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Professional fitness criteria for male volleyball athletes of the Saigon University team, Vietnam

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Abstract
In modern volleyball, physical fitness serves as the foundation for an effective execution of technical skills and tactical strategies. It enables athletes to move efficiently, jump higher, perform movements with precision, and maintain stable performance throughout a match. This study aims to identify appropriate tests for assessing the sport-specific physical fitness of male athletes on the volleyball team of Saigon University, Vietnam. To address the research objectives, the study employed document synthesis and analysis, expert interviews, pedagogical testing, and statistical methods. The research sample consisted of 20 male volleyball athletes from Saigon University and 30 experienced experts. The study has identified nine sport-specific fitness, including 20-m sprint (s), 12-minute run (m), standing vertical jump (cm), approach vertical jump (cm), standing long jump (cm), standing triple jump(m), T-test agility run (s), two-hand overhead throw with a 1-kg medicine ball (m), and sit-and-reach test (cm). The study also developed C-scale standards and overall fitness classifications for these tests. According to the assessment outcomes, 10% of athletes reached a "Fair" level, 40% achieved an "Average" level, and 50% were classified as "Below average."

Keywords: Standards, professional fitness, male athlete, volleyball, saigon university, Vietnam

Introduction

Volleyball is one of the most popular sports, with more than 46 million participants in the United States and approximately 800 million people [1]. Volleyball is a team-based sport characterized by indirect opposition. In competitions, players are required to show strength, endurance, and teamwork. The outcome of a match is strongly influenced by overall team collaboration as well as individual competencies.

A volleyball match consists of two teams of six players on opposite sides of the court, separated by a net and boundary lines. Each team is allowed no more than three consecutive touches, and the match duration is not time-limited. The team that wins three sets first is declared the winner. In the first four sets, a minimum of 25 points is required to win a set, while the fifth set is played to 15 points [2, 3].

Volleyball is a non-cyclical sport in which match situations shift continuously between offensive and defensive phases. Technical skills vary according to situational demands and form an interconnected system of actions such as serving-receiving, attacking-blocking, and attacking-backcourt defense [4]. Another feature of volleyball is the rotational movement of players through designated court zones in a clockwise direction. Back-row players are prohibited from attacking or blocking in front of the 3-meter line, meaning that all athletes must perform both front-row and back-row duties, contributing to both offense and defense. Consequently, the comprehensive offensive and defensive capabilities of each player significantly influence the team's overall performance outcomes [5].

In volleyball, the confrontation between offensive and defensive actions occurs primarily at the net; therefore, physical attributes such as height and vertical jump play a crucial role. Because ball contact is brief and performed mainly with the hands and fingers rather than full-body control, precise ball-handling is an essential skill for high-level volleyball performance.

Volleyball is played on a relatively small court with many players actively involved, resulting in short movement distances and rapid changes in play. Ball flight speed is highly variable and often very fast, reaching 28–30 m/s for spikes and up to 30 m/s for jump serves. Consequently, success in tactical execution depends greatly on speed, accuracy, and the athletes' ability to quickly interpret the actions of both teammates and opponents, as well as their capacity to move efficiently across the court [6].

As volleyball matches are operated under a fast-paced rally-point scoring system, competition is often intense. Thus, in addition to physical fitness, athletes must demonstrate strong psychological resilience, willpower, and sustained effort throughout the match.

Volleyball performance is shaped by a team's capacity to score points effectively while minimizing the opponent's scoring opportunities. In contemporary competition, offensive actions generally have an advantage, as the speed and power of spikes often exceed the defensive response time. As a result, rallies are frequently interrupted, and play sequences tend to be short.

Modern volleyball is evolving toward higher speed, precision, technical complexity, and artistic execution. To meet these demands, elite athletes must demonstrate comprehensive physical qualities, including speed, power, agility, and adaptability. Physical fitness is therefore indispensable to fulfilling tactical requirements. Indeed, the level of physical preparation is closely linked to athletic performance. Since the emergence of the modern Olympic movement, significant scientific efforts have been devoted to optimizing physiological function and muscular performance to maximize competitive achievement.

Given that physical fitness is the foundation for executing technical and tactical skills, improving athletes' physical conditioning has become one of the central priorities in contemporary volleyball training [7, 8, 9]. For these reasons, this study has been conducted with the title:

"Professional fitness criteria for male volleyball athletes of Saigon University team, Vietnam".
The research aims to identify tests, thereby building standards for evaluating the professional fitness of male athletes in the volleyball team of Saigon University, Vietnam.

Methodology

Research Methods

Document synthesis and analysis: Relevant domestic and international literature was collected, reviewed, and synthesized to establish the theoretical foundation of the study. This process supports the formulation of the research hypothesis, the identification of research objectives, and the development of the conceptual framework. It also provides the basis for interpreting and validating findings throughout the research process.

Expert interviews: Interviews were conducted with experienced experts, coaches, and specialists in volleyball training to select and validate the sport-specific fitness tests appropriate for male volleyball athletes of Saigon University, Vietnam.

Pedagogical testing: Selected tests assessing the sport-specific fitness of male volleyball athletes were administered at baseline (Pre-test) and again after one year of training to evaluate changes in performance.

Statistical analysis: All collected data were processed and analyzed using statistical methods with the support of SPSS 22.0, ensuring accuracy and reliability in the interpretation of findings.

Participants

Testees: 20 male volleyball athletes from the Saigon University team, Vietnam.

Surveyees: 30 experts, including coaches, specialists, managers, and university lecturers with extensive experience in volleyball training and instruction, participated in the interview component.

Results and Discussion

To develop the sport-specific fitness assessment standards for male volleyball athletes of Saigon University, Vietnam, the study was conducted in two main stages:

Step 1: Identify appropriate tests for assessing the professional fitness of male volleyball athletes at Saigon University.

Step 2: Establish the assessment standards based on the selected tests.

1. Identification of professional fitness tests

To determine professional fitness assessment tests, the selection was conducted according to the following steps:

Step 1: Synthesis of professional fitness assessment tests in volleyball suggested by domestic and foreign authors: Bui Huy Cham (1988) [10], Nguyen Thanh Lam (1998) [11], Nguyen Ngoc Cu et al. (1998) [12], Nguyen Math - Pham Danh Thuan (2000) [13], Nguyen Huu Hung (2001) [14], Nguyen The Truyen, Nguyen Kim Minh, Tran Quoc Tuan (2002) [15], Nguyen Van Hai (2006) [16], Nguyen Huu Tin (2007) [17], Pham Van Han (2014) [18], Nguyen Van Truong (2014) [19], Le Nguyet Nga et al. (2016) [20], Tran Tri Hai (2016) [21], Nguyen Thi Kieu Thu (2017) [22], Thach Fat Mai Ly (2020) [23], Tran Quoc Tuan (2021) [24], Do Xuan Thanh (2021) [25].

The study then relied on two key principles to determine the tests: (1) the tests must be measurable, and (2) the test results must allow comparison at the individual, regional, and international levels [26].
Considering the characteristics of the athletes, the practical training conditions of the Saigon University men's volleyball team, and the experience of coaches and volleyball experts, 25 tests had been selected for further evaluation.

Step 2: From the compiled list, the study designed a questionnaire and conducted two rounds of expert interviews, spaced 15 days apart. Both interviews used the same set of tests, procedures, and scoring criteria to ensure consistency. The interview participants included 30 experts, consisting of coaches, specialists, managers, and university lecturers with extensive experience in volleyball training and instruction.
The purpose of the questionnaire is to determine which indicators were essential for evaluating the sport-specific fitness and basic technical abilities of the Saigon University men's volleyball team. Experts rated each test using three response options: Use (3 points), Use to some extent (2 points), Do not use (0 points). The summarized results are presented in Table 1.

Table 1: Interview results of the selection of the professional fitness assessment tests for the men's volleyball team at Saigon University, Vietnam

No.	Test	1st		2nd		Selected
		Total	%	Total	%	
1	20-meter sprint test (s)	81	90.00	81	90.00	X
2	30-meter sprint test (s)	46	51.11	40	44.44	
3	Back strength pulls (kg) / back extensor strength (kg)	67	74.44	70	77.78	
4	Cooper 12-minute run test (m)	84	93.33	86	95.56	X
5	9 x 6m shuttle run (s)	67	74.44	70	77.78	
6	Standing vertical jump (cm)	86	95.56	86	95.56	X
7	Approach vertical jump (cm)	88	97.78	85	94.44	X
8	Standing long jump (cm)	84	93.33	86	95.56	X
9	Standing single-step long jump (cm) / standing one-step broad jump (cm)	46	51.11	40	44.44	

10	Standing triple jump (cm)	81	90.00	82	91.11	X
11	T-test agility drill (s)	47	52.22	47	52.22	
12	Agility cone test (s) (pine tree run variation)	86	95.56	86	95.56	X
13	Two-hand overhead throw with a 1-kg medicine ball (m)	87	96.67	88	97.78	X
14	9-3-6-3-9 shuttle run (s)	46	51.11	46	51.11	
15	Timed abdominal crunches (10 seconds) (reps)	60	66.67	63	70.00	
16	Sit-to-stand test (20 seconds) (reps)	47	52.22	47	52.22	
17	Medicine ball throw 1 kg (one-handed) (m)	48	53.33	51	56.67	
18	Forward roll combined with approach jump and two-handed medicine ball throw over a net (s)	57	63.33	57	63.33	
19	4 x 10m shuttle run (s)	60	66.67	59	65.56	
20	5-minute endurance run (m) / 5-minute free run (m)	67	74.44	65	72.22	
21	Supine abdominal crunches (30 seconds) (reps)	72	80.00	70	77.78	
22	Dominant hand grip strength (kg)	53	58.89	55	61.11	
23	Sit and reach test (standing variation) (cm)	81	90.00	81	90.00	X
24	Prone push-ups (10 seconds) (reps)	53	58.89	65	72.22	
25	Forward rolls (10 seconds) (reps)	56	62.22	66	73.33	

Based on the interview results, the study selected tests that achieved at least 90% of the total possible score across both rounds of expert consultation. Following this criterion, nine sport-specific fitness tests were identified as appropriate for male volleyball athletes of Saigon University, Vietnam, including 20-m sprint (s), 12-minute run (m), standing vertical jump (cm), approach vertical jump (cm), standing long jump (cm), standing triple jump(m), T-test agility run (s), two-hand overhead throw with a 1-kg medicine ball (m), and sit-and-reach test (cm).

Step 3: Reliability Testing

The reliability of the selected tests was examined using the Pre-Test method described by Le Van Lam & Pham Xuan Thanh (2007) [26], Nghiep Chi (2004) [27], and Do Vinh & Trinh Huu Loc (2010) [28]. The athletes were tested twice, with a 7-day interval between sessions, under identical testing conditions. The correlation coefficient (r) was calculated for each test by comparing the results of Test 1 and Test 2. Tests with $r \geq 0.80$ were considered sufficiently reliable for use. The detailed results are presented in Table 2.

Table 2: Reliability coefficient of professional fitness assessments of the men's volleyball team of Saigon University, Vietnam

No.	Test	1st		2nd		Pearson coefficient	
		Mean	SD	Mean	SD	r	P
1	20 m sprint (s)	3.06	0.24	3.07	0.25	0.88	<0.05
2	12-minute run (m)	2814.9	189.5	2825.6	192.3	0.91	<0.05
3	Standing vertical jump (cm)	299.2	18.6	298.4	18.4	0.84	<0.05
4	Approach vertical jump (cm)	306.25	22.4	305.18	22.56	0.83	<0.05
5	Standing long jump (cm)	248.1	21.6	249.56	21.42	0.92	<0.05
6	Three-step no-run long jump (m)	6.65	0.38	6.63	0.36	0.85	<0.05
7	Shuttle run (s)	22.39	1.12	22.38	1.11	0.87	<0.05
8	Two-hand overhead throw with a 1-kg medicine ball (m)	15.46	1.08	15.52	1.09	0.88	<0.05
9	Sit-and-reach (cm)	2.8	0.92	2.85	0.94	0.81	<0.05

The results presented in Table 2 indicate that all sport-specific fitness tests for male volleyball athletes at Saigon University achieved reliability coefficients greater than 0.80, with $p < 0.05$. Therefore, all selected tests meet the required reliability standards and are appropriate for assessing the sport-specific fitness of the study participants.

2. Development of professional fitness standards for male volleyball athletes of Saigon University.

2.1 Construction of the scoring scale

Based on the results of the initial fitness assessments, the study developed a scoring system to evaluate the sport-specific physical fitness of male volleyball athletes at Saigon University. The scoring scale was constructed using the C-scale method, with individual criteria established for each fitness test. The calculated scoring values are presented in Table 3.

Table 3: Scoring scale for sport-specific fitness tests of male volleyball athletes at Saigon University

Score	20 m sprint (s)	12-minute run (m)	Standing vertical jump (cm)	Approach vertical jump (cm)	Standing long jump (cm)	Three-step no-run long jump (m)	Shuttle run (s)	Two-hand overhead throw with a 1-kg medicine ball (m)	Sit-and-reach (cm)
10	2.86	3112.22	316.72	323.89	270.71	7.48	19.97	18.19	-7.29
9.5	2.88	3082.49	314.97	322.12	268.45	7.40	20.21	17.92	-6.28
9	2.90	3052.76	313.22	320.36	266.19	7.32	20.46	17.65	-5.27
8.5	2.92	3023.03	311.46	318.60	263.93	7.23	20.70	17.37	-4.26
8	2.94	2993.29	309.71	316.83	261.66	7.15	20.94	17.10	-3.25
7.5	2.96	2963.56	307.96	315.07	259.40	7.07	21.18	16.83	-2.24
7	2.98	2933.83	306.21	313.31	257.14	6.98	21.42	16.55	-1.23
6.5	3.00	2904.10	304.46	311.54	254.88	6.90	21.67	16.28	-0.23
6	3.02	2874.36	302.70	309.78	252.62	6.82	21.91	16.01	0.78

5.5	3.04	2844.63	300.95	308.01	250.36	6.73	22.15	15.73	1.79
5	3.06	2814.90	299.20	306.25	248.10	6.65	22.39	15.46	2.80
4.5	3.08	2785.17	297.45	304.49	245.84	6.57	22.64	15.19	3.81
4	3.10	2755.44	295.70	302.72	243.58	6.48	22.88	14.91	4.82
3.5	3.12	2725.70	293.94	300.96	241.32	6.40	23.12	14.64	5.83
3	3.14	2695.97	292.19	299.19	239.06	6.32	23.36	14.37	6.83
2.5	3.16	2666.24	290.44	297.43	236.80	6.23	23.60	14.09	7.84
2	3.18	2636.51	288.69	295.67	234.54	6.15	23.85	13.82	8.85
1.5	3.20	2606.77	286.94	293.90	232.27	6.07	24.09	13.55	9.86
1	3.22	2577.04	285.18	292.14	230.01	5.98	24.33	13.27	10.87
0.5	3.24	2547.31	283.43	290.38	227.75	5.90	24.57	13.00	11.88
0	3.26	2517.58	281.68	288.61	225.49	5.82	24.81	12.73	12.89

2.2 Construction of classification standards

To facilitate the quantification and comparison of results across different tests, the study established a five-level classification system for evaluating sport-specific fitness. Based on the scoring scale in Table 3, each test was converted to a 10-point scale, with the following classification categories:

- **Excellent:** 9 – 10 points
- **Good:** 7 – < 9 points
- **Average:** 5 – < 7 points
- **Weak:** 3 – < 5 points
- **Poor:** 0 – < 3 points

Using these classification criteria and the scoring scale for each test (Table 3), the study developed a comprehensive classification standard for evaluating the overall sport-specific fitness of male volleyball athletes at Saigon University. The maximum score is 90 points due to nine selected tests. The resulting classification thresholds are summarized in Table 4.

Table 4: Composite classification standards for sport-specific fitness of male volleyball athletes at Saigon University

No.	Criteria	Level				
		Good	Fair	Average	Below average	Poor
1	Professional fitness	81 - 90	63 - < 81	45 - < 63	27 - < 45	0 - < 27

Calculation of Composite Scores

To quantify the athletes' overall fitness level, each test score on the 10-point C-scale (Table 3) was summed to generate a composite fitness score. This composite value represents the athlete's overall sport-specific physical fitness profile.

Using test results, the C-scale scoring system (Table 3), and the classification levels (Table 4), the study calculated the composite scores for all 20 male volleyball athletes. The results are presented in Table 5.

Table 5: Classification of sport-specific physical fitness of male volleyball athletes at Saigon University

No.	Athlete	20 m sprint (s)	12-minute run (m)	Standing vertical jump (cm)	Approach vertical jump (cm)	Standing long jump (cm)	Three-step no-run long jump (m)	Shuttle run (s)	Two-hand overhead throw with a 1-kg medicine ball (m)	Sit-and-reach (cm)	Total	Level
1	Athlete 01	3.5	3.5	2.5	5.0	3.0	4.5	5.5	4.0	8.5	40.0	Poor
2	Athlete 02	4.0	2.5	9.0	8.5	10.0	2.5	3.5	6.5	3.5	50.0	Average
3	Athlete 03	7.0	4.0	4.5	4.0	5.5	4.0	9.0	5.0	3.0	46.0	Average
4	Athlete 04	5.5	4.5	5.0	4.0	5.0	2.5	5.5	5.0	5.5	42.5	Poor
5	Athlete 05	7.5	8.5	3.0	2.5	4.5	2.0	7.5	3.0	4.5	43.0	Poor
6	Athlete 06	2.5	8.0	4.0	3.0	5.0	4.0	3.0	3.0	8.0	40.5	Poor
7	Athlete 07	1.0	4.5	2.5	3.0	2.0	6.5	4.5	4.0	5.0	33.0	Poor
8	Athlete 08	4.5	4.5	6.0	5.0	5.0	3.0	3.5	1.0	5.5	38.0	Poor
9	Athlete 09	7.0	8.0	3.5	3.0	5.0	6.0	6.0	6.0	3.0	47.5	Average
10	Athlete 10	5.5	6.5	7.0	6.5	2.5	8.0	4.0	7.0	4.5	51.5	Average
11	Athlete 11	7.5	8.0	4.0	4.0	3.5	4.0	8.5	6.5	2.5	48.5	Average
12	Athlete 12	3.5	3.0	6.5	6.5	5.0	5.5	3.5	4.5	8.0	46.0	Average
13	Athlete 13	7.0	6.5	8.0	9.5	7.5	8.5	5.5	6.5	7.0	66.0	Fair
14	Athlete 14	5.0	3.0	4.5	4.5	2.5	7.0	6.0	3.5	3.5	39.5	Poor
15	Athlete 15	7.0	4.5	4.5	4.5	3.0	6.5	7.5	8.0	3.0	48.5	Poor
16	Athlete 16	6.0	4.5	2.5	4.5	7.0	3.0	4.5	4.5	4.0	40.5	Poor
17	Athlete 17	8.0	8.0	8.5	8.5	6.0	7.0	6.5	9.5	5.5	67.5	Fair
18	Athlete 18	3.5	2.5	4.5	4.0	6.5	3.5	1.5	4.0	3.5	33.5	Poor
19	Athlete 19	4.0	4.0	3.5	4.0	7.0	6.0	4.5	4.0	9.0	46.0	Average
20	Athlete 20	5.5	3.0	5.5	6.0	4.0	6.5	3.5	6.0	5.0	45.0	Average

The data in Table 5 shows the following results:

- **Goof:** 0 athletes (0%)
- **Fair:** 2 athletes (10%)
- **Average:** 8 athletes (40%)
- **Below average:** 10 athletes (50%)
- **Poor:** 0 athletes (0%)

Conclusion

The study identified nine tests for evaluating the specialized physical fitness of male volleyball athletes from the Saigon

University team, Vietnam. These tests include: 20 m sprint (s), 12-minute run (m), standing vertical jump (cm), approach vertical jump (cm), standing long jump (cm), triple jump without approach (m), agility shuttle run (s), two-handed chest throw of a 1-kg medicine ball (m), and the sit-and-reach test (cm).

Based on these tests, the study established standardized criteria for assessing specialized physical fitness, including the C-scale scoring system and the overall classification categories. According to the results, 10% of the athletes were classified as "Fair," 40% as "Average," and 50% as "Below average."

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