Flexibility is another physical ability required for high performance in women artistic gymnastics. Trunk flexion (trunk flexibility) has been measure by forward bend and reach test High performance group has been found to have significantly higher amount of trunk flexibility when compared with low performance group. However, non-significant difference in trunk flexibility between high and mediocre performance group and mediocre and how performance group has been found in the present study. Similar results have also been reported by Debnath 1983.

Active trunk extension flexibility is another important physical ability for obtaining high performance in women artistic gymnastics. The test, back bridge, measures the passive flexibility of the trunk extension. Too much passive trunk extension flexibility is not good for high performance in Gymnastics. Non-significant differences in trunk extension ability between high and low performance group, high and mediocre performance group and mediocre and low performance group have been found in the present study. In some research studies High performance group have been found to have higher amount of trunk extensibility when compared with the low performance group. Debnath (1983) has also reported significant difference in trunk extension ability between high and low performance groups. Another important physical ability which play role in achieving high performance in women Gymnastics is Cardio Respiratory Endurance. Women Artistic Gymnastics is a strength endurance dominating support discipline. A women has to perform about 10-12 movements continuously one after the another in her routing performing 10-12 strength dominating movement continuously also requires endurance. Thus, the strength endurance plays important role in getting high performance in women Gymnastics. The results found in the present investigation revealed a significant difference in Cardio Respiratory endurance between high and mediocre performance group ($t = 3.85$; $P<0.01$) and between high and low performance group ($t = 2.67$; $P<0.05$). The result of the investigation also revealed a significant difference between mediocre and low performance group in cardio respiratory endurance ($t = 1.45$ Non Significant; $P<0.01$).

Another variable taken for the study was competition performance. In fact, grouping of the entire sample into high, mediocre and low performance groups was done on the basis of competition performance scores. Competition performance is Gymnastics is evaluated by two judging panels i.e. panel 'A' which consist of two judges and panel 'B' which consist of 4 judges. In the present investigation high performance group has been found to have significantly higher competition performance scores when compared with the low performance group ($t = 12.64$; $P<0.01$) and mediocre performance group ($t = 5.81$; $P<0.01$). Mediocre performance group is significantly higher in competition performance when compared with low performance group ($t = 8.33$; $P<0.01$).

It is evident from the results of above discussion that high performance group significantly possess greater amount of arms and shoulders strength, abdominal strength of the back muscles, cardio respiratory endurance when compared with mediocre and low performance groups. Similarly, mediocre performance group possess significantly greater amount of arms and shoulders strength, abdominal strength, strength of the back muscles, cardio respiratory endurance when compared with low performance group.

The purpose of the present study was to find out the role of different physical abilities compared to competition performance of different level of Gymnasts i.e. elite, mediocre and low level of Gymnasts. Purpose of the study was also to find out that, in which of the Physical abilities, top female Gymnasts are better than mediocre and low level female Gymnasts.

Gymnasts: The study was conducted on 40 female Gymnasts, out of 40 female Gymnasts, 8 belong to high performance group (group A), 16 belong to mediocre performance group (Group B) and 16 belong to lower performance group (Group C). The study is based upon competitive performance and tests of strength, flexibility, speed and endurance.

To measure the level of strength abilities pull-ups, sit-ups, back lift from vaulting Horse and standing broad jump, were administered. 50 meters sprint to measure speed; trunk flexion and back extension (back bridge) to measure flexibility and Harvard step test to measure endurance ability were administered.

The data obtained through different tests have been statistically analyzed by using one was Analysis of variance to find out the significance of difference in various variables among the three groups i.e. high performance group, mediocre performance group and low performance groups. Scheffe's test was used to find out significance of difference and't' value of all variables in respect of high performance group with low performance group, high performance with mediocre and mediocre performance group with low performance group.

From the present study it was found that the women Gymnasts who excel in this technical sport discipline have better level of strength in arms and shoulder, abdominal and back muscles as compared to mediocre and low performance group Gymnasts.

We know that sprinting ability is one of the important conditional abilities required by the Gymnasts for better performance in competition.

The present study reveals the non-significant difference in sprinting ability of high and low, high and mediocre and mediocre and low level performance groups.

From the present study it has also been found that there exist a non-significant difference in trunk flexibility between the high and low, high and mediocre performance group and mediocre and low performance groups.

The results found in the present investigation reveal a significant difference in Cardio-Respiratory endurance between high and mediocre performance group ($t = 5.81$; $P<0.01$) and between high and low performance group ($t = 12.64$; $P<0.01$). The result of the study also shows a significant difference between mediocre and low performance group ($+ = 8.33$; $P<0.01$)

CONCLUSIONS

From the above discussions the following conclusions are drawn:

- High performance group significantly possesses greater amount of arm and shoulder strength, abdominal strength, strength of the back muscles and cardio respiratory endurance when compared to mediocre and low performance groups.
- Mediocre performance Group possesses significantly greater amount of arms and shoulders strength, abdominal strength, strength of back muscle and cardio respiratory endurance when compared with low performance group.
- Competition performance in case of high performance group has been found to have higher competition performance scores as compared with low performance group and mediocre performance group.
- Mediocre performance group is significantly higher in the competition performance when compared with low performance group ($t = 8.33$; $P<0.01$)

SUGGESTIONS

- The same kind of the study can be repeated on male Gymnasts
- In the same study some coordination abilities can also be added for further advance study.
- A study may also be conducted regarding the co-relation among different variables of strength, speed, flexibility and endurance

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