

An Examination of female gymnasts with emphasis on Dipa

Karmakar

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Abstract

Sports scientists from all around the world are working to determine the various needs for improving performance in various sports. The goal of the study was to ascertain how female gymnasts' physiological, hematological, morphological, and motor capacities related to their performance. The individuals from the All India Inter-University Gymnastics Championship, were used to gather data on the physiological. The subjects were tested while they were lying down on a variety of physiological parameters, such as the essential limit, the breath holding limit, the resting heart rate, and the pulse. The study's 80 gymnasts were chosen. Following completion of one questionnaire by the team or group of players, another was provided. Correlation of data analysis were employed, with the level of significance set at .05 levels.

Keywords: *Dipa Karmakar, female gymnasts, Vital Capacity, Breath holding, Resting beat rate*

1. INTRODUCTION

1.1. BACKGROUND OF THE STUDY

Tumbling is a game. "Acrobatic" has been derived its name from Greek word. Gymnastic is performed by both male and female at different levels like school, school, college, public and worldwide rivalries. (Borrmann, 2016) It contributes to a good state of body control, coordination, balance, disciplinary exercises, strength and gracefulness with acrobatic skills performed in artistic manner as well as systematic ways.

Gymnastics training is offered mostly at cities and towns throughout the world. In fact, gymnastic coaching centers are active in various states of India and are contributing towards development of this sport. (Narender, 2015) Further, acrobatic exercises are additionally presented at school, universities and colleges. Media consideration toward acrobatic has proceeded to develop and made it one of the top TV crowd draws.

Gymnastic assumes an extraordinary part in actual activity. It is the foundation of numerous exercises since it assists with fostering all wellness parts. For improvement and advancement of sports the public authority assumes an essential part. The public authority and legislative associations comprise the public area of the games business, which is capable in making sports arrangements, designating awards for creating framework, sustaining gifts and

planning particular projects for in general improvement of sports. It has been the undertaking of the Government to set down methodology for powerful coordination among different organizations associated with the advancement of sports and broaden required framework, preparing and different offices to the sportspersons for accomplishing greatness in the global occasions. Since the best part in the exhibition sports is the best administration of offices including training and preparing and contest. (Caine, 2003) Besides, the players need the offices, for example, security measures, preparing settings, offices, voyaging offices and financial administration and so on. To put it plainly, for making progress in sports the players ought to be furnished with offices and foundation as per the idea of sports.

By and by, the situation of execution of Indian serious tumbling whenever contrasted and the exhibition at world level is normal and that too explicitly of the specific areas of India. The offices furnished to the gymnasts when contrasted and the worldwide norms are small. The administration at different levels from associations of the rivalries, governmental issues in the organization the favoritism towards particularity is exceptionally taken note. In any case, the presentation of the gymnasts with this multitude of hardships isn't commendable. On the off chance that the administration at different levels is sustained and thrived, in the impending times it very well might be workable for the Indians to praise the Indian gymnasts on the triumph platform. The administration at different levels has a ton of effect as it is the foundation of the discipline in executing the projects.

1.2. DIPA KARMAKAR

Dipa Karmakar (considered 9 August 1993) is an Indian imaginative trapeze artist. Karmakar actually stood separated as truly newsworthy when they won the bronze decoration at the Glasgow 2014 Commonwealth Games, arising as India's best tumbler during the opposition. She nearly won a bronze improvement at the Asian Gymnastics Championships and at the 2015 World Artistic Gymnastics Championships she set fifth, her two firsts for her country



Karmakar kept an eye out for India at the 2016 Summer Olympics in Rio de Janeiro, changing into the crucial Indian trick savage to fight in the Olympics in 52 years and the fundamental Indian aerobic overall around informed power. She finished fourth in the women's vaulting tumbling struggle in Rio with an undaunted score of 15.066. (Hartig,

2017)

In July 2018, Karmakar changed into India's driving tumbling organized proficient and battled at the FIG Gymnastics World She Challenge held in Mersin, Turkey where she put first in the vault of the Cup in a general event. I won a gold arrangement. Karmakar is one of the most marvelous five women to actually complete Produnova and is after a short time saw as the trickiest vault acted in women's gymnastic. Karmakar is a beneficiary of her Padma Shri, her fourth most major differentiation for non-military staff in the Republic of India. In August 2016, the Government of India allowed her the Major Dhyan Chand Kel Ratna Scholarship for her show at the Rio 2016 Olympic Games.

1.2.1. Early life and employment

At first from Agartala, Tripura, Karmakar started his school life and getting ready at Aboynagar Nazrul Smriti Vidyalaya. She started chipping away at tumbling at six years of age and from there on out she has been arranged by Soma Nandi and She Bishweshwar Nandi. Karmakar had straight legs when she started to falter. This is a terrible genuine characteristic of the tumbler as it influences her show. Through her cautious readiness, she made a move to support the bend of her legs.

She won the 2008 Jalpaiguri Junior Nationals. As of around 2007, Karmakar has won 77 distinctions, including 67 golds, at state, public and large confrontations. It was huge for the Indian tumbling contingent.

Senior job

- **Early Appointment (2011-2013):** In February, Karmakar went to the 2011 Indian National Games and watched out for Tripura. She won gold on all of the four occasions by and large on the floor, vault, balance her post, and bowed shaft.
- **Affiliation and Asian Awards and World Her Cup Finals (2014-2015):** In July she at the 2014 Commonwealth Games, Karmakar truly won a bronze improvement in women's vault in the Produnova vault. Her difficulty is 7.00. She achieved her customary two-skip score of 14.366. She changed into the focal Indian to run the enhancement of the Commonwealth match and the second Indian all around, after Ashish Kumar. At the 2014 Asian Games, Karmakar finished fourth in vault, 14,200 concentrations before Hong Eun-jung, Oksana Chusovicina and Phan Tu Ha Tan. At the Asian Championships held in Hiroshima from July 31 to August 2, Karmakar won a bronze arrangement in the women's vault and placed eighth on the harmony shaft. In October 2015, Karmakar changed into the genuinely Indian tumbler fulfilling every one of the necessities of the last season of the World Artistic Gymnastics Championships. She scored 14.900 in her round of vaulting skill[24] and in two jumps she qualified for the finals where she put fifth in her normal 14.683.
- **Rio Olympics and further (2016-present):** On tenth August 2016, Karmakar turned into India's top tumbling expert with a score of 14.833 in the 2016 Olympic test occasion. She surpassed her bronze award and put her fourth with a score of 15.066 in the last of the occasion held at the Gymnastics Center in Rio de Janeiro,

Brazil on August 14, 2016.

- Karmakar is the fifth woman all through the whole presence of aerobatics to show up on the Produnova vault (twofold handspring front). Produnova is an inventive dive including vaulting her front hand to her pony jumping her and her two front somersaults. Her continuous D-score on vault is her 6.4, the most problematic vault in women's fantasy tumbling.

Karmakar was breastfeeding toward the finish of 2017 she had actual issues at half. She harmed her knee during practices for the 2017 Asian Gymnastics Championship qualifying. In April of that year, she went through treatment for her front sacral ligament and couldn't take part in that frame of mind until after her merciless season. She in like manner pulled out of the India pack qualifying round for the 2018 Commonwealth Games since she wasn't ready, her guide said. Karmakar won a gold beautification in vault at her FIG Gymnastics World Challenge Her Cup in Mersin, Turkey in July 2018. From there on out, she won a gold beautification in the world challenge and transformed into India's top her tumbler. In a similar rivalry, she showed up at the remainder of the balance segment and finished fourth. Karmakar didn't meet all the hopping necessities at the 2018 Asian Games. She harmed her right knee which went through a medical procedure for a genuine issue when she appeared at a preliminary gathering prior to taking part in the ladies' competition and the finals of the contraption. She additionally as of late resigned from the gathering.

1.3. STATEMENT OF THE PROBLEM:

“AN ANALYTICAL STUDY ON FEMALE PHENOMENAL GYMNAST WITH REFERENCE OF DIPA KARMAKAR

1.4. OBJECTIVE OF THE STUDY

2. To evaluate the relationship of imperative Capacity, Breath holding, Resting beat rate with the exhibition of female Gymnasts.
3. To evaluate the relationship of vital capacity with execution of Gymnasts.
4. To evaluate the relationship of Blood tension with execution of Gymnasts.

1.5. RESEARCH HYPOTHESIS

H1: It was guessed that there would be basic relationship of Vital Capacity with execution of Gymnasts.

H2: It was speculated that there would be critical relationship of Breath holding limit with execution of Gymnasts.

H3: It was theorized that there would be gigantic relationship of Resting beat rate with execution of Gymnasts.

H4: It was conjectured that there would be huge relationship of Blood tension with execution of Gymnasts.

2. REVIEW OF LITERATURE

Medred (1966) while concentrating on the grown-up female gymnasts reasoned that the level of the grown-up female gymnasts was less (160.54 cm) than the typical gathering (161.9 cm). Pool et al (1969) took anthropological and physiological estimations on 38 female gymnasts who partook in European Title in 1967 held at Amsterdam. The gymnasts were attributes by little level (Mean=158cm) and weight (Mean=52.6 kg). The female gymnasts were seen as exceptional more modest on their skinfolds, which were viewed as related adversely with their exhibition. Muscles were viewed as well created and associated fundamentally with the all-out score. The running time and hop level of the gymnasts likewise observed to be corresponded fundamentally with the imprints for floor works out.

Falls and Humphery (1978) gathered information on 71 female gymnasts and 54 non-competitors (NA). The gymnasts were partitioned into two gatherings for example placers (P) incorporated those gymnasts who got position in the opposition and non-placers (NP) incorporated those gymnasts who got no situation in the opposition. It was presumed that placers were more limited and lighter (161.5 cm, 55.1 kg) than NP = (162.1 cm, 55.2 kg) and than the non-competitors (164.6 cm, 58.5 kg), with fundamentally less measure of muscle versus fat (P = 16.82%, NP = 18.4%, NA = 21.45%) separately. While contrasting the placers and non-placers among themselves it was seen that both the gatherings were practically indistinguishable in level what's more, weight.

Bundle (1981) tracked down the mean somatotype attributes of the gymnasts (3.5 - 3.9 - 2.9) when contrasted with hockey players (3.5 - 4.1 - 2.6), b-ball players (3.7 - 3.4 - 3.3), swimmers (3.6 - 4.0 - 2.7) and crosscountry competitors (2.8 - 3.0 - 4.8).

Beunen et al (1981) detailed information on 23 Blegium female gymnasts and 450 control subjects of a similar age bunch. The mean age was recorded 16.6 years. It was finished up from the review that the gymnasts had more modest body aspects than the reference bunch with the exception of biacromial width and upper arm outline. Comparative with their level, the gymnasts had more limited trunks what's more, a somewhat bigger bulk. It was also construed that the female gymnasts were more humble in their hips relative in their biacromial width than the controls. The mean somatotype of female gymnasts was recorded as 2.4 - 3.7-3.1.

Shankar (1985) examined the 13-position victor (PW) what's more, 28 non-position champ (NPW) female gymnasts. The mean period of PW was 17.5 years and NPW was 17.4 years. No enormous differentiations were seen as in level (PW= 58.6, NPW= 60.1) and weight (PW=90.7 Ibs, NPW = 89 Ibs) between position victors and non-position champs, yet the past were seen as essentially more endomorphic and mesomorphic and less ectomorphic than the last decision.

Broekheff et al (1986) gathered information on eighteen female (X= 13.32 years) youthful American gymnasts. The female gymnasts were noted to be altogether more limited and lighter (X =150.21 cm, 42.0 kg) than controls (X =160.46 cm, 50.88 kg). It was additionally reasoned that in relation to the body level, the female gymnasts had altogether bigger upper arm circumference, humerus width; more extensive shoulders and smaller hips than the reference bunch.

Claessens et al (1991) took anthropometric estimations of remarkable male and female gymnasts from the 1987 World Championship. 200 and one first class female gymnasts were estimated for body aspects and somatotype rating. The outcomes were contrasted and reference information acquired at global vaulting rivalries of earlier years. They viewed female gymnasts as altogether ($p < .01$) more modest than gymnasts of earlier years in weight and in all length aspects including level. A decrease in mean range from 159 cm to 154.3 cm was seen and appeared to be highlighted between the 1976 Olympics and the World Titles at Budapest in 1983. Alongside the level decline, there was a weight decrease from 52 kg to 45 kg. The skinfold estimation showed the 1987 gymnasts were more slender with 48% of the gymnasts showing a very low measure of subcutaneous fat. In addition to the fact that these physiological variables contrasted, be that as it may, the gymnasts in 1987 were more youthful than all past gymnasts with a decrease in mean age from 22.7 in 1964 to 16.5 years old in 1987. The specialists likewise observed that there was more change looking like the female gymnastic specialist from 1967 to 1987 than that of the male athlete.

Gualdi et al (1992) considered the skinfold and body synthesis of female gymnasts (N= 227, Mean age=19.6 Years) what's more, were accounted for to have 19.59% of muscle to fat ratio and 43.92 fat free mass.

3. RESEARCH METHODOLOGY

3.1..1. RESEARCH DESIGN

To evaluate the relationship of physiological Parameters with execution of female gymnasts was utilized as plan of the current review. 80 (N = 80) subjects were chosen for purposive inspecting went through this review. The subjects were tried in laying state on chosen physiological factors, for example, essential limit, breath holding limit, resting beat rate, pulse, bloodpressure.

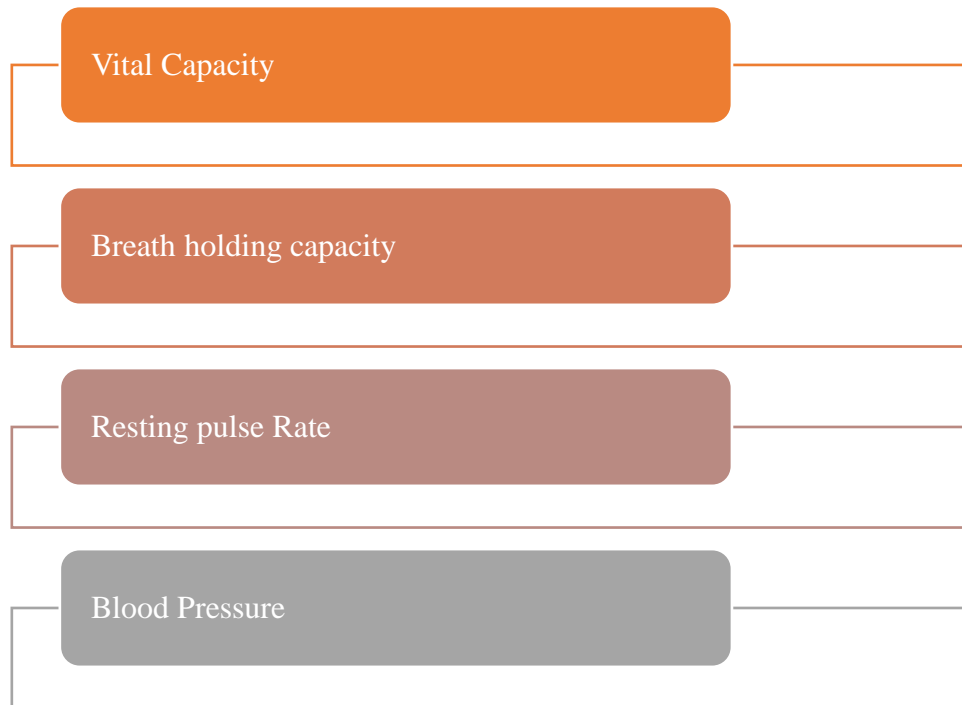
3.1. SELECTION OF SUBJECTS

The reason for the review was to analyze the chosen physiological parameters of female gymnasts according to their exhibition. All subjects were chosen as far as purposive Sampling Technique under the examining technique for non-likelihood inspecting. To finish reason for present review, complete 80 (N= 80) female creative Gymnasts were chosen as subjects from All India Inter-University Gymnastics Championship. The age of the subjects ran between 18 to 25 years.

3.2. SELECTION OF VARIABLES

On the basis of presented literature, researcher had gone through with findings of relate research studies and after the discussions with various senior experts of this game and her own research guide, the variables presented in the figure 3.1 were selected for the study of physiological of female gymnasts.

Figure.3.1: Physiological Parameters



4. RESULT AND DISCUSSION

Table-4.1: Vital Capacity and the Athletic Prowess of Female Gymnasts

Variable	N	Mea n	SD	Coefficientofcorrelation(r)	Pvalue
VitalCapacity	8 0	4.42	0.595	0.20	0. 1 6
Performance	8 0	32.35	9.126		

$r_{0.05(73)}=0.22$

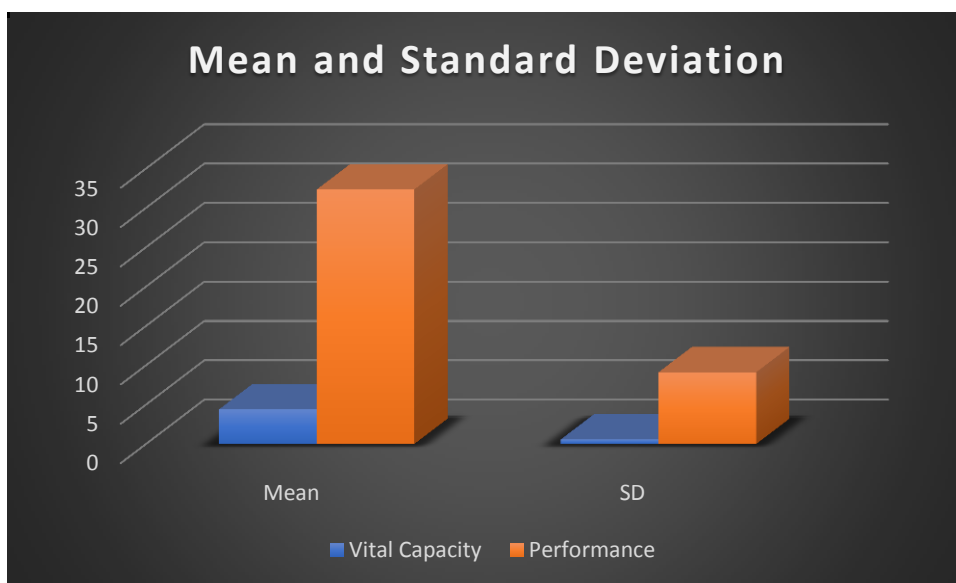


Figure 4.1: Female gymnasts' vital capacity and their results, as depicted by a bar graph

Table 4.1 shows the mean and SD value of the imperative limit and performance as 4.42 ± 0.595 and 32.35 ± 9.126 individually. Inconsequential relationship has been seen from Table 4.1 between crucial limit and performance. As coefficient of connection if there should be an occurrence of imperative limit and performance was 0.20 which was not exactly the expected worth (0.22). p value(0.11) was more than critical worth (0.05).

Table 4.2: Female gymnasts' performance and the effect of breath holding

Variable	N	Mea n	SD	Coefficientofcorrelation(r)	Pvalue
Holding one's breath	8 0	37.71	11.89	0.04	0. 9 2
Performance	8 0	35.22	9.362		

$r_{0.05}(73) = 0.22$

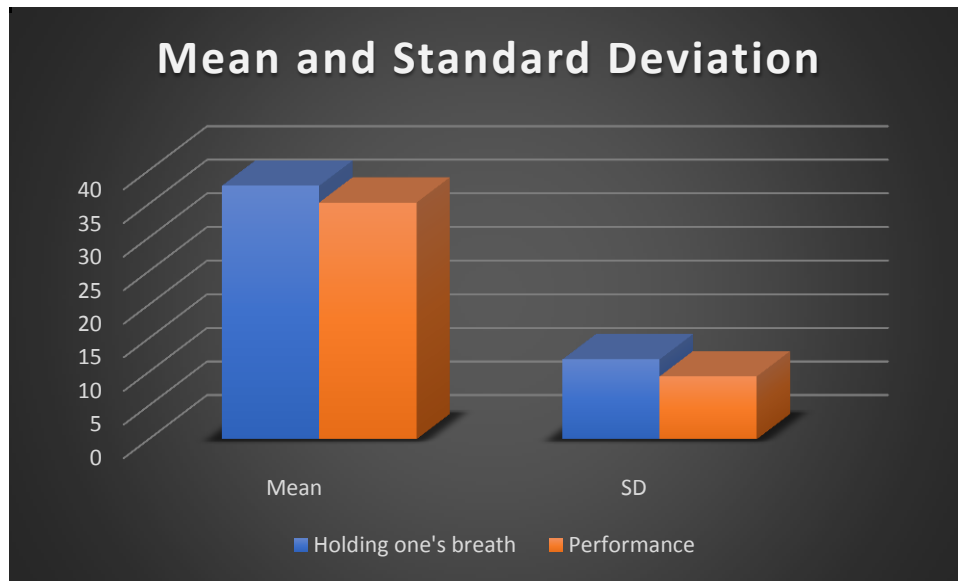


Figure 4.2: Scatter Plot Showing Relationship of BreathHoldingCapacitywithPerformance ofFemaleGymnasts

Table 4.2 shows the mean and SD value of the breath holding limit and performance as 37.71 ± 11.89 and 35.22 ± 9.362 separately. Table 4.2 uncovers immaterial connection between breath holding limit and performance. As coefficient of connection in the event of breath holding limit and performance was 0.04 which was not exactly the expected worth (0.22). p value (0.92) was more than huge worth (0.05).

Table 4.3: Female gynecologists’ resting pulse rates and their workout results are correlated

Variable	N	Mea n	SD	Coefficientofcorrelation(r)	Pvalue
Restingpu lseRate	8 0	62.75	6.23	- .426 *	.0 0 3
Performance	8 0	32.63	9.263		

$r_{0.05}(73)=0.22$

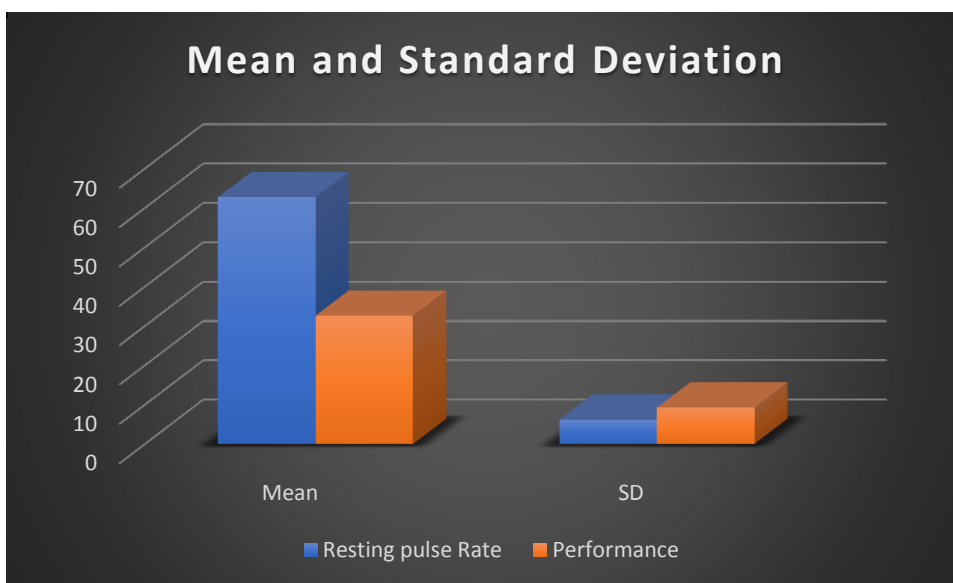


Figure 4.3: Scatter Plot Showing Relationship of Resting PulseRate withPerformance ofFemale Gymnasts

Table 4.3 shows the mean and SD value of the resting beat rate and performance as 62.75 ± 6.23 and 32.63 ± 9.263 individually. The outcome uncovers from table 4.3 that there is negative huge relationship existed between resting beat rate and performance. As coefficient of connection in the event of resting beat rate and performance was $- 0.426^*$ which was more than the necessary worth (0.22). p value(0.003) was not exactly huge worth (0.05). It shows that when performance is higher than beat rate is less.

Table 4.4: The Association between Systolic Blood Pressure and the Performance of Female Gymnasts

Variable	N	Mea n	SD	Coefficientofcorrelation(r)	Pvalue
SystolicBlo odPressure	8 0	132.7 2	8.215	0.03	0. 5 2
Performance	8 0	35.56	9.263		

$r_{0.05(73)} = 0.22$

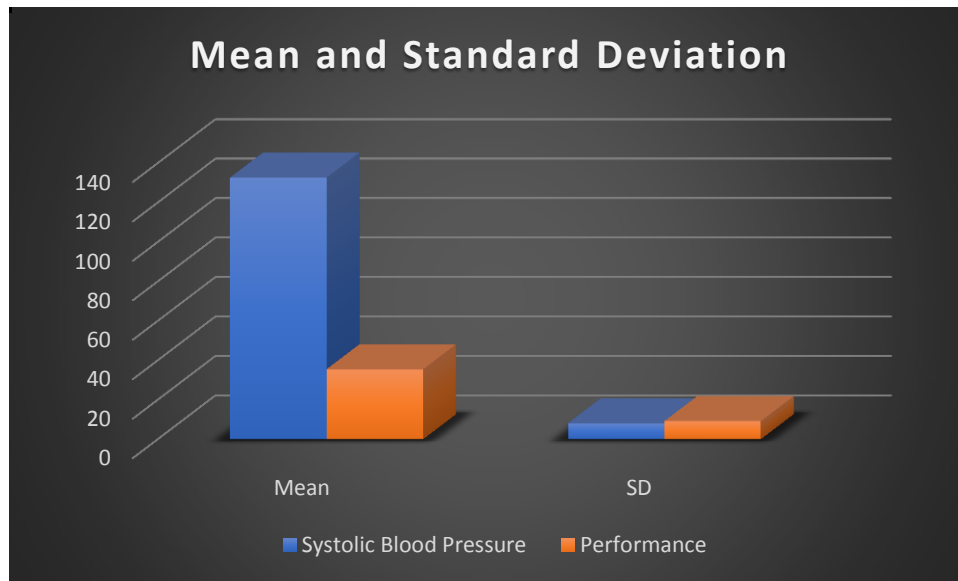


Figure 4.4: Scatter plot showing relationship of systolic blood pressure with performance of female gymnasts

Table 4.4 shows the mean and SD of the systolic circulatory strain and performance as 132.72 ± 8.215 and 35.56 ± 9.263 separately. The aftereffect of table 4.4 demonstrates that there is irrelevant coefficient connection relationship existed between systolic pulse and performance. As coefficient of relationship in the event of systolic circulatory strain and performance was 0.03 which was not exactly the expected worth (0.22). p value(0.52) was more than critical worth (0.05).

Table 4.5: The Association between Diastolic Blood Pressure and the Performance of Female Gymnasts

Variable	N	Mean	SD	Coefficient of correlation (r)	P value
Diastolic Blood Pressure	80	79.62	5.521	0.03	0.85
Performance	80	35.85	9.263		

$r_{0.05(73)} = 0.22$

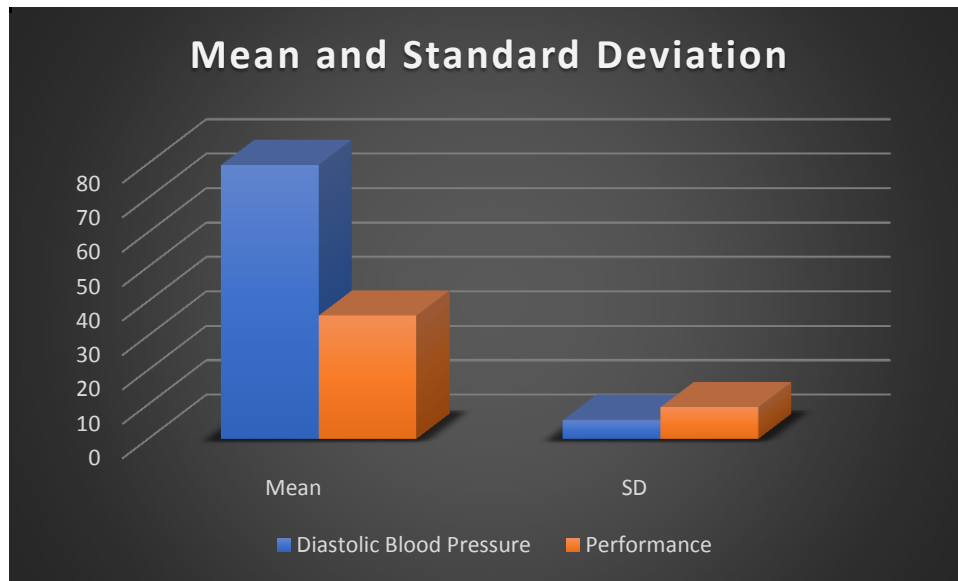


Figure 4.5: Graph showing relationship of diastolic blood pressure with performance of female gymnasts

Table 4.5 shows the mean and SD values of the diastolic blood pressure and performance as 79.54 ± 5.521 and 35.85 ± 9.263 respectively. It is evident from table 4.5 that insignificant relationship existed between diastolic blood pressure and performance. As coefficient of correlation in case of diastolic blood pressure and performance was 0.03 which was less than the required value (0.22). p value (0.85) was more than significant value (0.05).

5. CONCLUSION

The motivation behind this study was to figure out the relationship of chosen physiological Parameters of female gymnasts comparable to their presentation. Present review was led on 80 (N=80) creative female gymnasts (matured 18 to 25 years). The review was intended to evaluate the relationship of physiological Parameters of female gymnasts. To make the examination between them, the gymnasts were separated into two gatherings based on their presentation. The best 25 gymnasts were named superior execution gymnasts and other people who scored over 20% were placed in low execution athlete. These subjects were chosen as far as purposive examining from the All India Inter-University Gymnastics Championship. Physiological boundaries (crucial limit, breath holding limit, resting beat rate, resting pulse (systolic and diastolic)).

6. REFERENCES

1. Borrmann, G. (1978). *Relationships between anatomy, physiology and gymnastics movements*. In G. Borrmann (Ed.), *Geraturnen Third Edition* (pp. 70-82). Berlin, G.D.R.: Sportverlag.
2. Bucher, C. A. & Krotee, M. I. (2002). *Management of physical education sports*. New York: McGraw-Hill Company.

3. *Buhrle, M., & Werner, E. (1984). The muscle hypertrophy training of the body builder.*
4. *Caine, D. J. (2003). Scientific aspects of women's gymnastics: injury epidemiology. Med Sport Sci. 45, 72–109.*
5. *Cupisti, A., D'Alessandro, C., Castrogiovanni, S., Barale, A., & Morelli, E. (2000). Nutrition survey in elite rhythmic gymnasts. J Sports Med Physical Fitness, 40(4), 350-355.*
6. *Di Cagno, A., Baldari, C., Battaglia, C., Brasili, P., Merni, F., Piazza, M., Toselli, S., Ventrella, A. R., & Guidetti, L. (2008). Leaping ability and body composition in rhythmic gymnasts for talent identification. J Sports Med Phys Fitness, 48(3), 341-346.*
7. *Di Cagno, A., Baldari, C., Battaglia, C., Monteiro, M. D., Pappalardo, A., Piazza, M., & Guidetti, L. (2009). Factors influencing performance of competitive and amateur rhythmic gymnastics--gender differences. J Sci Med Sport., 12(3), 411-416.*
8. *Di Cagno, A., Battaglia, C., Fiorilli, G., Piazza, M., Giombini, A., Fagnani, F., Borrione, P., Calcagno, G., & Pigozzi, F. (2014). Motor learning as young gymnast's talent indicator. J Sports Sci Med., 13(4), 767-773.*
9. *Difiori, J. P., Caine, D. J., & Malina, R. M. (2006). Wrist pain, distal radial physical injury, and ulnar variance in the young gymnast. Am J Sports Med., 34, 840–849.*
10. *Hartig, R., & Buchmann, G. (1988). Gymnastics training methodology. Berlin, G.D.R.: Sportverlag.*
11. *Hirtz, P., & Starosta, W. (2002). Sensitive and critical periods of motor coordination development and its relation to motor learning. Journal of Human Kinetics, 7, 19-28.*
12. *Kumar, D. (2003). Survey of facilities for physical education and sports in schools of centre Delhi, cited in the Book, Gupta, Rakesh and Bedi, M.M.S. Research Process and Sports in Physical Education & Sports Sciences, Friends Publications (India): New Delhi.*
13. *Kumar, S. (2003). An assessment of sports facilities in relation to sports participation for school boys of West Delhi, cited in the book, Gupta, Rakesh and Bedi, M.M.S., Research Process and Studies in Physical Education and Sport Sciences, Friends Publication (India): New Delhi.*
14. *Kumar, T. (2003). Survey of facilities for physical education, and sports in schools of West Delhi, cited in the book, Gupta, Rakesh and Bedi, M.M.S., Research Process and Studies in Physical Education and Sports Sciences, Friends Publication (India): New Delhi.*
15. *Martin, D. (Ed.) (1991). Handbook of training theory and methodology. Schorndorf, F.R.G.: Verlag Karl Hofmann.*
16. *Massidda, M., Toselli, S., Brasili, P., & Calo, C. M. (2013). Somatotype of elite Italian gymnasts. Coll Antropol., 37(3), 853-857.*
17. *Meeusen, R., & Borms, J. (1992). Gymnastic injuries. Sports Med., 13, 337– 356.*
18. *Meister, K. (2000). Injuries to the shoulder in the throwing athlete, part one:*

- Biomechanics/pathophysiology/classification of injury. Am J Sports Med.*, 28, 265–275.
19. Oppel, C. (1967). *The dependency of gymnastics performance on muscular strength during the junior ages. Theorie u. Praxis d. Korperkultur*, 12, 236-244.
 20. Pankhurst, A., Collins, D., & Macnamara, A. (2013). *Talent development: linking the stakeholders to the process. J Sports Sci.*, 31(4), 370-380.
 21. Peltenburg, A. L., Erich, W. B., Bernink, M. J., & Huisveld, I. A. (1982). *Selection of talented female gymnasts, aged 8 to 11, on the basis of motor abilities with special reference to balance: A retrospective study. Int J Sports Med.*, 3(1), 37-42.
 22. Pion, J., Hohmann, A., Liu, T., Lenoir, M., & Segers, V. (2017). *Predictive models reduce talent development costs in female gymnastics. JSports Sci.*, 35(8), 806-811.
 23. Pion, J., Lenoir, M., Vandorpe, B., & Segers, V. (2015). *Talent in female gymnastics: a survival analysis based upon performance characteristics. Int J Sports Med.*, 36(11), 935-940.
 24. Starosta, W., & Hirtz, P. (1989). *Sensitive and critical periods in development of coordination abilities in children and youths. Biology of Sport*, 6, 276- 282.
 25. Stratton, O. J. (1978). *A survey of physical education teachers professional preparation, available facilities and activities included in the adopted physical educational programmes in the AAA secondary schools of the State of Tennessee. Dissertation Abstracts International*,
 26. Tingle, D.L. (1976). *A survey to determine the status of physical education programme in selected schools for the deaf in the United States of America. Completed Research in Health, Physical Education and Recreation*, 21.
 27. Vandorpe, B., Vandendriessche, J. B., Vaeyens, R., Pion, J., Lefevre, J., Philippaerts, R. M., & Lenoir, M. (2012). *The value of a non-sportspecific motor test battery in predicting performance in young female gymnasts. J Sports Sci.*, 30(5), 497-505.
 28. Vandorpe, B., Vandendriessche, J., Vaeyens, R., Pion, J., Lefevre, J., Philippaerts, R., & Lenoir, M. (2011). *Factors discriminating gymnasts by competitive level. Int J Sports Med.*, 32(8), 591-597.
 29. Verchoshanskij, J. V. (1985). *The programming and organization of the training process. Moscow, USSR: Fizkultura I sport.*
 30. Ahuja, Veena Mehta (2005). *Textbook of Physiology (1st Ed.). Delhi: M.L.Pandey Modern Publication.*