European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejpe.v10i6.5303 Volume 10 | Issue 6 | 2024

PROFESSIONAL FITNESS STATUS OF YOUNG FEMALE ATHLETES OF HO CHI MINH CITY BASKETBALL TEAM, VIETNAM

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Abstract:
Basketball is a team sport characterized by direct opposition, so it requires physical strength and agility. The sport has gained global popularity which attracts numerous individuals to engage in practice and competition. This research was conducted to establish a standardized professional fitness assessment for female athletes from the Ho Chi Minh City basketball team. To fulfil the stated aim, the study employed three common scientific research methods, namely document analysis, interviews, and statistical analysis. Sixteen female basketball players from the Ho Chi Minh City team were involved as the participants, with an average age of 23.5 ± 3.54 years, height of 169.25 ± 4.77 cm, and weight of 64.75 ± 5.56 kg. The result has provided a scoring system and classification table to accurately measure the professional fitness of female basketballers. One more notable thing was that the participants exhibited superior professional fitness compared to their counterparts of the years 2004 and 2010, but inferior to that of the national team in 2006. Furthermore, regarding their performances in fitness tests, 18.75% of the participants were deemed good, 25.0% satisfactory, 37.50% unsatisfactory, 18.75% poor, and none achieved the excellent level.

Keywords: fitness, professional fitness, basketball player, Ho Chi Minh City, Vietnam

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1. Introduction

Basketball is deemed one of the most popular sports in the world with a history of more than 150 years. Basketball today is developed in all aspects including fitness, techniques, tactics, and psychology built on the solid basis of scientific research and coaching experience. It cannot be denied that the sport is growing rapidly, along with the advancement of techniques and fitness.

Modern basketball, a sport for giants, is characterized by sporadically intense movements. The players have to push their physical limits to navigate the demands of fiercely competitive games [1]. As a result, physical fitness is found to be crucial as it has a strong correlation to batting performance, as proven by the study of Fort-Vanmeerhaeghe A. *et al.* [2] on female athletes under the age of 18.

On May 8, 2000, FIBA implemented changes to some basketball rules, such as the 10-second rule being replaced by the 8-second rule and the 30-second rule to the 24-second rule when the ball touched the rim of the basket [3]. These modifications necessitate athletes to perform swifter manoeuvres and ball passes. In other words, the players have to maintain a continuous state of motion while executing high-intensity movements during long matches [4], [5]. Moreover, in modern sports, both male and female athletes are equally provided with the same training program, which has a positive impact on the enhancement of female fitness and skills. Now, there seems no discrimination when instructing featured techniques for the two genders such as jump shots, layups, hook shots, defensive and attacking manoeuvres, low-post steals, aerial manoeuvres, etc. In elite-level competitions, top-tier teams typically achieve a success rate of around 50%.

In today's basketball, achieving peak performance is a multifaceted endeavour as it necessitates a blend of technical proficiency, strategic acumen, and superior physical conditioning (Ziv & Lidor, 2009). Thus, a proficient basketball player in the present era must possess both tactical expertise and a robust physical foundation to excel on the court. Recognizing the significance of the physical base in basketball, the researcher attempted to conduct a study on: "Professional Fitness Status of Young Female Athletes of Ho Chi Minh City Basketball Team, Vietnam".

2. Research Aims

The study aims to propose professional fitness tests for young female basketballers in the Ho Chi Minh City team.

3. Materials & Methods

3.1 Research Methods

- Document Reference: Compile research to compare and discuss research findings.
- Interview: Consult with experts and coaches to establish appropriate fitness tests.

- Statistic Analysis: Analyse the collected data to establish criteria based on the C scale; assessing the distribution of the dataset with the Shapiro-Wilk method; comparing the average performance of the participants with their counterparts by theoretical average assessments.

3.2 Participants

Sixteen female athletes of Ho Chi Minh City basketball team, with an average age of 23.5 ± 3.54 years, height of 169.25 ± 4.77cm, and weight of 64.75 ± 5.56 kg.

3.3 Interviewees

Twenty people including four experts and managers, ten coaches, and six basketball lecturers from Ho Chi Minh City, Can Tho, and Soc Trang.

4. Results

Two following steps were implemented to evaluate the professional fitness of the participants:

- **Step 1:** Establishing tests and standards for professional fitness assessment.
- **Step 2:** Application of those professional fitness standards to the physical assessment of female basketballers in the Ho Chi Minh team.

4.1 Establishment of physical tests and standards for professional fitness assessment for female athletes of the Ho Chi Minh City basketball team

A. Professional fitness tests

By combining documents, interviews, and reliability assessments, the research study discovered 14 fitness tests for the participants, as follows.

a. Pedagogical tests

20-meter sprint (s), High jump (cm), Sit and Reach Test (cm), Hexagonal Obstacle Jump (s), T-Test (s), Drill test (s), Maximum Ball Passes in 30 seconds (points), Two-Point Basketball Shooting from 5 Positions in One Minute (points), Three-Point Basketball Shooting from 5 Positions in One Minute (points), Defensive Slide (s), Dribbling (s).

b. Functional tests

Relative Peak Power Output (RPP) (w/kg), Relative Aerobics Capacity (RAC) (w/kg), $VO2_{max}$ (ml/kg/minute).

4.2 Establishment of standards for professional fitness tests

a. C scale

The C scale was selected due to its convenience in assessing the performance of each athlete on each separate test, aiming to enhance the precision and detail of the results and facilitate the subsequent comparison. The measurements were conducted on a scale

ranging from 0 to 10. Given that the C scale is a standardized measure, it is essential for the data under evaluation to exhibit a standard or near-standard distribution. Hence, to assess the standardization of the probability distribution of the datasets, the study employed the Shapiro-Wilk methodology (SW). Following the initial testing phase, the researcher performed a four-step verification process following the Shapiro-Wilk method (SW). The outcomes of these analyses are presented in Table 1.

Table 1: Shapiro-Winki standard distribution test for professional fitness assessment of female basketball athletes of Ho Chi Minh City team (n = 16)

No.	Test	Shapiro-Wink Test		
		S^2	b	SW
1	20-meter sprint (s)	0.04	0.54	0.902
2	High jump (cm)	19.45	259.34	0.889
3	Hexagonal Obstacle Jump (s)	0.07	1.03	0.945
4	Sit and Reach Test (cm)	15.21	212.41	0.931
5	T-Test (s)	0.07	0.98	0.894
6	Drill test (s)	3.39	47.03	0.926
7	Maximum Ball Passes in 30 seconds (points)	4.12	55.51	0.898
8	Two-Point Basketball Shooting from 5 Positions in One Minute (points)	5.34	76.20	0.952
9	Three-Point Basketball Shooting from 5 Positions in One Minute (points)	2.66	36.31	0.911
10	Defensive Slide (s)	0.20	2.76	0.908
11	Dribbling (s)	0.15	2.11	0.923
12	VO2max/kg (ml/minute/kg)	0.72	9.92	0.915
13	Relative Peak Power Output (RPP) (w/kg)	7.56	104.59	0.922
14	Relative Aerobics Capacity (RAC) (w/kg)	0.98	13.50	0.918

Table 1 indicates that the fitness results of the athletes have SW greater than SW_{01}, thus the H_0 hypothesis is accepted. Additionally, the sample exhibits a standard distribution at a significance level of α = 0.01, showing that the fitness tests meet the criteria for building the C scale.

Using the mean and standard deviation from the initial test, the study conducted a C scale score computation (presented in Chapter 2) for the fitness tests. The results are displayed in Table 2.

Table 2: Results of the professional fitness assessments conducted on the female athletes of Ho Chi Minh City basketball team

No.	Test	Scores									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	20-meter sprint (s)	4.13	4.03	3.93	3.83	3.73	3.63	3.53	3.43	3.33	3.23
2	High jump (cm)	39.7	41.9	44.2	46.4	48.6	50.8	53.0	55.2	57.4	59.6
3	Hexagonal Obstacle Jump (s)	16.45	16.32	16.18	16.05	15.91	15.78	15.64	15.51	15.37	15.24
4	Sit and Reach Test (cm)	13.1	15.0	17.0	18.9	20.9	22.8	24.8	26.7	28.7	30.6
5	T-Test (s)	12.09	11.96	11.82	11.69	11.55	11.42	11.28	11.15	11.01	10.88
6	Drill test (s)	36.87	35.95	35.03	34.11	33.19	32.27	31.35	30.43	29.51	28.59
7	Maximum Ball Passes in 30 seconds (points)	46.4	47.5	48.5	49.5	50.5	51.5	52.5	53.5	54.6	55.6
8	Two-Point Basketball Shooting from 5 Positions in One Minute (points)	11.4	12.5	13.7	14.8	16.0	17.2	18.3	19.5	20.6	21.8
9	Three-Point Basketball Shooting from 5 Positions in One Minute (points)	6.4	7.2	8.0	8.8	9.6	10.4	11.3	12.1	12.9	13.7
10	Defensive Slide (s)	12.59	12.37	12.14	11.92	11.69	11.47	11.24	11.02	10.79	10.57
11	Dribbling (s)	9.45	9.26	9.06	8.87	8.67	8.48	8.28	8.09	7.89	7.70
12	VO2max/kg (ml/minute/kg)	39.86	41.24	42.61	43.99	45.36	46.74	48.11	49.49	50.86	52.24
13	Relative Peak Power Output (RPP) (w/kg)	7.35	7.84	8.33	8.82	9.31	9.80	10.29	10.78	11.27	11.76
14	Relative Aerobics Capacity (RAC) (w/kg)	5.71	6.15	6.58	7.02	7.45	7.89	8.32	8.76	9.19	9.63

4.3 Standards for professional fitness assessment

The creation of the standardized scale enables the evaluation of each athlete's performance. However, in order to classify his professional fitness, a set of criteria is necessary. Hence, the study proposed five categories as follows.

- Excellent: 9 - 10 scores;
- Good: 7 - 9 scores;
- Satisfactory: 5 - 7 scores;
- Unsatisfactory: 3 - 5 scores;
- Poor: 0 - 3 scores.

4.4 Assessment of the professional fitness of the female athletes of the Ho Chi Minh City basketball team

4.4.1 The athletic fitness level of the female players on the basketball team from Ho Chi Minh City

Evaluating a phenomenon's status necessitates a comparative analysis against a standard or a comparable entity. In this context, the author attempted to compare the athletic proficiency of the participants with that of other twelve female athletes of the Ho Chi Minh City basketball team in 2004 [7], thirteen from the same team in 2010 [10], and sixteen from the Vietnam Basketball Club in 2006 [8], [9] by utilizing theoretical mean values. The outcomes are presented in Table 3.

Table 3: Comparison of the fitness performances of female basketballers of Ho Chi Minh City Basketball Team in three different years and Vietnam Club in 2006

No.	Test	Ho Chi Minh team in 2019 (n=16)		Ho Chi Minh team in 2004	Ho Chi Minh team in 2010	Vietnam Basketball club in 2006	Comparison results		
		$\overline{X}$	SD	$\overline{X_1}$	$\overline{X_2}$	$\overline{X_3}$	P_1	P_2	P_3
1	20-meter sprint (s)	3.73	0.20	3.75	-	3.55	>0.05	-	3.60
2	High jump (cm)	48.56	4.41	46.1	-	46.5	<0.05	-	>0.05
3	Hexagonal Obstacle Jump (s)	15.91	0.27	16.2	-	14.23	<0.05	-	<0.05
4	Sit and Reach Test (cm)	20.88	3.90	-	-	-	-	-	-
5	T-Test (s)	11.55	0.27	11.1		10.28	<0.05	-	<0.05
6	Drill test (s)	33.19	1.84	-	34.85	30.18	-	<0.05	<0.05
7	Maximum Ball Passes in 30 seconds (points)	50.50	2.03	49.8	-	52.75	>0.05	-	<0.05
8	Two-Point Basketball Shooting from 5 Positions in One Minute (points)	16.00	2.31	16.3	-	19.50	>0.05	-	<0.05
9	Three-Point Basketball Shooting from 5 Positions in One Minute (points)	9.63	1.63	6.5	-	2.50	<0.05	-	<0.05
10	Defensive Slide (s)	11.69	0.45	11.6	11.79	9.30	>0.05	>0.05	<0.05
11	Dribbling (s)	8.67	0.39	8.82	8.75	8.03	>0.05	>0.05	<0.05
12	VO2max/kg (ml/minute/kg)	45.01	2.90	-	44.67	-	-	>0.05	-
13	Relative Peak Power Output (RPP) (w/kg)	9.31	0.92	-	-	-	-	-	-
14	Relative Aerobics Capacity (RAC) (w/kg)	7.45	0.73	-	7.57	-	-	>0.05	-

Table 3 indicates that the female athletes of the Ho Chi Minh City basketball team in 2019 exhibited superior lower limb strength, continuous jumping skills, and endurance in three-point shooting compared to the 2004 team. They also demonstrate comparable speed, strength, and speed in passing, two-point shooting, and defensive skills. However, they show inferior agility in direction shifts.

The 2019 team also performed better professional endurance compared to their counterparts from the 2010 team, but comparable speed in attacking and defensive skills, as well as atmospheric stamina and aerobic endurance.

The Ho Chi Minh City basketball team in 2019 has better professional endurance in three-point shooting than the Vietnam Basketball team in 2006, but comparable lower limb explosive strength. However, the Ho Chi Minh City team's female basketballers possess lower levels of speed, rotational speed, continuous jumping ability, professional stamina, passing accuracy and speed, two-point shooting, and defending skills.

In short, the athletic performance of the female athletes from the Ho Chi Minh City basketball team in 2019 exhibited greater physical fitness levels when compared to those from the same team in 2004 and 2010, yet inferior to that of the Vietnam Basketball Club in 2006.

4.5 Assessment of the physical strength of the participants in accordance with the set criteria

The study performed a comprehensive fitness evaluation on 16 female athletes from the basketball team of Ho Chi Minh City. The assessment involved 14 professional fitness tests that had been conducted on the participants. The results of these tests were individually scored for each athlete, and the outcomes are presented in Table 4 based on the data provided in Table 2.

Table 4: Individual scores of the professional fitness tests

No.	Test	Results of each athlete															
		No 1	No 2	No 3	No 4	No 5	No 6	No 7	No 8	No 9	No 10	No 11	No 12	No 13	No 14	No 15	No 16
1	20-meter sprint (s)	8.4	8.1	7.8	6.8	7.1	3.3	4.3	3.9	3.2	4.2	2.8	3.7	4.5	5.5	4.4	2.2
2	Defensive Slide (s)	7.7	7.3	8.1	7.8	5.5	5.1	5.9	6.0	3.8	5.0	3.0	3.5	3.0	2.6	2.5	3.1
3	Dribbling (s)	7.5	7.1	7.7	7.3	6.6	3.9	6.7	3.1	3.6	5.7	2.1	4.6	5.0	4.5	2.0	2.5
4	High jump (cm)	7.5	8.4	6.1	5.7	6.6	3.8	7.9	4.7	2.9	6.6	3.8	4.7	2.0	3.4	2.5	3.4
5	Hexagonal Obstacle Jump (s)	7.6	7.2	6.9	5.6	6.0	4.2	8.1	3.8	2.7	7.2	3.1	5.7	2.9	4.1	2.8	2.3
6	Sit and Reach Test (cm)	8.7	7.6	7.1	6.1	5.1	4.6	6.6	3.5	3.0	7.1	2.5	4.0	5.1	3.5	2.0	3.5
7	T-Test (s)	7.3	6.2	9.4	7.6	5.7	2.8	6.5	3.8	4.2	5.3	3.0	3.9	4.8	4.3	2.5	2.6
8	Maximum Ball Passes in 30 seconds (points)	7.5	6.5	8.4	7.5	6.5	3.5	5.5	2.5	4.5	5.5	2.5	3.5	6.5	4.5	2.5	2.5
9	Two-Point Basketball Shooting from 5 Positions in One Minute (points)	8.5	8.5	6.7	7.6	5.9	5.9	5.0	4.1	4.1	3.3	4.1	5.0	3.3	2.4	3.3	2.4
10	Three-Point Basketball Shooting from 5 Positions in One Minute (points)	9.1	7.9	7.9	6.7	5.5	4.2	4.2	5.5	4.2	3.0	5.5	4.2	3.0	3.0	3.0	3.0
11	Drill test (s)	7.0	7.7	8.3	6.8	6.4	2.7	6.1	4.0	2.5	5.7	2.5	5.2	5.0	4.7	2.0	3.4
12	VO2max/kg (ml/minute/kg)	8.3	7.5	7.4	5.9	3.8	3.0	6.0	5.3	3.8	6.8	2.0	5.8	4.7	5.1	2.3	2.2
13	Relative Peak Power Output (RPP) (w/kg)	8.3	8.0	7.0	6.8	5.6	3.3	7.6	3.7	3.1	4.8	2.5	5.0	4.6	4.2	2.7	2.7
14	Relative Aerobics Capacity (RAC) (w/kg)	8.1	7.9	7.0	7.2	5.6	3.3	7.4	3.7	2.8	5.3	2.3	4.9	4.7	4.2	3.0	2.6

Based on the results provided in Table 4, the average score of each factor and the overall average physical strength point were calculated and shown in Table 5.

Table 5: Individual average fitness score by factor

No.	Athlete	Average scores						Level
		Speed	Strength	Flexibility	Agility	Stamina	Professional fitness	
1	No1	7.9	7.5	8.7	8.1	7.9	8.0	Good
2	No2	7.5	7.8	7.6	7.3	7.8	7.6	Good
3	No3	7.9	6.5	7.1	8.1	7.4	7.4	Good
4	No4	7.3	5.7	6.1	7.3	6.7	6.6	Satisfactory
5	No5	6.4	6.3	5.1	5.9	5.4	5.8	Satisfactory
6	No6	4.1	4.0	4.6	4.1	3.1	4.0	Unsatisfactory
7	No7	5.7	8.0	6.6	5.3	6.8	6.5	Satisfactory
8	No8	4.3	4.3	3.5	4.0	4.2	4.1	Unsatisfactory
9	No9	3.5	2.8	3.0	4.3	3.1	3.3	Unsatisfactory
10	No10	4.9	6.9	7.1	4.3	5.6	5.8	Satisfactory
11	No11	2.6	3.5	2.5	3.8	2.3	2.9	Poor
12	No12	3.9	5.2	4.0	4.2	5.2	4.5	Unsatisfactory
13	No13	4.2	2.4	5.1	4.4	4.7	4.2	Unsatisfactory
14	No14	4.2	3.7	3.5	3.6	4.5	3.9	Unsatisfactory
15	No15	3.0	2.6	2.0	2.8	2.5	2.6	Poor
16	No16	2.6	2.8	3.5	2.6	2.7	2.9	Poor

Table 5 reveals the professional fitness assessment of sixteen female athletes of Ho Chi Minh City basketball team as follows:
- No excellent athletes accounted for 0.0%,
- Three good athletes accounted for 18.75%,
- Four athletes with satisfactory results accounted for 25.0%,
- Six athletes with unsatisfactory results accounted for 37.50%,
- Three athletes with poor performance accounted for 18.75%.

5. Conclusion

The study has established a standard for professional fitness assessment for female athletes of the Ho Chi Minh City basketball team. It also involves the use of a scoring system and a classification table. Notably, the physical fitness performance of the female athletes of the Ho Chi Minh City basketball team in 2019 was found to be superior compared to those of the same team in 2004 and 2010, but inferior to Vietnam Basketball Club in 2006. The study also revealed that 18.75% of the participants were classified as good, 25.0% as satisfactory, 37.50% as unsatisfactory, 18.75% as poor, and none achieved an excellent level.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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