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Comparative Study of Dietary Habits and Physical Fitness of Trained and Untrained Basketball Players

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ABSTRACT

Sports in all forms is usually a competitive physical activity where nutrition plays a significant role as far as performance is concerned. The study was undertaken with an aim to know the dietary habits and physical fitness of the trained and untrained male basketball players. A total of 60 samples were selected (30 trained and 30 untrained) of the age group 18 - 29 years. Most of the subjects were non-vegetarian (73.3% trained and 86.7% untrained respectively), while the others were eggetarian and vegetarian. The water consumption was found to be more than 4 litres per day in majority of the players (40%). It was found that there was no significant difference in both the dietary habits and physical fitness of the trained and untrained basketball players.

Keywords: Basketball Players, Dietary Habits, Physical Fitness

"Sport" comes from the old French 'disporter' meaning 'leisure', to amuse, please or play. The English definition of sport from around 1300 being "anything humans find amusing or entertaining" and includes activities like gambling and events staged for the purpose of gambling, hunting, and games and diversions, including ones that require physical activity. Roget's defines the noun sport as an activity engaged for relaxation and amusement with synonyms including diversion and recreation. Sport in almost all forms is usually a competitive physical activity which, through casual or organized participation, aims to use, maintain or improve physical ability and skills while providing entertainment to participants, and in some cases spectators.

Sport is commonly defined as an **organized, competitive, and skilful** physical activity requiring commitment and fair play. It is governed by a set of rules or customs. In a sport the key factors are the physical capabilities, balanced diet and skills of the competitor which are the sole or primary determiner of the outcome (winning or losing). Nutrition plays an important role for attaining a high level of achievement in sports and athletics, besides other factors like motivation, skill, techniques, commitment, physical fitness and training.

Sport is defined as an activity engaged for relaxation and amusement. Nutritional status and nutrient intake are interrelated to each other. Physical fitness helps in increasing performance and the endurance levels.

The aim of Sports nutrition is to enhance performance by improving body composition which increases speed, mobility, strength and quick responses. Appropriate nutrition and diet will help in speedy recovery after training and competitions. Good nutrition will increase the energy for both practice and competition by increasing immunity and muscle strength. A balanced and individualised diet will improve the overall health and performance of the athlete. Individualised diet is concerned with the type and quantity of fluid and food taken by an athlete, and deals with nutrients such as vitamins, minerals, supplements and organic substances such as carbohydrates, proteins and sugars. Nutritionplays a vital part in strength sports (such as weight lifting and body building) and endurance sports (for example cycling, running, triathlon, volley ball, basketball, football, hockey).

Basketball is a limited-contact sport played on a rectangular court. While most often played as a team sport with five players on each side, three-on-three, two-on-two, and one-on-one competitions are also common. The objective is to shoot a basketball (approximately 9.4 inches (24 cm) in diameter) through a hoop 18 inches (46 cm) in diameter and 10 feet (3.048 m) high which is mounted to a backboard at each end of the court.

FIBA (International Basketball Federation) was formed in 1932 by eight founding nations: Argentina, Czechoslovakia, Greece, Italy, Latvia, Portugal, Romania and Switzerland and initially the organization only oversaw amateur players. The organizations acronym is derived from the French Fédération Internationale de Basket-ball Amateur, ("FIBA"). The sport demands excellent fitness: players require aerobic stamina, agility, explosive strength, speed and precision. It is also a technical sport, requiring good motor coordination and the development of sophisticated hand movements.

The components of fitness are, cardiovascular Endurance, Muscular Endurance, Speed, Flexibility and these components can be measured using various tests like step test for cardiovascular endurance, pushups and sit ups for muscular endurance, suicide run for speed and standing flex for flexibility.

Basketball is energy snapping, fast paced and quick reflexes-oriented sport. Nutrition is an important component of the sport as it plays a pivotal role in fitness. On a day-to-day basis good nutrition is obtained by consuming a well-balanced diet comprising of Carbohydrates, Fats, Protein, Electrolytes, Vitamins, Minerals and Water.

Carbohydrates are available in simple and complex forms. Simple carbohydrates are monosaccharide (Glucose, Fructose and Galactose) and Disaccharides (Sucrose, Lactose and Maltose). Carbohydrates are digested in the gastrointestinal system and broken down into simpler substances with the help of enzymes. Glycogen is stored in liver and muscles. Glycogen plays an important role in sports performance. There is a relationship between levels of glycogen and beginning of fatigue. So more the level of muscle glycogen, longer it will be before fatigue sets in. Simple carbohydrates are easily digested, absorbed and utilized but complex carbohydrates contain vitamin and minerals. Eating simple carbohydrates (sugar and sweet) which are devoid of nutrients should be avoided. About 60-65 percent of total calories should come from carbohydrates and ¾ th of it should come from complex carbohydrates.

An important part in helping athletes recover is by consuming the appropriate nutrients immediately following the practice or after participating in competition. Thiswindow of opportunity can be used to replenish carbohydrates that were used as fuel during practice or competition and also to replace the fluid and sodium lost in sweat. The time period soon after training or after participation in the competition also presents a good opportunity to consume protein to help rebuild damaged muscles, promoting muscle adaptation and enhancing recovery. The amount of protein can be individualized based upon a player's body weight, age, specific food preferences and type of sport being played. However Overenthusiastic protein intake predisposes to constant thirst, dehydration, decreased desire to consume food, loose motions and puts undue stress on kidneys.

Maintaining adequate fluid and electrolyte balance is an important consideration during exercise as physical activity results in increased heat production, and evaporation of sweat from the skin. The amount of fluid lost as sweat varies according to the factors such as intensity and duration of activity and the atmospheric temperature. In hot weather, long distance runners can lose up to two litres of water per hour. However, on average, sweat losses equate to approximately one litre of fluid for each hour exercise. Failure to replace lost fluid results in dehydration. Severe dehydration can lead to heat stroke and can be fatal but even mild dehydration (having lost little as just over 2% of body weight) affects exercise performance. Fluid losses in excess of 5% of body weight can reduce exercise capacity to as much as 30%. It is therefore important to keep oneself well-hydrated by drinking before, during and after exercise. To offset fluid losses, it is suggested that 150 to 250 ml of fluid should be drunk every 15 minutes. The choice of drink depends on the intensity and duration of the activity. For exercise sessions lasting less than one hour, which are of low to moderate intensity, water is suitable. However, if the activity is more intense or lasts longer than one hour, specially formulated drinks containing carbohydrate and/or electrolytes may be appropriate.

Adding carbohydrates to the drinks, usually in the form of glucose polymers, is a useful way of increasing the fuel supply to the working muscles and can delay fatigue during endurance exercise. However, the higher the carbohydrate concentration of a drink, the slower the rate at which it leaves the stomach (the rate of gastric emptying) and therefore the slower the speed at which fluid from the drink is likely to get in to the body. The addition of electrolytes, especially sodium, promotes absorption from the intestine and encourages fluid retention. The type and duration of the activity, and, in particular, whether supplying fuel or fluid is the main priority will therefore determine the optimal carbohydrate and electrolyte composition of the drink. Commercial sports drinks generally fall into one of three categories - isotonic, hypotonic and hypertonic – based on their carbohydrate and electrolyte concentrations. Isotonic and hypotonic are the most usually consumed during exercise. Vitamins and minerals are to be obtained by diet optimally. The players require vitamins like thiamine, riboflavin, niacin, and minerals like iron to utilize the additional calories they need during playing. These vitamins and minerals are to be obtained by including fresh fruits, vegetables, greens, egg etc. in their diet.

Artioli GG et.al. (2009) found that men athletes consume a high fat, low carbohydrate diet, whereas women athletes consume moderate to high carbohydrate diet and the energy consumption was markedly variable. Ubeda. N, et.al, (2010) studied food habits and body composition of Spanish elite athletes and found that their food choices were adequate however there were variations in some food choices like vegetables, red meat and its derivatives and it was not according to Recommended Dietary Allowance. Endurance sports are gaining in popularity and athletes at all levels are looking for ways to optimize their performance by training and nutrition. For endurance exercise lasting 30 min or more, the most likely contributors to fatigue are dehydration and carbohydrate depletion, whereas gastrointestinal problems, hyperthermia, and hyponatremia can reduce endurance exercise performance and are potentially health threatening, especially in longer events (more than 4 h). An individualized nutritional strategy can be developed that

aims to deliver carbohydrate to the working muscle. Jeukendrup A provided a comprehensive overview of research findings and suggested several detailed guidelines for increasing the endurance of the individual athletes. (Jeukendrup AE 2011); (Trushina EN et al., 2012) based on the findings of their study stated that athletes engaging in longer periods of intensified training can exhibit an inefficiency of cell immunity leading to decreased immune response. The imbalance in athletes' diet also leads to dis-lipoproteinemia, which plays a pathogenic role in cell immunosuppression

Juzwiak CR, 2008 , observed that the nutritional deficiencies represent an additional barrier for adolescents engaged in competitive sports to achieve an optimum nutrition to maintain growth, health and performance.

Jeukndrup A et al ., (2011) , showed that Nutrition plays an essential role in the health of elite young athletes as well as in their exercise and performance. Children and adolescents need adequate energy intake to ensure proper growth, development, and maturation and their requirements will further increase with increasing exercise training. The nutritional needs also differ for different age groups and for different types of sports.

Nuviala RJ, et al., (1996),studied the iron nutritional status was in 84 sportswomen (19 karatekas (practitioner of karate), 20 handball players, 20 basketball players, and 25 middle and long distance runners) and in 82 nonathletic females of similar characteristics (control group). After a 7-day nutritional survey by means of the food weighing method, it was found that iron intake was significantly higher in the handball players ($p < 0.05$), basketball players ($p < 0.01$), and runners ($p < 0.01$) with regard to the control group; the basketball players were the only ones to cover the recommended minimum intake (15 mg/day). The heme iron intake was significantly greater in the handball and basketball players ($p < 0.01$), who, together with the runners, reached the value of 1.5 mg/day, which is considered to be optimal. In relation to the control group, the karatekas and handball and basketball players had lower levels of serum ferritin, although their iron intake was greater, whereas the runners had higher values that were very similar to those of the control group, due to the iron supplementation they had received. Despite finding a marked prevalence of inadequate iron intake, both in the sportswomen and in the control group, the manifest cases of anemia are relatively scarce. The organic iron stores do not seem to depend exclusively on the iron intake but also on intimate mechanisms of intestinal absorption and diverse causes of iron loss.

Jesus Fernando Escanero et al ,(1997) reported Iron stores in professional athletes throughout the sports season.
SchroderHelmut et al., (2004),analysed dietary habits and fluid intake of professional basketball players with consideration of dietary guidelines and sport nutrition recommendations. A dietary habit questionnaire including a 24 h recall was recorded by 55 elite basketball players of the first Spanish Basketball League. Energy consumption among these athletes was high 17.7 ±0.9 MJ · day –1 in comparison to other elite team sport athletes. Furthermore, intakes of protein, fat, saturated fatty acids mineral and most vitamins exceed the current Daily Recommended Intakes (DRI's) for these macronutrients whereas, intakes of carbohydrate and vitamin E failed to meet the guidelines. Daily fluid intake was 3126 ±1226ml. Water was the preferred beverage (1688±1032 ml), followed by milk (445 ±521 ml), commercial sport drinks (377 ±520 ml), carbonated beverages (307 ±492 ml), juices (150 ±208 ml), beer (67 ±189 ml), non-alcoholic (beer 49 ±158 ml) and wine (43 ±218 ml). Sixty-six percent of the participants reported to consume particular foods before competition and 10% stated to do this after competition. On average athletes consumed 646 ±352 ml · h –1 and 882 ±486 ml of liquids during training and competition session, respectively. Furthermore, 44 % of the participants recorded not to drink before getting thirsty and 3 athletes stated never to drink during training and 2 did so during competition. Sallimen J et al.,(2008), compared muscle strength and thickness, body composition and dietary intake between master strength athletes and controls. Athletes had more lean body mass than age-matched controls ($P<0.001$-0.05) and young controls more than older controls ($P<0.01$). No group differences were observed in the thickness of vastus lateralis. Athletes showed higher absolute strength and strength per vastus lateralis thickness ratio than all control groups ($P<0.01$-0.001). Body mass adjusted dietary intake did not differ between the strength trained and control men. Dietary intake did not correlate with strength, muscle thickness and lean body mass.

Team sport performance is dependent upon a diverse range of qualities including size, fitness, sport-specific skills, team tactics, and psychological attributes. Body size and physical fitness plays a significant role in the game of basketball. A player's size has a large influence on the position in the team, while the high-intensity, intermittent nature of the physical demands requires players to have a high level of fitness. Basketball coaches and sport scientists often use a battery of sport-specific physical tests to evaluate body size and composition, and aerobic fitness and power. Sports science research is establishing typical (or 'reference') values for both within-athlete changes and between-athlete differences. Newer statistical approaches such as magnitude-based inferences have emerged which are providing more meaningful interpretation of fitness testing results. Careful selection and implementation of tests, and more pertinent interpretation of data, will enhance the value of fitness testing in high-level basketball programmes. (Eric J Drinkwater et. al, 2008).

The aim of the study was to find out the nutritional status and fitness levels of the basketball players. The following objectives were framed for the present study.

Objectives

- To assess the dietary intake of basketball players through 24 hours recall.
- To compare the nutrient intake of basketball players with the RDA.
- To measure the fitness levels of basketball players based on various components of fitness.

Specific Objectives

- To calculate the food intake of basketball players and compare with their individualized RDA.
- To measure height, weight, waist and hip circumference and calculate the anthropometric indices namely BMI among basketball players.
- To measure the physical fitness of basketball players the following were used:

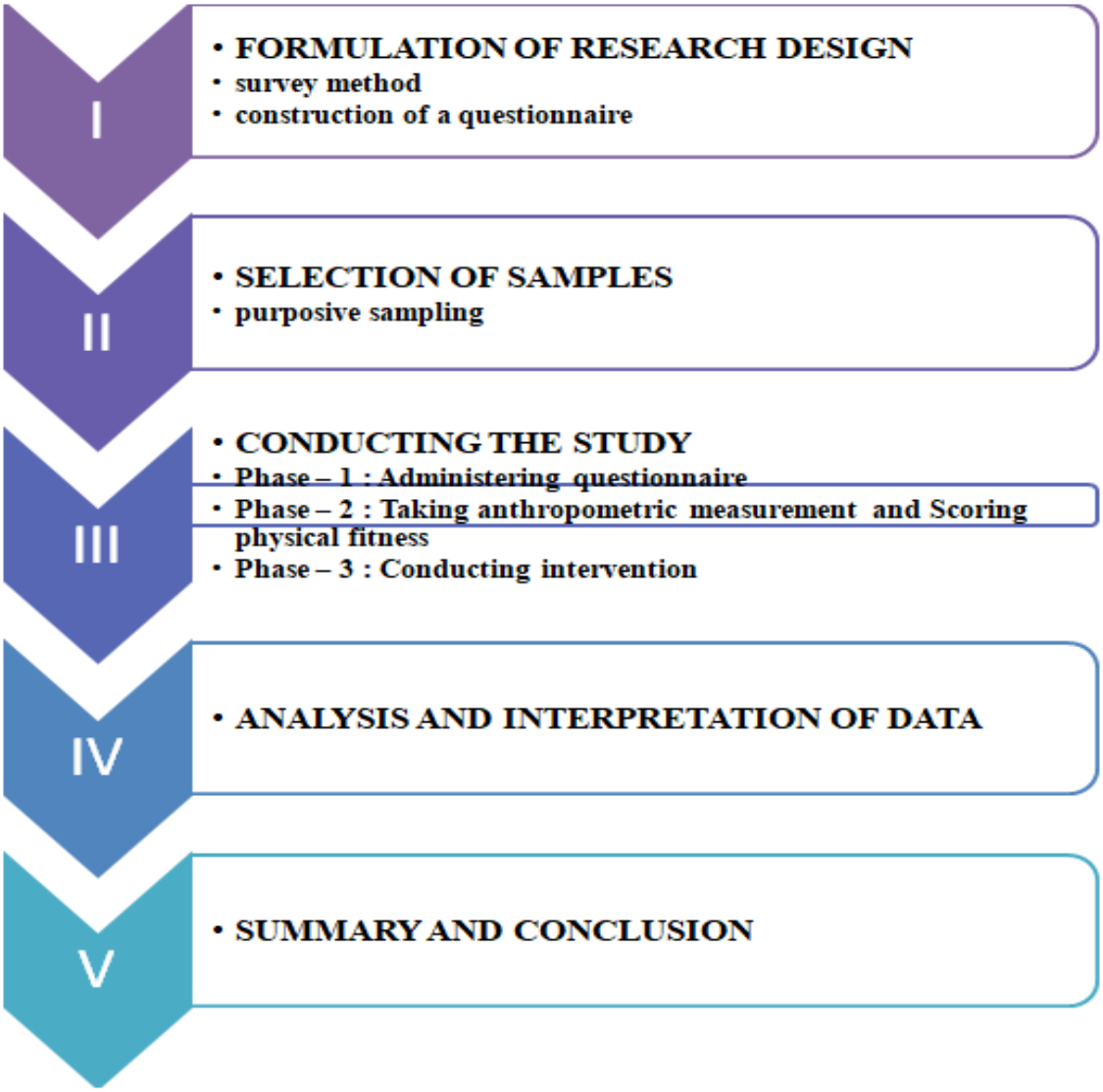
Cardiovascular endurance – step test

Muscular endurance – sit ups and push-ups

Speed – sprint run.

Flexibility – standing flex.

METHODOLOGY



FORMULATION OF RESEARCH DESIGN

A research design is the arrangements of conditions for collection and analysis of data in manner that aims to combine relevant to the research purpose with economy in procedure. To elicit information on "A Comparative Study of the Dietary Habits and Physical Fitness of Trained and Untrained Male Basketball Players".

Tools used to conduct the study:

A. Survey method
B. Questionnaire

Survey method

Survey is a process to collect data from existing populations limits with no particular control over factors that may affect the population characteristics of interest in study.

- Trained basketball players were purposively selected from Kanteerva Stadium, Bengaluru, of the age group between 18-29years.
- Untrained basketball players were purposively selected from the college HKBK college of engineering, Bengaluru, of the age group between 18-29.

Construction of questionnaire

A questionnaire is a device for seeking answers to questions by using form which is filled by a respondent.

- Questionnaire is a useful data gathering tool in research when properly constructed and administered.
- A detailed questionnaire was formulated to elicit data the information on various aspects related to:

1. General information,
2. Anthropometric measurements,
3. Dietary habits
4. Physical activity.

- For physical fitness, an observation table was constructed to note down the scores of each physical fitness test.
- Information was collected by distributing questionnaire to the subjects.

1. **General information:** The demographic profile was collected on area of age, area of residence, education, father's occupation, mother's occupation, type of family, size of family and their religion.
2. **Anthropometric measurements**: Anthropometric data acts as an important tool in the evaluation of nutritional status of the individual. It is relatively easy to employ, as it is non invasive . Standard anthropometric measurement protocol was adopted and height, weight, waist circumference and hip circumference were measured. BMI was calculated by using standard formulae.
3. **Height:** Height of the subject was taken, by making them stand on a flat surface against the wall without shoes, with gaze horizontal and heels, buttocks and shoulders touching the wall. A mark was put on the wall which was then measured with a non elastic measuring tape to the nearest 0.5 cms.
4. **Weight:** weight is an indicator of current nutritional status. Weight of the subject was recorded with minimum clothing and without shoes. Weight was measured using a electronic weighing scale accurate to 0.5 kg. Prior to each measurement, zero adjustment was checked .
5. **Body mass index (B.M.I):** B.M.I is defined as weight in kilograms divided by square of the height in meters . Body mass index was calculated by using the formula: Body mass index (BMI) = weight (kg)/ height $(cm)^2$.

The subjects were categorized based on their B.M.I according to the world health organization recommendation , appropriate for Asian population given in Table.T-1

Table T-1: BMI categories

Sl. No	BMI status category	Cut Offs
1	Underweight	<18.5
2	Normal	18.5 – 22.9
3	Pre overweight	23 – 24.9
4	Overweight	25 – 29.9
5	Obese	>30

6. **Waist circumference:** waist circumference is an indicator of health risk associated with excess fat around the waist. It was measured by using a non elastic tape with the subject in a standing position at mid way between the lower rib margin and the iliac crest in the horizontal plane.
7. **Hip circumference:** Hip Circumference was measured at the point yielding the maximum over the buttocks using a tape measure to measure to the nearest 1 cm.
8. **Physical activity:** The Questionnaire of Baecke et al (1982) for Measurement of a Person's Habitual Physical Activitywas used to determine the physical activity of a person. Questions on sedentary behaviors followed the physical activity questions and aimed to determine important information from adolescents related to the typical daily time spent on sedentary activities, including time spent viewing TV, playing games, and computer and Internet use. Participants were asked to provide the average number of daily hours spent on various sports without differentiating between weekdays and weekends. A standard questionnaire of physical activity was administered to the participants.
9. **Dietary habits:** In addition to the physical-activity questionnaire, the questionnaire in a separate section included 10 specific questions designed to determine the frequency of certain dietary habits of adolescents. The questions included those related to how many times per typical week the participants consumed breakfast, sugar-sweetened drinks including soft beverages, vegetables (cooked and uncooked), fruit, milk and dairy products, donuts and cakes, candy and chocolate, energy drinks and fast foods.

Selection of Sample
A sample of 60 adolescent college going girls in the age range of 18-29 years from kanteerva stadium (trained basketball players)and HKBK college of engineering(untrained basketball players), Bangalore were purposively selected for the study.

The sample of 60 consists of both trained[30 samples] and untrained male adults **[30 samples].**

Conducting the Study
In order to collect the required information, the study was conducted in 3 phases

- **Phase – 1: Administering questionnaire**
- **Phase – 2: Taking anthropometric measurement and Scoring physical fitness**
- **Phase – 3: Giving intervention**

Phase – 1: Administering questionnaire

- The purpose of the study was explained to the respondents and their consent was taken in order to avoid ambiguity.
- The modified questionnaire was distributed among the respondents personally, necessary instructions were given and to help them answer the questions.

Phase – 2: Taking anthropometric measurement and Scoring physical fitness

- Anthropometric measurements of the participants were taken by using standard procedures.
- Health related physical fitness components tests were administered in two trails among the respondents to determine their physical fitness under favorable conditions with necessary equipments.

Phase – 3: Giving intervention

- After collecting the required reliable information from the subjects, based on their nutritional status the subjects were given a presentation and explained on the importance of good dietary habits and physical activity in order to improve their physical fitness .

Tools used for data collection

- Based on the nature of the study, different data collecting tools were used to conduct the research.
- This study is to determine the dietary habits of adult males, a questionnaire was constructed and a standard questionnaire was used to determine the habitual physical activity of the subjects.

- To test the physical fitness in this study health related fitness components are used. They are:
- Cardiovascular endurance was assessed by using Harvard step test (A. W. Sloan 1959).
- Muscular endurance was measured by using 3 minute sit ups test, (Diener M H et al - 1995).
- Muscular strength was measured by using 1minute pushups test (Ted A. Baumgartner et al- 2002).
- Flexibility was measured by using **Standing Flex** (Vauqhan Kippers et al – 1987).

Analysis and Interpretation of data

The data collected needs to be processed and analyzed in accordance with outline laid down for the purpose at the time of developing the research plan.

Statistical analysis

Statistical analysis included coding and decoding of the questions and the same was subjected to statistical analysis. The statistical tests used were students 't' test, Chi-square test of significance were worked out for making simple comparisons and calculations.

Microsoft Excel and SPSS software was used for tabulation and calculation process.

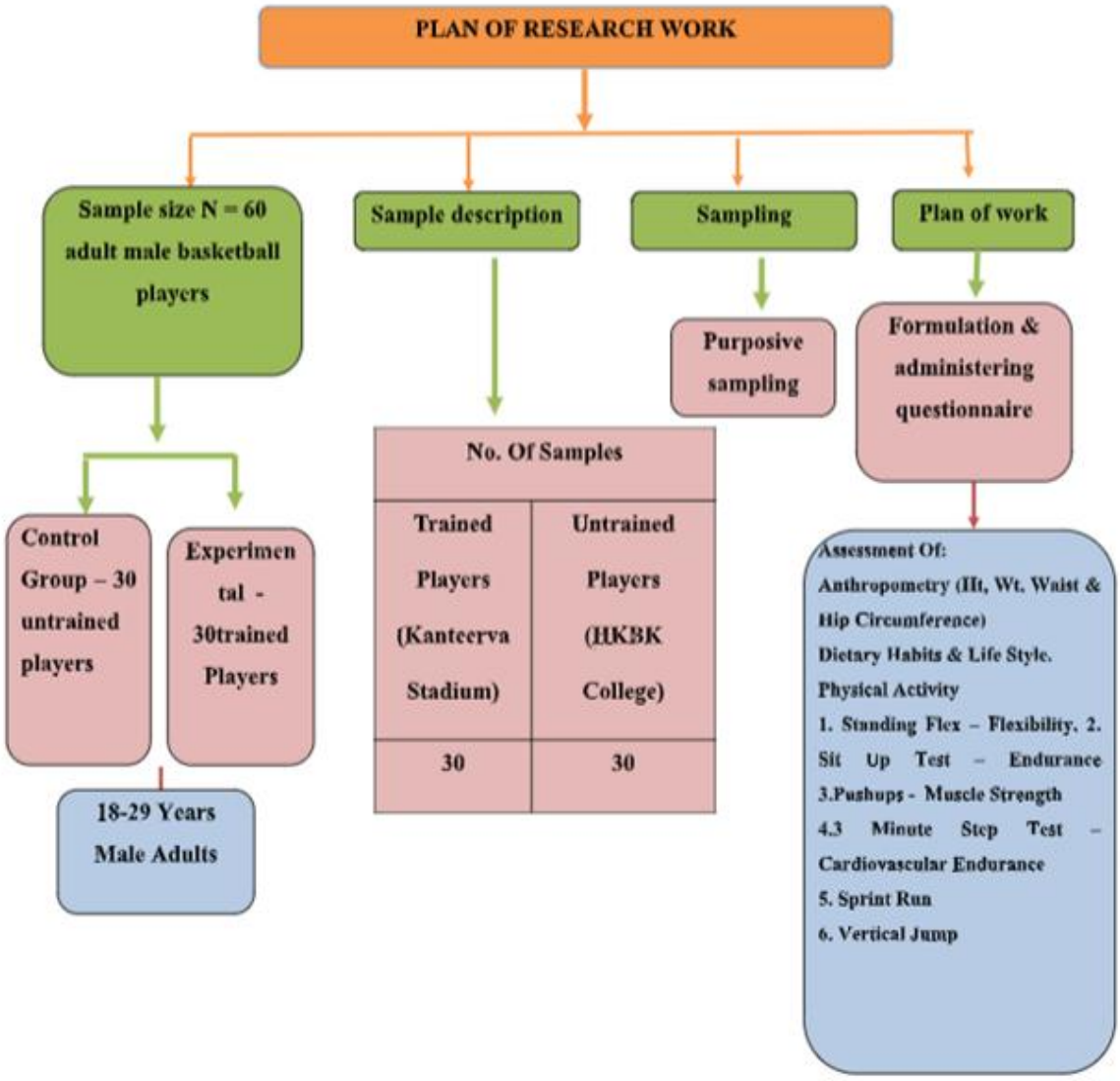


Figure F-1: Plan Of Research Work To Conduct The Study

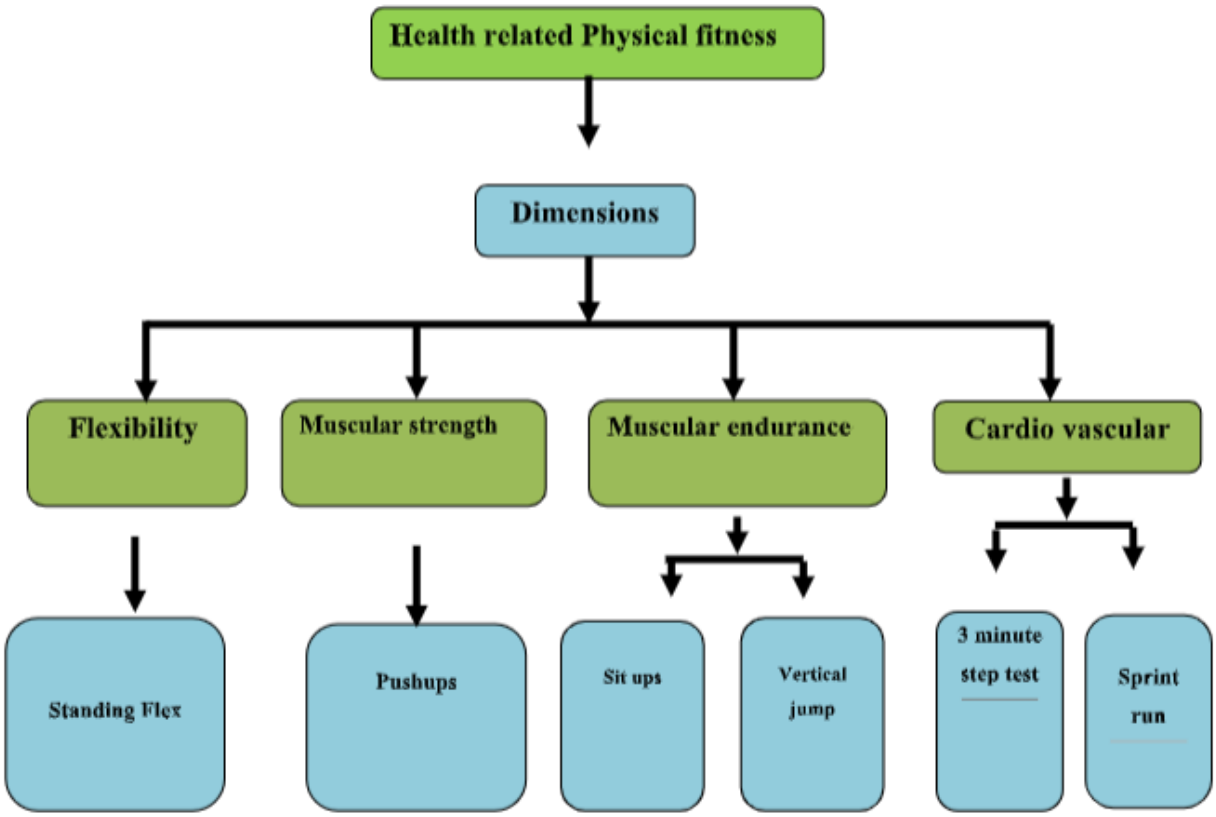


Figure F-2: Health Related Physical Fitness Dimensions

The players were made to stand straight barefooted and were told to touch the ground with their hands without bending their knees. This position was supposed to be maintained for a minute to test their flexibility.

PUSH UPS

A push-up (or press-up) is a common calisthenics exercise performed in a prone position by raising and lowering the body using the arms. Push-ups exercise the pectoral muscles, triceps, and anterior deltoids, with ancillary benefits to the rest of the deltoids, serratus anterior, coracobrachialis and the midsection as a whole. The number of push ups in a minute done by the respondents were recorded.

SIT UPS

Sit up is a physical exercise designed to strengthen the abdominal muscles, in which a person sits up from a supine position without using the arms for leverage. While standing in a straight position, the players were told to squat down to the ground and get back to the standing position. During this the hands of the respondents should be kept loose. The number of sit ups in a minute were recorded**.** This test was done to assess the muscular endurance of the players.

VERTICAL JUMP

The players were made to stand next to the wall, with the feet flat on the ground, the players were told to jump and hit the highest point on the wall and the point was recorded.

STEP TEST

The players were made to walk up and down a step for 3 minutes. After the completion of 3 minutes the pulse of the players was recorded for a minute. This was done to assess the cardiovascular endurance of the players.

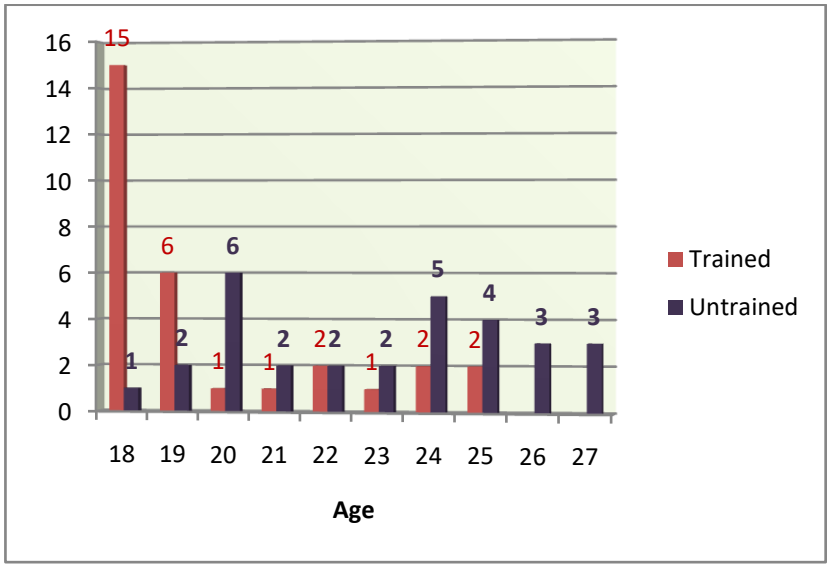
SPRINT RUN

The players were repeatedly sprinting from one point to each of a series of lines across the court, and back again. This was done to assess the speed and agility. The run was carried out for a minute and the time was noted in seconds.

RESULTS AND DISCUSSION

Table 1 Age Distribution among Basketball Players

	Trained		Untrained	
Age	Number	Percentage	Number	Percentage
18	15	50.0	1	3.3
19	6	20.0	2	6.7
20	1	3.3	6	20.0
21	1	3.3	2	6.7
22	2	6.7	2	6.7
23	1	3.3	2	6.7
24	2	6.7	5	16.7
25	2	6.7	4	13.3
26		0.0	3	10.0
27		0.0	3	10.0
Grand total	**30**	100.0	**30**	100.0
Mean ± SD	19.67 ± 2.368		22.7 ± 2.734	



In the trained subjects the maximum number of subjects belong to the age group of 18 with 50% , whereas, in the untrained the maximum number of subjects belong to the age group of 20 with 20%. It is evident that the majority of the subjects are from the younger age group and are at their best form in the game.

Table 2 Family Composition among Basketball Players

	Trained		Untrained	
Family	Number	Percentage	Number	Percentage
Nuclear	25	83.3	17	56.7
Joint	3	10.0	13	43.3
Extended	2	6.7		0.0
Grand Total	**30**	100.0	**30**	100.0

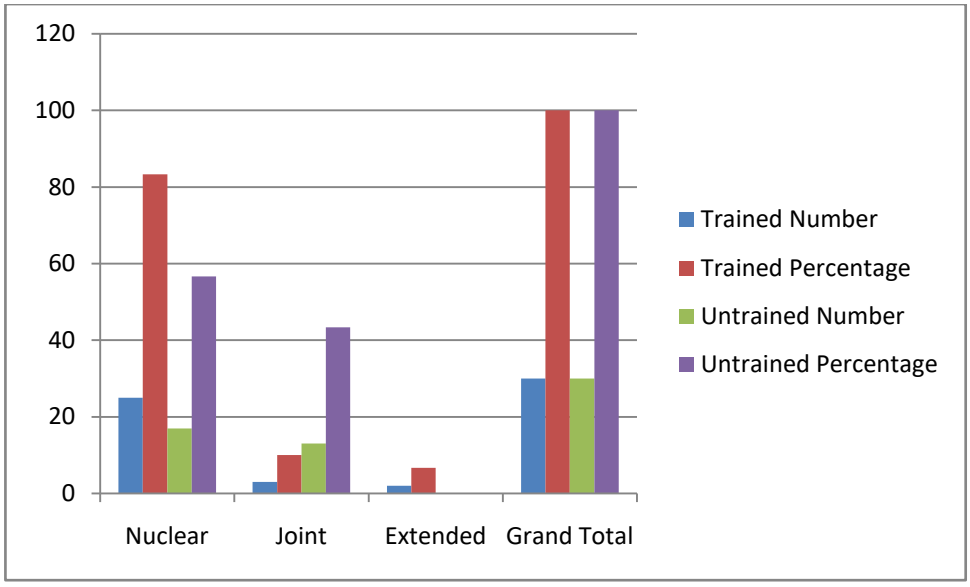


Table 2, indicates most of the subjects live in a nuclear family, 83.3% of trained and 56.7% of untrained. 10% and 43.3% of trained and untrained subjects live in joint families respectively. The rest belong to extended families.

Table 3. Body Mass Index distribution Among Basketball Players

	Trained		Untrained		Grand total
Row labels	number	percentage	number	percentage	
underweight	3	10.0	5	16.7	8
Normal	22	73.3	17	56.7	39
Overweight	3	10.0	6	20.0	9
Obese	2	6.7	2	6.7	4
Grand total	30	100.0	30	100.0	60
Chi- Square	2.141^{NS}		Independent		

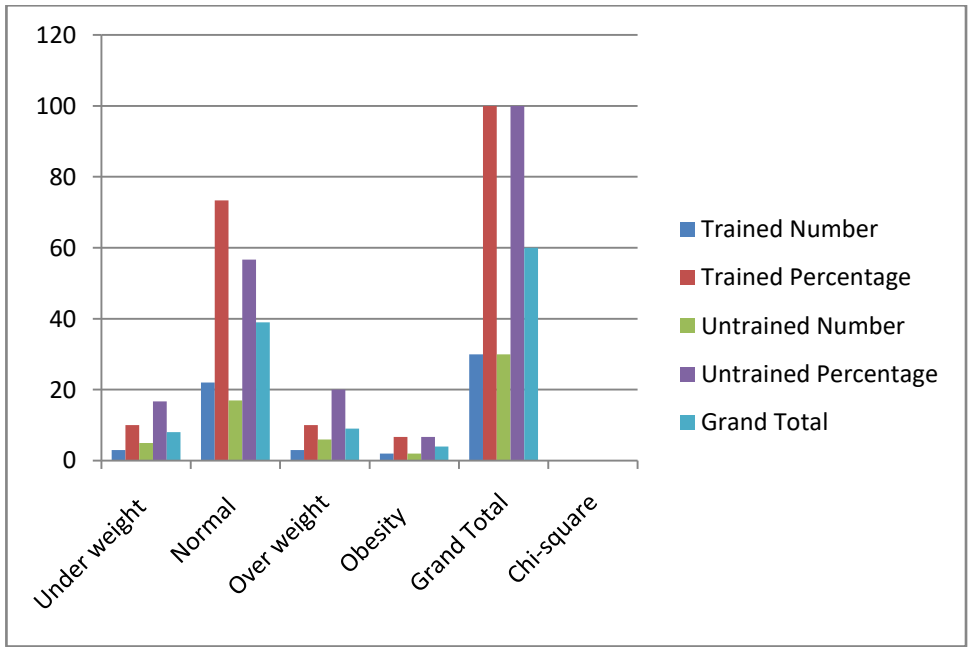
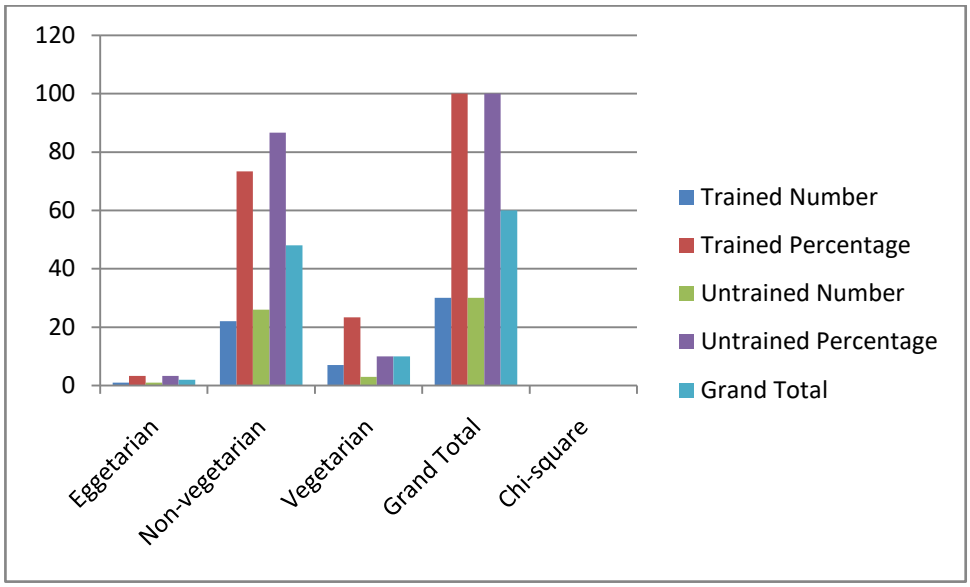


Table 3, indicates that the BMI of the trained and untrained basketball players are independent. The majority of the trained and untrained subjects fall under the normal category with 73.3% and 56.7% respectively. The number of subjects under underweight are 6.7% higher in untrained compared to the trained. The number of subjects falling under obesity are equal.

Table 4. Type of Food Habit Among Basketball Players

	Trained		Untrained		Grand Total
Row Labels	Number	Percentage	Number	Percentage	
Eggetarian	1	3.3	1	3.3	2
Non-vegetarian	22	73.3	26	86.7	48
Vegetarian	7	23.3	3	10.0	10
Grand Total	30	100.0	30	100.0	60
Chi-square	1.933 ^{NS}		Independent		



From Table 4, it is indicated that the number of non-vegetarians are high in both trained and untrained with 73.3% and 86.7% respectively. The number of vegetarians are high in the trained subjects with a percent of 13.3. there are equal number of Eggetarian in both the groups. The main reasons for adopting vegetarian diets reported by general population include cultural and religious beliefs, moral beliefs concerning animal rights, health benefits and environmental issues. For athletes, these reasons are likely to be similar to those of the general population.

Table 5 Components of Fitness among Basketball Players

	TRAINED		**UNTRAINED**		
Push-ups/min	**Number**	**Percentage**	**Number**	**Percentage**	**Significance of Chi Square**
<20	8	26.7	16	53.3	
20-40	12	40.0	7	23.3	4.512 ^{NS}
>40	10	33.3	7	23.3	
Sit ups/min					
<20	5	16.7	6	20.0	
20-40	15	50.0	19	63.3	**2.228** ^{NS}
>40	10	33.3	5	16.7	
Standing flex/min					
No	5	16.7	9	30.0	**1.491** ^{NS}
Yes	25	83.3	21	70.0	
Step test/3min					

50-75	12	40.0	3	10.0	**9.294****
75-100	15	50.0	17	56.7	
>100	3	10.0	10	33.3	
Vertical jump					
15-20	5	16.7	13	43.3	**6.119***
20-25	17	56.7	14	46.7	
25-28	8	26.7	3	10.0	
Sprint run					
<120	12	40.0	0	0	**18.488****
120-150	16	53.3	19	63.3	
>150	2	6.7	11	36.7	

Table 5, depicts clearly that both the groups are very active . this indicates that the players are highly active due to practice sessions, warm up and training session that they take part in and hence an increases their activity level.

By determining the level of activity, duration of intermittent activity, inactive periods, muscle groups involved, range of motion, demands in terms of components of fitness such as strength and explosive power, the coach can then work out the type of training that will prepare the body for the specific demands of the sport.

With regard to younger athletes in particular, much of the physical preparation can be done making use of the sport specific game situation. This means the physical preparation can be closely linked to the movement preparation. That is, the physical demands can be placed on the body while developing skills specific to the sport.(New Zealand principle of sport coaching).

Table 6 Dietary Intake among Basketball Players

	Trained		Untrained		Grand Total
Hours of training/day	Number	Percentage	Number	Percentage	
a. 30 mins	3	10.0	8	26.7	11
b. 1 hour	4	13.3	6	20.0	10
c. 1 ½ hour	6	20.0	4	13.3	10
d. 2 hour	17	56.7	12	40.0	29
Grand Total	30	100.0	30	100.0	60
Chi-square	3.935 ^{NS}		Independent		

Table 6, indicated that majority of the players train 2 hours per day.

To steadily improve the fitness of the athletes, they should continuously increase the physical demands to overload their systems. If the training demand is increased too quickly, the athlete will be able to adapt and may break down. If the demand is not adequate, the athlete will not achieve optimal fitness levels.

The specificity principle states that the more specific the training to the demands of the sport, the better and variation principle seemingly asserts the opposition-train by using a variety of activities. The incompatibility is resolved by the degree to which each principle is followed. More specific training is better, but it can become exceedingly boring. Thus some variety involves the same muscle groups is a useful change.

Table 7 Frequency of Playing Basketball among Basketball Players

	Trained		Untrained		Grand Total
Frequency of playing basketball?	Number	Percentage	Number	Percentage	
Daily	24	80.0	7	23.3	31
Twice a week	2	6.7	5	16.7	7
Thrice a week	3	10.0	10	33.3	13
Once a week	1	3.3	8	26.7	9
Grand Total	30	100.0	30	100.0	60
Chi-square	19.822**		Dependent		

Table 7, indicates 80% of the trained athletes play the sport on a daily basis. Whereas, only 23.3% of the untrained play daily. The reason may be due to attending colleges or work stations. 33.3% of untrained players play the sport thrice a week, the reason may be due to leisure.

Table 8 Awareness of Sports Drink among Basketball Players

	Trained		Untrained		Grand Total
aware of sports drink	Number	Percentage	Number	Percentage	
Fully	8	26.7	17	56.7	25
Partially	22	73.3	12	40.0	34
Not at all	0	0.0	1	3.3	1
Grand Total	30	100.0	30	100.0	60
Chi-square	7.181*		Dependent		

Table 8 , shows that 56.7% of untrained players are fully aware of the sports drink whereas only 26.7% of the trained athletes are aware of the sports drink. When intervened, the trained athletes, did not favour the use of sports drink as they were figure conscious as most of the sports drink contained sugars and carbohydrates.

Sports drink consumption was associated with higher moderate and vigorous physical activity, adolescents should be reminded of recommendations to consume these beverages only after vigorous, prolonged activity. There is also a need for future interventions designed to reduce sports and energy drinks consumption, to address the clustering of unhealthy behaviours. (Larson N et al., 2014)

Table 9 Tiredness Experienced among Basketball Players

	Trained		Untrained		Grand Total
Experience tiredness	Number	Percentage	Number	Percentage	
Yes	17	56.7	17	56.7	34
No	13	43.3	13	43.3	26
Grand Total	30	100.0	30	100.0	60
Chi-square	0.000 ^{NS}		Independent		

Results in Table 9, for experiencing tiredness in both the groups are similar. 56.7% experience tiredness while playing whereas the rest do not. This indicates that the 56.7% of players have higher level of activity due to which they feel tired due to fatigue.

Table 10 Consumption of Protein Supplements among Basketball Players

	Trained		Untrained		Grand Total
Consume protein supplements	Number	Percentage	Number	Percentage	
Yes	7	23.3	4	13.3	11
No	23	76.7	26	86.7	49
Grand Total	30	100.0	30	100.0	60
Chi-square	1.002 ^{NS}		Independent		

Table 10, indicates that most of the players don not consume supplements with 76.7% and 86.7% in trained and untrained players. There is no significant difference in the consumption of protein supplements among the two groups. The supplements consumed by the players were found to be creatinine, whey protein and caffeine.

Table 11 Details of A Particular Diet Followed By Basketball Players

	Trained		Untrained		Grand Total
Follow diet	Number	Percentage	Number	Percentage	
Yes	8	26.7	3	10.0	11
No	22	73.3	27	90.0	49
Grand Total	30	100.0	30	100.0	60
Chi-square	2.783 ^{NS}		Independent		

Table 11, indicates majority of the players do not follow a particular diet (such as weight loss diet, keto diet or paleo diet). Most of the players focus on a lot of protein rich foods in their diet to increase their muscle mass in turn results in improved performance levels.

Table 12 Inclusion of Food Groups among Basketball Players

	Trained		Untrained		Grand Total
Include 5 groups	Number	Percentage	Number	Percentage	
Yes	11	36.7	5	16.7	16
No	19	63.3	25	83.3	44
Grand Total	30	100.0	30	100.0	60
Chi-square	3.068 ^{NS}		Independent		

Table 12, indicates that most of the players do not include all the 5 food groups in their daily diet. 36.7% and 16.7% of the players include all the five food groups respectively in their diet.

Table 13 Consumption of Alcohol Among Basketball Players

	Trained		Untrained		Grand Total
Alchohol	Number	Percentage	Number	Percentage	
No	26	86.7	29	96.7	55
Yes	4	13.3	1	3.3	5
Grand Total	30	100.0	30	100.0	60
Chi-square	1.964 ^{NS}		Independent		

Table 13, shows there is no significant level in consumption of alcohol between the two groups. The table indicates that a majority of players do not consume alcohol, 86.7 and 96.7% respectively. The rest 13.3% and #.3% respectively consume alcohol occasionally.

Table 14 Diets Tried In the Past among Basketball Players

	Trained		Untrained		Grand Total
Tried diets	Number	Percentage	Number	Percentage	
Yes	10	33.3	8	26.7	18
No	20	66.7	22	73.3	42
Grand Total	30	100.0	30	100.0	60
Chi-square	0.317 ^{NS}		Independent		

Table 14. shows that 33.3% and 26.7% of both trained and untrained players have followed diets in their past. Most of the diets tries include Keto diet, Bulking diet, GM diet and other diets

Table 15 Consumption of Water among Basketball Players

	Trained		Untrained		Grand Total
Litres of water/day	Number	Percentage	Number	Percentage	
1-2	1	3.3	3	10.0	4
2-3	7	23.3	8	26.7	15
3-4	9	30.0	7	23.3	16
>4	13	43.3	12	40.0	25
Grand Total	30	100.0	30	100.0	60
Chi-square	1.357 ^{NS}		Independent		

Table 15. clearly indicates that majority of them consume more than 4 litres of water per day. The table also indicates that the players consume more water due to loses that occur during training sessions and workout in the form of perspiration. Hence they consume more water to keep their body in well hydrated state. Severely hypo hydrated state will negatively affect performance.

Dehydration influences several aspects of exercise in a negative way. Rises in core temperature, early fatigue, and decreased performance are some factors that are present in a dehydrated athlete.

Understanding the signs and symptoms of dehydration and managing it early will stop any further injury to the athlete. Certified Athlete Trainers' must promote hydration before exercise but must also be knowledgeable of the signs and symptoms of dehydration n the event that it occurs.

Although water is the primary method of rehydration, sports drink can be incorporated before, during and after exercise in order to maintain fluid balance. Proper hydration during exercise is known to have benefits that aid in athletic performance. Overall hydration is beneficial not only to exercise and athletic performance but also for physiologic functions.

Table 16 Lifestyle Activity among Basketball Players

	TRAINED		UNTRAINED		Significance of Chi Square
Sleep (hrs)	**Number**	**Percentage**	**Number**	**Percentage**	
<6	0	0.0	1	3.3	2.698 NS
6-8	5	16.7	9	30.0	
8-10	25	83.3	20	66.7	
Sitting (Hrs)					
<3	4	13.3	4	13.3	3.196 NS
3-6	20	66.7	18	60.0	
6-8	6	20.0	5	16.7	
>8	0	0.0	3	10.0	
Light activity					
<3	6	20.0	6	20.0	1.022 NS
3-6	23	76.7	22	73.3	
6-8	1	3.3	1	3.3	
>8	0	0.0	1	3.3	
Slow walk					
<2	5	16.7	6	20.0	0.112 NS
2-4	24	80.0	23	76.7	
>4	1	3.3	1	3.3	
Leisure					
<2	22	73.3	29	96.7	5.961**
2-4	4	13.3	0	0.0	
>4	3	10.0	1	3.3	
Jogging					
<2	14	46.7	7	23.3	3.733 NS
2-4	14	46.7	21	70.0	
>4	2	6.7	2	6.7	

From Table 16, it is clearly shown that there is 1 % level of significance in leisure with 5.961. the rest has no significance.

Table 17 Food Frequency among Basketball Players

	Trained		Untrained		Significance of Chi Square
Pulses	**Number**	**Percentage**	**Number**	**Percentage**	
Daily-B	22	73.3	20	66.7	0.372 NS
1-2/Week-C	6	20.0	7	23.3	
Once/Week-D	2	6.7	3	10.0	
Leafy Veg					
Daily	20	66.7	9	30.0	10.700*
1-2/Week	9	30.0	13	43.3	
Once/Week	1	3.3	4	13.3	
Once.In.15days	0	0.0	1	3.3	
Once/Month	0	0.0	3	10.0	
Other Veg					
Daily	24	80.0	15	50.0	7.077*
1-2/Week	5	16.7	10	33.3	
Once/Week		0.0	1	3.3	
Once.In.15days		0.0	2	6.7	
Once/Month	1	3.3	2	6.7	
Roots And Tubers					
Daily	4	13.3	10	33.3	5.857 NS
1-2/Week	15	50.0	13	43.3	
Once/Week	6	20.0	3	10.0	
Once.In.15days		0.0	1	3.3	
Once/Month	4	13.3	3	10.0	
Never	1	3.3		0.0	
Fruits					
Daily	26	86.7	17	56.7	7.284*
1-2/Week	3	10.0	7	23.3	
Once/Week	1	3.3	4	13.3	
Once.In.15days		0.0	1	3.3	
Once/Month		0.0	1	3.3	
Salads					
Daily	11	36.7	4	13.3	13.582**
1-2/Week	10	33.3	6	20.0	
Once/Week	1	3.3	5	16.7	
Once.In.15days	1	3.3	6	20.0	
Once/Month		0.0	3	10.0	

Never	7	23.3	6	20.0	
Sprouts					
Daily	5	16.7	4	13.3	9.849**
1-2/Week	7	23.3		0.0	
Once/Week	3	10.0	3	10.0	
Once.In.15day	2	6.7	5	16.7	
Once/Month	2	6.7	5	16.7	
Never	11	36.7	13	43.3	
Milk Products					
Daily	27	90.0	25	83.3	5.410 NS
1-2/Week		0.0	3	10.0	
Once/Week	2	6.7	1	3.3	
Once In 15 Days		0.0	1	3.3	
Never	1	3.3		0.0	
Meat					
Daily	16	53.3	18	60.0	5.390 NS
1-2/Week	6	20.0	6	20.0	
Once/Week		0.0	1	3.3	
Once In 15 Days		0.0	2	6.7	
Never	8	26.7	3	10.0	
Fish					
Daily	5	16.7	2	6.7	9.622*
1-2/Week	8	26.7	7	23.3	
Once/Week	1	3.3	7	23.3	
Once.In.15days	1	3.3	4	13.3	
Once/Month	1	3.3	2	6.7	
Never	14	46.7	8	26.7	
Poultry					
Daily	8	26.7	11	36.7	13.278**
1-2/Week	6	20.0	11	36.7	
Once/Week		0.0	2	6.7	
Once.In.15days	1	3.3	2	6.7	
Once/Month		0.0	1	3.3	
Never	15	50.0	3	10.0	
Fats					
Daily	24	80.0	25	83.3	4.163 NS
1-2/Week	3	10.0	4	13.3	

Once/Week	3	10.0		0.0	
Never		0.0	1	3.3	
Sugars					
Daily	13	43.3	21	70.0	8.454*
1-2/Week	11	36.7	3	10.0	
Once/Week	4	13.3	4	13.3	
Once.In.15days	1	3.3		0.0	
Once/Month	0.0	1	3.3		
Never	1	3.3	1	3.3	

Table 17, indicates that there is a significant difference in consumption of leafy vegetables, other vegetables, fruits, salads, sprouts, fish, poultry and sugars with 7.077, 7.284, 13.582, 9.849, 9.622. 13.278 and 4.163 at 1% significance respectively among trained and untrained players.

Table 18 Consumption of Beverages among Basketball Players

	Trained		Untrained		Significance of Chi Square
Milk	Number	Percentage	Number	Percentage	
Daily once	12	40.0	15	50.0	2.524 NS
Daily twice	13	43.3	8	26.7	
Twice a week	1	3.3	3	10.0	
Once a week	2	6.7	2	6.7	
Never	2	6.7	2	6.7	
Coffee					
Daily once	4	13.3	9	30.0	9.381*
Daily twice	1	3.3	2	6.7	
Twice a week		0.0	4	13.3	
Once a week	4	13.3	4	13.3	
Never	21	70.0	11	36.7	
Tea					
Daily once	5	16.7	2	6.7	7.130*
Daily twice	1	3.3	1	3.3	
Twice a week		0.0	5	16.7	
Once a week	4	13.3	6	20.0	
Never	20	66.7	16	53.3	
Fruit Juice					
Daily once	16	53.3	11	36.7	10.212*
Daily twice	9	30.0	3	10.0	
Twice a week	3	10.0	9	30.0	
Once a week	2	6.7	5	16.7	
Never		0.0	2	6.7	
Carbonated Drinks					
Daily once	3	10.0	2	6.7	5.612 NS
Daily twice	2	6.7	1	3.3	
Twice a week	3	10.0	6	20.0	
Once a week	9	30.0	15	50.0	
Never	13	43.3	6	20.0	

Table 18, indicates a significance difference between the consumption of coffee, tea and fruit juice with 9.381, 7.130 and 10.212 at 1% level of significance among the trained and untrained.

Table 19 Consumpton of Snacks among Basketball Players

	Trained		Untrained		Significance of Chi Square
Bakery products	Number	Percentage	Number	Percentage	
Once a week	8	26.7	13	43.3	6.231 NS
Twice/thrice a week	10	33.3	8	26.7	
Daily once	6	20.0	2	6.7	
Twice a day	2	6.7		0.0	
Never	4	13.3	7	23.3	
Cakes					
Once a week	13	43.3	14	46.7	0.096 NS
Twice/thrice a week	8	26.7	8	26.7	
Never	9	30.0	8	26.7	
Fried Foods					
Once a week	8	26.7	10	33.3	5.792 NS
Twice/thrice a week	4	13.3	9	30.0	
Daily once	5	16.7	6	20.0	
Never	13	43.3	5	16.7	
Chocolates					
Once a week	10	33.3	13	43.3	2.620 NS
Twice/thrice a week	7	23.3	5	16.7	
Daily once	7	23.3	4	13.3	
Twice a day		0.0	1	3.3	
Never	6	20.0	7	23.3	

There is no significant difference in the consumption of snacks between the trained and untrained players.

Table 20 Difference between 24 Hour Dietary Recall

	Trained	Untrained	T – test
Energy (Kcal)	1456	1545	0.44 NS
Protein (g)	101	111	0.39 NS
Fat (g)	45	47	0.81 NS
Calcium (mg)	650	694	0.58 NS
Iron (mg)	21	16	0.25 NS
Vitamin C (mg)	51	76	0.03 **

Except for vitamin C there exists no significant difference with respect to diet recallbetween trained and untrained basketball players.

Summary
A broad range of body sizes and fitness levels are evident in the different playing positions across most high-intensity intermittent team sports. Basketball is a sport where the body size and fitness level of players on the team will play a major role in determining competition success. While basketball is classified as a non-contact sport, body contact is common, particularly among the comparatively bigger players on the team. For these players, body mass and muscular strength are required to maintain nearly stationary positions when opponents contest for important positions under the basket.

Relatively smaller players are responsible for carrying the ball quickly up the court and scoring points while defending their counterparts on the opposing team from doing the same. Speed, agility, and rapid recovery are critical fitness components of smaller players. Clearly, having favourable anthropometric and fitness characteristics is very important to success in basketball despite the highly skilled nature of the game.

On a day-to-day basis good nutrition is obtained by consuming a well-balanced diet comprising of carbohydrates, fat, protein, electrolytes, vitamins, minerals and water. the aim of the study was to elicit information on "Dietary Habits and Physical Fitness between Trained and Untrained Basketball Players".

The salient features of the study were as follows:

1. The study was conducted on 60 subjects containing 30 trained male basketball players and 30 untrained male basketball players of the age group 18-29 years.
2. Hydration status plays a key role as far the performance of players is concerned. The water consumption was found to be more than 4 litres per day only in case of 43.3% in trained and 40% in untrained respectively. It was also observed that 30% of the trained players consumed 30% of the trained players consumed -4 litres of water per day, whereas 26.3% consumed less than 3 litres per day.
3. Sports nutrition is an important aspect in maintaining the health and to improve the performance which has not been taken care by the players. The fatigue or tiredness experienced by the 56.7% among both the trained and untrained players and can be related to under nutrition.
4. The dietary habits of the subjects were satisfactory as their frequency of consumption of different food groups was good.
5. The physical fitness of both the trained and untrained players was good.
6. There was no significant difference observed between the dietary habits between the trained and untrained players, except for the consumption of Vitamin C which was higher in untrained players when compared to the trained players.

CONCLUSION

Sports in all forms are usually competitive and depends on physical fitness. Sports, through casual or organized participation, aims to use, maintain or improve physical ability and skills while providing entertainment to participants. Performance related fitness involves skills that will enhance one's accomplishment in athletic or sports events. The skill related fitness elements are – speed, agility, power, balance, coordination and reaction time.

The nutrient intake of the players was less than the RDA computed on individual basis pertaining to carbohydrate, protein, fat, calcium, iron and vitamin C. Sports nutrition is an important aspect in not only maintaining the health but alsoin improving the performance of players. The unduefatigue experienced by the players can be related to under nutrition.

Basketball is an aerobic activity of long duration with high intensity. Basketball coaches should continue to emphasize fitness in their development-level programs and a greater focus in more senior level programs to maintain and improve fitness. This type of activity increases the lean body mass and a higher basal metabolic rate persists due to increased activity levels.

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