

## **Progress Pattern of Playing Ability in Basketball Due to Specific Conditioning Program**

Ajay Nehra\*, Dr Narender Kumar Duggal \*\*

\* Research Scholar, Shri Venkateshwara University, Gajraula, UP

\*\* Assistant Professor Physical Education, DAV Centenary College, Faridabad, Haryana

(Received 15 March 2023- Accepted & Published 25 March 2023)

---

### **Abstract**

The objective of the study was to study the progress pattern of basketball playing ability due to specific conditioning program. The scholar designed a specific conditioning program specifically for basketball players. For the said purpose, 31 male basketball players with age range of 17 – 22yrs were included in the study. A 12 weeks specific training program was designed and implemented on the experimental group. Before the commencement of training program, a pre-test was conducted to collect data with help of Johnson Basketball skill test. Thereafter, data was collected on Repeated measure design i.e. after every four weeks till 12<sup>th</sup> week. In order to statistically analyse data, repeated measure MANOVA was applied. The f-test and post-hoc values represented the significant improvement in basketball playing ability of subjects. Thereafter, the objective of the research was fulfilled by executing the within subject contrast test. The obtained result proved the linear pattern in improvement of basketball performance of the selected subjects.

***Key words: leg power, breath holding capacity, competitive anxiety***

---

### **INTRODUCTION**

Different games require different level of the physical fitness depending upon the type of activity, event, game and sports. Physical fitness necessitates effective motor procedure (quality of body movement), proficient organic mechanism (physiological aspect) and well-organized mental functioning (psychological aspect). An individual possesses all these qualities are said to be best fitted.

Improvement of the sports performance and all-round development of sports is the main task of the coaches and physical education teachers. Their dual efforts of channelling potential of their trainees to the most suitable games and sports discipline and of selecting suitable sportsmen for their particular branches is helped to a great extent by the recent development in the field of anthropology as it is applied to construction of adjective and valid criteria for selection of potential champions. A number of scientific research studies have tested the essential pre-requisite of potential champions in various sports and games. Agility plays an important role in physical education activities, especially in such events as gymnastics, basketball, pole vaulting, long jump, hurdling, and high jump and in all man assuring of the ends and backs in football. It is revealed to a great extent in sports involving efficient foot work, combined with high level of strength, endurance, agility and speed.

Today games and sports is a specialised field. It requires scientific and systematic type of training to improve performance of the player. Each activity requires a specific types of physical fitness components, thus to improve these components, a specific type of training is required.

The programme of training process is known as sports training. Sports training are the branch of science which helps to increase sports performance. There are various types of training method to improve performance by developing physical fitness in a proper way. Sports training programmes improve physical fitness components along with health and wellness. It guides us the correct method to perform physical activity.

The programmes of sports training also guide us the preventive, safe and correct way of performing physical activity. Nowadays, sports competition is becoming tough, thus best training method are developed and used to prove the excellence.

The word “training” means to give practical and theoretical knowledge but in physical education this word has deep meaning. Training method is of various ways or means to enhance sports performance. In other words, these are long term processes based on scientific and scientific and systematic way to enhance sports performance. Training method is based upon the scientific principles in a systematic order.

It is based on various aspects in its process like specific individual care, improve specific fitness, scientific way, psychological feedback technical help, good machines and apparatus, consideration climate, diet, safety, means, etc. It helps to develop basic skill, advanced skill, techniques, tactics, strategies, emotional stability during competition, motivation forces, etc.

The purpose of the study was to assess the **PROGRESS PATTERN OF PLAYING ABILITY IN BASKETBALL DUE TO SPECIFIC CONDITIONING PROGRAM**. On the basis of statement of the problem and other factors, following were stated as objectives of the research: To understand the pattern of improvement in basketball playing ability following specific conditioning exercise. The study was delimited to following factors: a) The study was delimited to Basketball Players only, b) The study was confined to male Basketball Trainee of Nehra Sports Academy, Saket, New Delhi and c) This study was further delimited to Basketball players of age between 17 to 22 years. Besides, following were considered the limitations of the study: a) No motivational technique was employed by the research scholar to enable the subjects to give their best performance. However, the subjects were asked to put up their best performance, b) Non-availability of sophisticated equipment was considered as a limitation of the study, c) Lifestyle, diet & nutrition of the students was another factor limiting this study and d) Psychological state of the students & climatic conditions was also not under the control of research scholar. On the basis of above information, it was hypothesized that specific conditioning programme will have positive effect on Basketball Playing Ability.

## **PROCEDURE AND METHODOLOGY**

### **Selection of the Subjects**

Thirty one male Basketball Trainee of Nehra Sports Academy, Saket, New Delhi were selected randomly to serve as subjects for the present study. The age of the subjects were ranging between 17 and 22 years.

All the subjects were given a 12 weeks specific training workout designed for the purpose of the present study. The training programme was designed in such a way that the subject does not have any undue stress both physical and mental after the schedule workout three days a week for 12 weeks.

The research scholar had informal discussion with all the subjects to apprise them with the purpose of the study and also to explain them the efforts required on their part.

### **Selection of Variables**

As the topic of the research “**EFFECT OF SPECIFIC CONDITIONING PROGRAM ON PLAYING ABILITY IN BASKETBALL**” suggest, following are the variables:

- INDEPENDENT VARIABLE  
Specific Conditioning Exercises
- DEPENDENT VARIABLE

Progress pattern of Basketball Playing Ability (Johnson Basic Basketball Skill Test Battery which includes:

- 1) Field Goal Speed Test (for Shooting),
- 2) Basketball Throw for Accuracy (for Throwing) and
- 3) Basketball Dribbling Test (for Dribbling).

### **Description of Tests**

In order to fulfil the research objectives, the basketball playing ability was assessed by using Johnson Basketball Test Battery. It is probably the oldest but the most commonly used test and was constructed in 1934 by Johnson during his research work for Master's thesis. This test is a battery of seven test items which includes three items of basic skill and four items of potential basketball ability. In this study, we have included the basic skill test battery which includes three tests as described below:

- i. Field Goal Speed Test
- ii. Basketball throw for accuracy
- iii. Basketball dribble test

To establish validity of the test battery, Johnson divided 180 high school basketball boys into two groups – “good” and “poor”. The “good” group of boys included those basketball players who represented in the school's basketball teams and the “poor” group of boys included those basketball players who were not selected for representing their school's basketball squad. There were fifty boys in the first group (good) and 130 in the second group (poor). A validity coefficient of 0.88 had been reported between test scores of both “poor” and “good” group boys. The reliability and the validity coefficient of the basic test items battery have been reported by Johnson to be 0.93 and 0.84 respectively (Clarke and Clarke, 1987).

### **Administration of Test**

As the experimental design suggest, the test was administered on Repeated Measure Design and data was collected. In particular, the test was administered before the commencement of training program which was called Pre-test. Following that, the next data was collected after 4 weeks, then 8 weeks and at last, after 12 weeks of training. So, there were four different occasions when the test was employed and data was collected i.e. Pre-test, after 4 weeks, after 8 weeks and after 12 weeks.

### **Administration of Training Programme**

To fulfil the purpose of the study, a training programme, with the aim to target physical fitness, was designed with the thorough discussion among supervisor and various specialised expert from concerned area. With keeping the fact in mind that physical capabilities are affected by individual differences, a training programme was designed which found feasible for all the subjects participated in the study as subject.

### **Collection of Data**

All the subjects were undergoing various tests during experimentation i.e. before the start of the training, after four weeks, after eight weeks & after twelve weeks of training. The scores were served as raw data on repeated measure design.

### **Statistical Procedure**

To fulfil the demand of the study and as the experimental design adopted for the research suggests, descriptive statistics and Repeated Measure MANOVA was applied to assess the between subjects effect among three test items of Johnson Basketball Skill Test. Besides, Repeated Measure ANOVA was applied on the composite score of Johnson Basketball Skill Test. Repeated Measure was also followed by Post hoc test to ensure the reliability of the

result and significance level was set on 0.05 level. All the statistical techniques were carried out by using SPSS software (16 version).

**RESULT OF THE STUDY**

The objective of the research was to study the effect of specific conditioning program on Johnson Basketball Skill Test Battery at different point of time. In order to assess this difference, Repeated Measure MANOVA technique was applied. In this process, first test was multivariate test that assessed the difference in combined dependent variables between the two or more related groups. Here, we have three dependent variables. And multivariate test assesses the differences among all three test items of Johnson Basketball Skill Test Battery. In order to assess Basketball Playing Ability, Multivariate test was calculated which proves the combined significant difference among selected test items i.e. Basketball Field Goal Speed Test, Basketball Dribble Test and Basketball Throw for Accuracy Test due specific conditioning program over a period of time i.e. before the commencement of training program, after 4 weeks, after 8 weeks and after 12 weeks of training program.

**Mean Value of Johnson Basketball Skill Test Battery and its Individual Variables**

	PRE	POST1	POST2	POST3
<b>FGST</b>	16.26	17.03	18.61	20.87
<b>BDT</b>	23.87	25.23	26.10	27.68
<b>BTAT</b>	13.90	14.32	16.42	17.61
<b>TOTAL</b>	54.03	56.58	61.13	66.16

First of all, Mauchly test for sphericity was assessed for basketball shooting ability. After conducting the sphericity test, the next calculations were made known as F-test to assess actual improvement in the Basketball Playing Ability of the subjects. All the obtained value of F-test were found significant which indicated that the specific exercise program had a positive impact on the basketball playing ability. This test was followed by pairwise comparison calculation against improvement in basketball performance at different point of time i.e. before the commencement of training programme, after 4 weeks, 8 weeks and 12 weeks of training programme.

**F-test for Different Variables of Johnson Basketball Playing Ability Test**

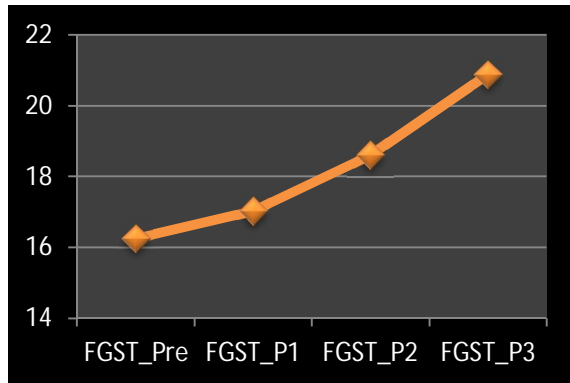
	F	Sig.
<b>FGST</b>	1.050E3	.000
<b>BDT</b>	2.673E3	.000
<b>BTAT</b>	580.106	.000
<b>TOTAL</b>	1.367E3	.000

After obtaining the desired result from MANOVA test, the test of within subjects contrast was conducted and it was found that all the individual items and composite score of Johnson Basketball Skill Test was found significant. The obtained result proves that there was linearity in the improvement of basketball performance through out the specific conditioning program duration. Hence, it was concluded that the 12 weeks specific conditioning program significantly improves the basketball performance with a linear pattern of playing ability.

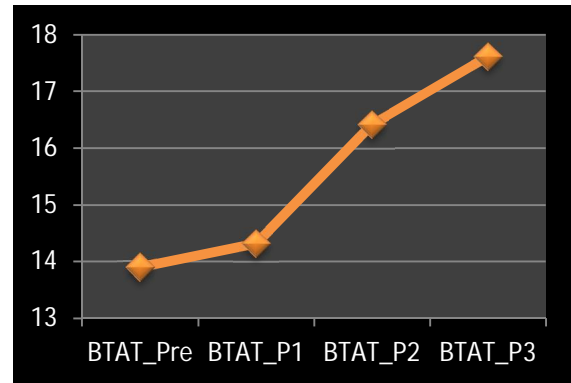
**Tests of Within-Subjects Contrasts**

	Type III Sum of Squares	df	Mean Square	F	Sig.
<b>FGST</b>	368.523	1	368.523	485.379	.000

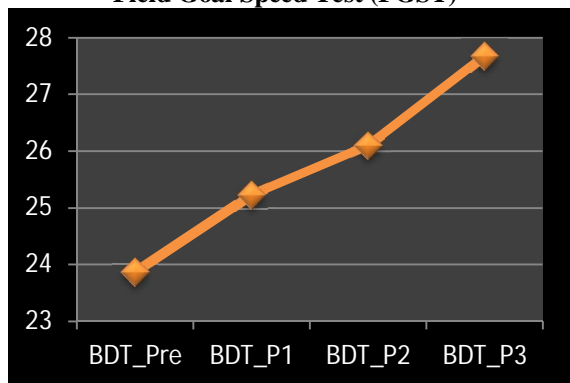
<b>BDT</b>	234.131	1	234.131	320.444	.000
<b>BTAT</b>	271.129	1	271.129	622.285	.000
<b>TOTAL</b>	2597.356	1	2597.356	1.779E3	.000



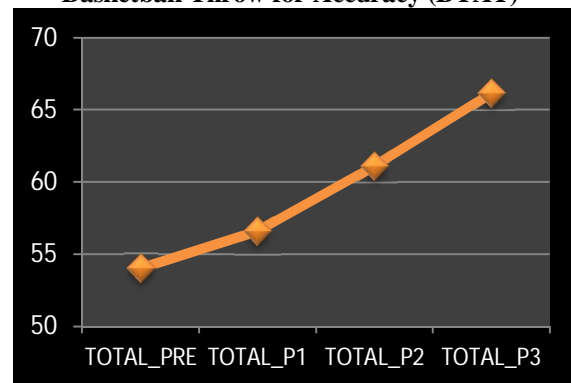
**Field Goal Speed Test (FGST)**



**Basketball Throw for Accuracy (BTAT)**



**Basketball Dribble Test (BDT)**



**Overall Score (Total)**

## CONCLUSIONS AND RECOMMENDATION

On the basis of result obtained and discussion on findings were made, following conclusion were drawn: It was also concluded that specific conditioning program increases the Basketball Dribbling ability at different point of time. Further, the study revealed that specific conditioning program increases the Basketball Throwing Accuracy ability at different point of time. Because, all the variables were improved due to specific training programme, therefore, it was found that same training had a positive impact on overall Basketball playing ability at different point of time. It was concluded as well that there was a linear pattern in improvement of Basketball Shooting ability following specific conditioning program. The similar pattern was also observed in improvement of Basketball Dribbling ability following specific conditioning program. Likewise, the pattern of improvement in Basketball Throwing Accuracy ability was also same due to specific conditioning program and concluded to be positive. It was also concluded that there was positive linearity in the pattern of overall Basketball playing ability following specific conditioning program. The following recommendations were stated after the whole works related to study was done: The same study may be done on female students. The same study can also be done on different age groups. The same work may be done with altered load components such as intensity,

frequency, density and volume. Similar study may be conducted on students related to other Sport/game. The same study can be carried out using kind of exercises other than used in this study.

## **BIBLIOGRAPHY**

- Aboshkair, Kamil, Abidhussain; Amri1, Saidon, Bin; Yee1, Kok Lian and Samah, Bahaman, Bin, Abu (2012). Factors affecting levels of health-related physical fitness in secondary school students in selangor. *Malaysia Journal of Basic & Applied Sciences*. 8, 202-216.
- Alana C (2014) Effects of concurrent training on inflammatory markers and expression of CD4, CD8, and HLA-DR in overweight and obese adults, *Journal of Exercise Science & Fitness* 12 (2014) 55-61
- Amusa1, L. O.; Goon1, D. T.; Amey, A. K. and Toriola, A. L. (2011). Health-related physical fitness among rural primary school children in Tshanda. *South Africa: Scientific Research and Essays*. Vol. 6(22), 4665-4680.
- Anusha E (2013) Effect of aerobic exercise on mitochondrial DNA and aging, *Journal of Exercise Science & Fitness* 11 (2013) 1-5
- Aziz AR et.al (2005) Measured Maximal Oxygen Uptake in a Multi-Stage Shuttle Test and Treadmill Run Test in Trained Athletes". *The Journal of Sports Medicine and Physical Fitness*, 2005, 45 (3), 306-14
- Barclay KD et.al (2013) Neuromuscular changes following simulated high-intensity cycling performance in moderate hypoxia, *Journal of Exercise Science & Fitness* 11 (2013) 78-84
- Bishop DC (2009) Effect of plyometric training on swimming lock start performance in adolescents. *Journal of strength and Conditioning Research/ national strength & conditioning association*. (2009 Oct): 23 (7): 2137-43.
- Boddington MK et.al (2004) Validity of a 5-meter Multiple Shuttle Run Test of Assessing Fitness of Women Field Hockey Players. *Journal of Strength and Conditioning Research*, 2004, 18 (1), 97-100
- Brain MH (2001) The efficacy of the ROM Device as an ergogenic aid with respect to select measures of power generation, flexibility and speed. Ph.D. The Florida State University, DAI Vol. 61, No. 10, April, 2001, pp. - 3938-A – 3939-A.
- Brain MH (2001) The efficacy of the ROM Device as an ergogenic aid with respect to select measures of power generation, flexibility and speed, Ph.D. The Florida State University, DAI Vol. 61, No. 10, April, 2001, pp - 3938-A – 3939-A.
- Cetin C (2005) A Regression Equation to Predict True Maximal Oxygen Consumption of Taekwondo Athletes Using a Field Test. *Saudi Medical Journal*, 2005, 26 (5), 848-50
- Chandra SA (1979) Comparative Relationship of Power, Agility, and Selected Speed Characteristics to Block Jump and Three Stride Jump in Volleyball. (Unpublished Master's Thesis, Jiwaji University, Gwalior, 1979)
- Chen, Chao-Chien Lin and Yi-Chun (2012). Jumping rope intervention on health-related physical fitness in students with intellectual impairment. *The Journal of Human Resource and Adult Learning*. Vol. 8.
- Clair WJ (1960) An Investigation of Tests of Agility. *Completed Research in Health, Physical Education and Recreation*, 2 (1960): 44
- Cleiton SC et.al (2014) Effects of high and low volume of strength training on muscle strength, muscle volume and lipid profile in postmenopausal women, *Journal of Exercise Science & Fitness* 12 (2014) 62-67
- Cristiano HX (2014) Is athletic background associated with a future lower prevalence of risk factors for chronic disease?, *Journal of Exercise Science & Fitness* 12 (2014) 47-54
- Dixit P (1982) Inter-Relationship of Reaction Time, Speed of Movement and Agility and Their Comparison among Players from Selected Sports. (Unpublished Master's Thesis, Jiwaji University, Gwalior, 1982)
- Don VR (1970) Developing a sprinters, *Swimming world* 11 (Dec 1970) P-5.
- Dubey A (1991) Anthropology of Arm and Leg speed performance of Indian Top Class Swimmers as predictor of swim speed (unpublished Ph.D. Theses, Jiwaji University, Gwalior, 1991) : P -14.
- Eddie TC et.al (2016) Physiological responses and exercise preference between the Trikke and the bicycle ergometer, *Journal of Exercise Science & Fitness* 14 (2016) 7-13
- Edward SS (1964) The Relationship of Reaction Time, Speed, Sargent Jump, Physical Fitness and Other Variable to Success in Specific Sports. *Completed Research in Health, Physical Education and Recreation*, 6 (1964): 95.
- Eiben, O. G.; Barabas, A. and Nemeth, A. (2005). Comparison of growth, maturation, and physical fitness of hungarian urban and rural boys and girls. *Journal Hum. Ecol.* 17(2): 93-100.

- Fernando LG (2001) Variation of Kinematics Parameters of Physiological among the swim normal and resisted swimming with parachute in the style of crawl, during 10 & 45 seconds. Spain University, 2001, DAI Vol. 64, No. 3, Sept. 2003, P - 843-A.
- Florence J. Phipps (1982) Comparisons of Selected Factors of Predictive of Volleyball Playing Ability. Dissertation Abstract International, 42 (April 1982): 4353
- Foong KO (2014) Effects of short-term swimming exercise on bone mineral density, geometry, and microstructural properties in sham and ovariectomized rats, Journal of Exercise Science & Fitness 12 (2014) 80-87
- Gabbett T et.al (2006) Change in Skill and Physical Fitness Following Training in Talent - Identified Volleyball Players". Journal of Strength and Conditioning Research, 2006, 20(1), 29-35
- Gaurav, Vishaw; Singh, Amandeep and Singh, Sukhdev (2011). Comparison of physical fitness variables between individual games and team games athletes. Indian Journal of Science and Technology. Vol. 4.
- Gill, Manmeet; Deol, Nishan, Singh and Kaur, Ramanjit (2010). Comparative study of physical fitness components of rural and urban female students of Punjabi University, Patiala .Anthropologist. 12(1): 17-21
- Gladys MS (1954) Learning rate of beginning swimmers. Research Quarterly 25 (March 1954) pp. – 91-99
- Grant S (1992) The effects of a university fitness programme on health-related variables in previously sedentary males. Br J Sports Med 1992;26:39-44
- Grant S and Armstrong G (1993) Physiological and psychological responses to a university fitness session. Br J Sports Med 1993;27:162-166
- Gusthart L (1995) Minimum Level of Teachers Performance and Students Achievement in Volleyball Skills. Perceptual Motor Skills, Vol.80, No.2 (April, 1995): 555-562
- Hasan MA et.al (2014) Effects of 12-week high-intensity interval training on plasma concentration and insulin resistance in overweight men, Journal of Exercise Science & Fitness 12 (2014) 20-25
- Hascelik Z et.al (1993) The Effect of Physical Training on Physical Fitness Tests and Visual and Auditory Reaction Times of Volleyball Players. British Journal of Sports Medicine and Physical Fitness, Vol-29, No.3 (Sept., 1993): 234-239.
- Hassan ME et.al (2013) The rating of perceived exertion is not different at the ventilatory threshold in sedentary women with different body mass indices, Journal of Exercise Science & Fitness 11 (2013) 102-106
- Homer AS (1975) The relationship of certain physical measurement to swimming speed in male age group swimmers. DAI 35 (Jan. 1975); pp. 4235-4236 – A.
- James AC (1978) Body Composition and Sinking Force and Oxygen uptake of young swimmers Treading water, completed research in Health, Physical Education and Recreation 20 (1978) P - 17
- Jeremy BC et.al (2014) Effects of a training program at the crossover point on the cluster of metabolic abnormalities and cardiovascular risk factors, Journal of Exercise Science & Fitness 12 (2014) 73-79
- John AM (2015) Heel-toe running: A new look at the influence of foot strike pattern on impact force, Journal of Exercise Science & Fitness 13 (2015) 29-34
- John NQ (1968) A Comparative study of two training methods and their effects upon leg power and Heamred by vertical jump", Completed Research in wreath, played & Recreative 10(1968), p23
- John NQ (1968) A Comparative study of two training methods and their effects upon leg power and Heamred by vertical jump", Completed Research in wreath, played & Recreative 10(1968), p23
- Josiane A et.al (2014) Obese adolescents who gained/maintained or lost weight had similar body composition and cardiometabolic risk factors following a multidisciplinary intervention, Journal of Exercise Science & Fitness 12 (2014) 38-45
- Jourkesh, Morteza; Sadri, Iraj; Ojagi, Ali and Sharanavard, Amineh (2011). Comparison of physical fitness level among the students of IAU. Shabestar Branch Annals of Biological Research. 2 (2) :460-467.
- Kamal A et.al (2014) Antioxidant enzymes and oxidative stress adaptation to exercise training: Comparison of endurance, resistance, and concurrent training in untrained Males, Journal of Exercise Science & Fitness 12 (2014) 1-6
- Keating, Xiaofen Deng; Huang, Young; Deng, Mingying and Shuhua (2003). A comparative study of fitness test batteries between school-based physical education programs in the USA and the people's republic of china. International Sports Studies. Vol. 25.
- Kumar, Rajesh (2015) made a comparative study on Health Related Physical Fitness Among Kho-Kho and Kabaddi Players, Indian Journal of Applied Research, Volume : 5 | Issue : 5 pp. 19-22
- Kumar, Sunil and Singh, Shahjad (2011). Comparative study of physical fitness components of rural and urban female students of Delhi University Delhi. International Journal of Transformations in Business Management. Vol. No. 1.

- Lemmink KA (2004) The Discriminative Power of the Interval Shuttle Run Test and the Maximal Multistage Shuttle Run Test for Playing Level of Soccer. *Journal of Sports Medicine and Physical Fitness*, 2004, 44 (3), 233-9
- Liang L et.al (2015) Effects of protein addition to carbohydrate-electrolyte solutions on postexercise rehydration, *Journal of Exercise Science & Fitness* 13 (2015) 8-15
- Louis Bherer, Kirk I. Erickson, and Teresa Liu-Ambrose (2013) A Review of the Effects of Physical Activity and Exercise on Cognitive and Brain Functions in Older Adults *J Aging Res.* 2013; 2013: 657508
- Loy, SF (1995) Benefits and practical use of cross training in sports, *Sports Medicine*, vol.19 (1995) pages 1-8
- Maria J (2012). Effects of Multicomponent Exercise Training on Physical Functioning among Institutionalized Elderly, Volume 2012
- Martin CK, (1989) The effect of training on swimming meet performance and associated psychological measures in high school swimmers with special reference to the Tapering period. University of Minnesota, (1998); Dissertation Abstract International Vol. 49, number 11, May 1989, P - 3300 A.
- Mathewos, Hosiso (2013) Dr. Sangeeta Rani and Dr. Shemelis Rekoninne (2013). Effects of Aerobic Exercise on Improving Health Related Physical Fitness Components of Dilla University Sedentary Female Community *International Journal of Scientific and Research Publications*, Volume 3, Issue 12, December 2013
- Merry LM (1989) The relationship between efficacy strength and performance in competitive swimmers of different skill levels” Ph.D. The Florida State University 1988 Dissertation Abstract International, February 1989, Vol. 49, No. 8, P - 2149-A.
- Merry LM (1989) The relationship between efficacy strength and performance in competitive swimmers of different skill levels. Ph.D. The Florida State University 1988 Dissertation Abstract International, February 1989, Vol. 49, No. 8, P - 2149-A.
- Michael GM (2006) The Effects Of A 6-Week Plyometric Training Program On Agility” *Journal of Sports science and Medicine* (2006) 5, 459-465
- Millet GP (2002) Modeling the transfers of training effects on performance in elite triathletes, *International Journal sports med* (2002): 23(1): 55-63 F Georg Thyme Verlag Stuttgart: New York, ISSN 0172-4622, DOI: 10.1055/s-2002-19276
- Morgan RE and Adamson GT (1963) Effect of Circuit Training on the modified Harvard step Test. *Circuit Training* (London: Bell and sons. 1967), as Cited by Maxwell James L. hodysen and J. thomassokson, *Research quarterly* 34(May 1963)
- Nadler SF (2002) Functional Performance Deficits in Athletes with Previous Lower Extremity Injury. *Clinical Journal of Sports Medicine*, 2002, 12(2), 73-8
- Nicole R et.al (2013) Duration, frequency, and types of children’s activities: Potential of a classification procedure, *Journal of Exercise Science & Fitness* 11 (2013) 85-94
- Nieman DC (1994) The exercise test as a component of the total fitness evaluation. *Prim Care.* 1994 Sep;21(3):569-87.
- Nigel GA et.al (2013) Effects of antecedent flexibility conditioning on neuromuscular and sensorimotor performance during exercise-induced muscle damage, *Journal of Exercise Science & Fitness* 11 (2013) 107-117
- Pedro R et.al (2015) Acute effects of high- and low-intensity exercise bouts on leukocyte counts”, *Journal of Exercise Science & Fitness* 13 (2015) 24-28
- Pellett TL and Nix CL (1996) Development of Content: Influence on Girls Junior High School Volleyball Success in Practice and Achievement. *Perceptual Motor Skills*, Vol.82, No.1 (Feb., 1996): 219-224
- Polman R (2004) Effective Conditioning of Female Soccer Players. *Journal of Sports Sciences*, 2004, 22(2), 191-203
- Rajan K (1980) Comparative Effect of Selected Weight Training and Specific Exercises on Volleyball Playing Ability. (Unpublished Master’s Thesis, Jiwaji University, Gwalior, 1980)
- Ramajayam M and Gopinath V (2013) Health Related Physical Fitness Among Adolescence School Boys Of Puducherry Indian Streams *Research Journal* Volume-3, Issue-10, Nov-2013
- Ranjana B (1985) Relationship of Depth Perception, Agility and Speed of Movement in Playing Ability of Volleyball. (Unpublished Master’s Thesis, Jiwaji University, Gwalior, 1985)
- Senlin C et.al (2015) Tracking energy balance in adolescents: Levels of compliance, energy flux, and learning, *Journal of Exercise Science & Fitness* 13 (2015) 35-41
- Senthilkumar P & Annadurai R (2014) A Study on Effects of Isolated and Combined SAQ and Strength Trainings on Selected Physical Variables of Intercollegiate Men Football Players, *International Journal of Recent Research and Applied Studies*, Volume 1, Issue 7(17) December 2014



- Shahana A, Nair US and Hasrani SS (2010) Effect of aerobic exercise programme on health related physical fitness components of middle aged women. *Br J Sports Med* 2010;44:i19
- Smith R (1980) The Effect of Circuit Training on the Performance Skills of Beginner and Advance beginner Swimmer. *Completed Research in Health, Physical Education and Recreation*. 21 (1980), 80
- Stain A (2009) Combined strength and endurance training in competitive swimmers, *Biophysik* (2009) Volume: 8, Issue: May, pages: 357-565 Publisher: blackwell Scientific Pb
- Stephen T (1968) A Comparison of the Relationship between Running Speed and Agility. *Completed Research in Health, Physical Education and Recreation*, 10 (1968): 30
- Tanaka H (1994) Effects of cross training-Transfer of training effects on VO<sub>2</sub>max between cycling, running and swimming, *Sports Medicine* (1994),
- Tarandeep, Rachhpal Singh and Kanchan (2012). Comparison of health related physical fitness components between urban and rural primary school children. *VSRD-IJBM*. Vol. 2 (5), 187-192
- Toussaint HM and Vervoorn K (1990) Effects of specific high resistance training in the water on competitive swimmers, *International Journal of sports Medicine*, 11,228-23
- Travis W et.al (2013) Hormonal responses associated with the nadir in blood glucose during graded cycling exercise, *Journal of Exercise Science & Fitness* 11 (2013) 6-11
- Ujevic, Tihana; Sporis, Goran and Podnar, Hrvoje (2011). Differences in health-related physical fitness status among elementary school girls in Croatia. 6Th Fiep European Congress.
- Vinicius CS (2013) Effect of regular exercise on leukocyte function in young and middle-aged women, *Journal of Exercise Science & Fitness* 11 (2013) 57-62
- Wonil P (2014) Effect of walking speed and placement position interactions in determining the accuracy of various newer pedometers, *Journal of Exercise Science & Fitness* 12 (2014) 31-37
- Xiangrong S (2014) Associations of health disparities and physical activity with children's health and academic problems, *Journal of Exercise Science & Fitness* 12 (2014) 7-14
- Yadav, Sameer Kumar (2012). Health related physical fitness among boys studying in different school of Mathura. *Indian Journal of Research*. Volume : 1.
- Yang G et.al (2015) Pedometer-determined physical activity patterns in a segmented school day among Hong Kong primary school children, *Journal of Exercise Science & Fitness* 13 (2015) 42-48
- Yanping DA et.al (2013) Steps to and correlates of health-enhancing physical activity in adulthood: An intercultural study between German and Chinese individuals, *Journal of Exercise Science & Fitness* 11 (2013) 63-77
- Yun W et.al (2016) Effect of plantar cutaneous inputs on center of pressure during quiet stance in older adults, *Journal of Exercise Science & Fitness* 14 (2016) 24-28
- Zachary SZ (2016) Acute effects of whole-body vibration with resistance exercise on postexercise blood pressure and oxygen consumption in prehypertensive adults, *Journal of Exercise Science & Fitness* 14 (2016) 14-23