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CURRENT STATUS OF SPECIALIZED PHYSICAL FITNESS IN MALE VOLLEYBALL ATHLETES OF THE VINH LONG UNIVERSITY OF TECHNOLOGY EDUCATION, VIETNAM

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Abstract:
Volleyball is a highly team-oriented sport and demands a high level of professional physical fitness. Hence, this study aims to identify appropriate tests to provide insights into the current status of specialized physical fitness in male athletes of the volleyball team at Vinh Long University of Technology Education, Vietnam. To address the aim, the research employs methods including document synthesis, survey, pedagogical

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testing, and statistical analysis. The study subjects included 20 male volleyball athletes from the Vinh Long University of Technology Education's team and 24 experts with experience in volleyball coaching. The finding leads to the identification of 12 specialized physical fitness tests suitable for evaluating the subjects.

Keywords: specialized physical fitness, male athletes, volleyball, Vinh Long University of Technology Education, Vietnam

1. Introduction

Volleyball was invented in 1895 by American William G. Morgan. Later, it was developed into beach volleyball and has gained popularity, especially in countries with long coastlines. In these places, beach volleyball attracts large numbers of participants [1], [2]. Volleyball is a sport played between two teams on opposite sides of a net. The game takes place with swift movements, with very short contact time with the ball, requiring players to be agile and highly responsive. Success also depends on solid technical skills, strategic thinking, and the ability to make quick decisions under pressure. Athletes are required to demonstrate strong teamwork, tactical awareness, and psychological readiness. Because of these demands, it is vital for volleyball players to be able to maintain a high level of physical fitness throughout the match [3].

A volleyball match is played by two teams of six players. Each team can touch the ball up to three times before hitting it over the net. Matches are played to the best of five sets. The first four sets are played to 25 points, and if needed, the fifth set is played to 15 points [4]. Hence, volleyball is often seen as a dynamic, non-cyclical sport. The game constantly shifts between offensive and defensive phases. Techniques are used in combination and vary depending on the situation, forming continuous sequences such as serve-receive, spike-block, or spike-backcourt defense. One unique feature of volleyball is the player rotation rule. In particular, players move to new positions in a clockwise direction throughout the match, which means all players must perform in both the front and back courts. Back-row players are not allowed to spike or block in front of the 3-meter line. This rule requires players to develop well-rounded skills in both attacking and defending, and their performance directly influences the success of the entire team [5].

Volleyball matches have no time limit, and the game is played at a fast pace with a direct scoring system. Matches are often intense, and at higher levels of competition, the point difference between winning and losing is usually only 4-5 points. Therefore, to meet the demands of competition, volleyball players not only need a high level of physical fitness but also strong mental focus, willpower, and sustained effort throughout the game.

The physical demands of volleyball are significant. Players constantly track the speed and direction of the ball, be aware of teammates and opponents, move quickly, jump explosively, and dive or fall repeatedly within a small court space. According to Kraemer and Hakkinen (2012) [6], Kibler (1990) [7], and Sheppard, Gabbett, Claudio, and Newton (2012) [8], volleyball performance depends largely on upper and lower body strength, which supports spiking, blocking, jumping, agility, and rapid directional changes. Because each position in volleyball involves different movements, physical demands vary depending on the role, whether it is outside hitter, middle blocker, setter, or libero.

On average, a player performs 21 to 36 complex, high-intensity movements in a single match. Jumping accounts for 50-60% of these actions, while fast directional changes make up 27-30%. Diving and falling cover 12-16%. Players also carry out 100-120 spikes and blocks per game. For example, a middle blocker may perform over 300 explosive jumps in one match, and a setter may contact the ball 100-120 times.

Physical fitness is the foundation for executing technical and tactical elements during gameplay. As a result, improving fitness levels to meet competitive demands has become one of the key trends in modern volleyball training [9], [10], [11], which is also a motivation for the researchers when conducting the research regarding*:* "Current status of specialized physical fitness in male volleyball athletes of the Vinh Long University of Technology Education, Vietnam".

2. Methodology

2.1 Research Methods

2.1.1 Document Synthesis

This method was used to collect and synthesize information from various domestic and international sources. The goal was to consolidate relevant knowledge related to the research topic, establish a theoretical foundation, develop scientific hypotheses, and identify research objectives. This method also served to verify the results of the study.

2.1.2 Survey Method

This method aimed to gather expert opinions from experienced professionals and volleyball coaches. Their responses were used to select appropriate tests for evaluating the specialized physical fitness of male volleyball athletes at Vinh Long University of Technology Education, Vietnam.

2.1.3 Pedagogical Testing Method

This method was employed to apply the selected tests in measuring the specialized physical fitness of the male volleyball athletes at Vinh Long University of Technology Education, Vietnam.

2.1.4 Statistical Analysis Method

The purpose of this method was to process and analyze the data collected throughout the research using statistical formulas and the support of SPSS version 24.0.

2.2 Participants

2.2.1 Research Subjects

20 male volleyball athletes from the university team at Vinh Long University of Technology Education, Vietnam.

2.2.2 Survey Participants

24 experienced experts and lecturers in volleyball from various universities.

3. Results and Discussion

To assess the current status of specialized physical fitness among male volleyball athletes of Vinh Long University of Technology Education, Vietnam, two main stages were conducted as follows:

- **Step 1:** Select specialized physical fitness tests
- **Step 2:** Assess the current status of specialized physical fitness among these athletes with the selected tests.

3.1 Select Specialized Physical Fitness Tests for Male Volleyball Athletes at Vinh Long University of Technology Education, Vietnam

To select specialized fitness assessment tests, the researchers implemented two steps as follows:

- **Step 1:** Collect volleyball physical assessment tests from the papers of domestic and foreign authors: Bui Huy Cham (1988) [12], Iu. N. Klesep - A. G. Airianx (1997) [13], Nguyen Thanh Lam (1998) [14], Nguyen Ngoc Cu et al. (1998) [15], Nguyen Toan - Pham Danh Thuan (2000) [16], Nguyen Huu Hung (2001) [17], Nguyen The Truyen, Nguyen Kim Minh, Tran Quoc Tuan (2002) [18], Nguyen Van Hai (2006) [19], Nguyen Huu Tin (2007) [20], Pham Van Han (2014) [21], Nguyen Van Truong (2014) [22], Le Nguyet Nga et al (2016) [23], Tran Tri Hai (2016) [24], Nguyen Thi Kieu Thu (2017) [25].

The selected tests needed to meet two main criteria: (1) being measurable, and (2) being feasible to evaluate and compare at the individual level, regional level, and across different countries [26]. Based on the practical conditions of the study, the researchers also added three additional requirements for selecting the tests: (1) the tests must be drawn from previously published studies in reputable national and international sources and demonstrate reliability; (2) the necessary equipment and testing tools must be available for the assessments; and (3) the tests must be appropriate for the physical

characteristics and health conditions of the research subjects. Following the criteria, the research initially identified 21 tests.

- **Step 2:** Based on the results of the above synthesis, a questionnaire was developed and administered in two rounds, spaced 15 days apart. Both surveys used the same set of tests, the same group of participants, and the same method of evaluation and response. The respondents included 24 experts and lecturers with experience in volleyball coaching and physical fitness assessment. The results are presented in Table 1.

Table 1: Survey results in the selection of the professional fitness assessment test for male volleyball athletes of Vinh Long University of Technology Education, Vietnam

No.	Test	1st		2nd		Total (%)
		Total	%	Total	%	
I	**Speed tests**					
1	20m sprint (s)	52	72.22	53	73.61	72.92
2	30m sprint (s)	66	91.67	67	93.06	**92.37**
3	4 x 10m shuttle run (s)	57	79.17	56	77.78	**78.48**
4	9-3-6-3-9 agility run (s)	61	84.72	61	84.72	**84.72**
5	20 alternating split jumps (s)	50	69.44	53	73.61	71.53
II	**Strength tests**					
6	Standing broad jump (cm)	59	81.94	58	80.56	**81.25**
7	Vertical jump - static (cm)	70	97.22	770	97.22	**97.22**
8	Vertical jump - with approach (cm)	72	100	72	100	**100**
9	Handgrip strength - dominant hand (kg)	56	77.78	57	79.17	**78.48**
10	Barbell squats - 30 repetitions (reps)	52	72.22	51	70.83	71.53
11	Repeated depth jumps in 30 seconds (reps)	51	70.83	50	69.44	70.14
12	Sit-ups in 30 seconds (reps)	64	88.89	63	87.50	**88.20**
13	Overhead medicine ball throw (two hands, overhead, forward) (m)	61	84.72	61	84.72	**84.72**
III	**Endurance tests**					
14	Continuous spiking from position 4 in one minute (reps)	53	73.61	52	72.22	72.92
15	1500m run (minutes)	69	95.83	70	97.22	**96.53**
16	Cooper test (m)	51	70.83	49	68.06	69.44
IV	**Agility tests**					
17	Side splits (cm)	44	61.11	46	63.89	62.50
18	Front splits (cm)	53	73.61	54	75.00	74.31
19	Sit and reach (cm)	57	79.17	57	79.17	**79.17**
V	**Coordination tests**					
20	92m Illinois agility run (s)	66	91.67	65	90.28	**90.98**
21	Jump rope in one minute (reps)	52	72.22	52	72.22	72.22

Based on the survey results, the study selected tests that achieved a total score of over 75% in both rounds. According to this principle, the study identified 12 tests to evaluate the specialized physical fitness of male volleyball athletes at Vinh Long University of Technology Education, Vietnam, as follows:

- **Speed tests:** 20m sprint (s), 4 x 10m shuttle run (s), 9-3-6-3-9 agility run (s).

- **Strength tests:** Standing broad jump (cm), Vertical jump - static (cm), Vertical jump - with approach (cm), Handgrip strength - dominant hand (kg), Sit-ups in 30 seconds (reps), Overhead medicine ball throw (two hands, overhead, forward) (m).
- **Endurance test:** 1500m run (minutes).
- A**gility test:** Sit and reach (cm).
- **Coordination test:** 92m Illinois agility run (s).
  Bước 3: Kiểm tra độ tin cậy của các test.

- **Step 3: Reliability Testing of the Selected Tests**

The reliability of the selected tests was determined using the Pre-Test method by Le Van Lam and Pham Xuan Thanh (2007) [26], Nghiep Chi (2004) [27], and Do Vinh and Trinh Huu Loc (2010) [28]. The research subjects then underwent two testing sessions, spaced five days apart, under the same testing conditions. The correlation coefficient (r) between the two test sessions was then calculated for each test. The results are presented in Table 2.

Table 2: Reliability coefficients of the specialized physical fitness tests for the male volleyball team at the Vinh Long University of Technology Education, Vietnam

No.	Test	1st		2nd		Reliability coefficients (Pearson)	
		Mean	SD	Mean	SD	r	Sig
1	30m sprint (s)	4.42	0.09	4.40	0.05	0.95	0.01
2	4 x 10m shuttle run (s)	12.26	0.22	12.13	0.48	0.89	0.01
3	9-3-6-3-9 agility run (s)	8.87	0.48	8.96	0.41	0.91	0.01
4	Standing broad jump (cm)	246.73	7.71	247.20	7.19	0.92	0.01
5	Vertical jump - static (cm)	69.87	2.61	70.53	2.64	0.86	0.01
6	Vertical jump - with approach (cm)	74.33	3.72	74.33	3.94	0.98	0.01
7	Handgrip strength - dominant hand (kg)	36.73	4.95	37.27	4.79	0.94	0.01
8	Sit-ups in 30 seconds (reps)	17.80	1.15	18.27	0.88	0.90	0.01
9	Overhead medicine ball throw (two hands, overhead, forward) (m)	14.22	0.84	14.54	0.66	0.84	0.01
10	1500m run (minutes)	5.50	0.09	5.50	0.07	0.99	0.01
11	Sit and reach (cm)	18.33	1.69	17.69	1.74	0.89	0.01
12	92m Illinois agility run (s)	25.21	1.34	25.25	0.83	0.88	0.01

The data in Table 2 show that all the selected tests for evaluating the specialized physical fitness of male volleyball athletes at Vinh Long University of Technology Education, Vietnam have correlation coefficients (r) greater than 0.80 and significance levels of p = 0.01. Therefore, all these tests are considered reliable for assessing the specialized physical fitness of the study participants.

3.2. Assessment of the Specialized Physical Fitness Status of Male Volleyball Athletes at the Vinh Long University of Technology Education, Vietnam

To assess the current status of specialized physical fitness, the study administered the selected tests to the participants. The results, including mean values, standard deviations, coefficients of variation (CV), and relative standard errors of the means, are presented in Table 3.

Table 3: Summary of performance results in the specialized physical fitness tests for male volleyball athletes at the Vinh Long University of Technology Education, Vietnam

No.	Test	Results			
		Mean	SD	*Cv%*	ε
1	30m sprint (s)	4.42	0.09	1.95	0.01
2	4 x 10m shuttle run (s)	12.26	0.22	1.76	0.01
3	9-3-6-3-9 agility run (s)	8.87	0.48	5.39	0.03
4	Standing broad jump (cm)	246.73	7.71	3.13	0.02
5	Vertical jump - static (cm)	69.87	2.61	3.14	0.02
6	Vertical jump - with approach (cm)	74.33	3.72	5.00	0.03
7	Handgrip strength - dominant hand (kg)	36.73	3.65	9.94	0.05
8	Sit-ups in 30 seconds (reps)	17.80	1.15	6.44	0.04
9	Overhead medicine ball throw (two hands, overhead, forward) (m)	14.22	0.84	5.88	0.03
10	1500m run (minutes)	5.50	0.09	1.69	0.01
11	Sit and reach (cm)	18.33	1.69	9.24	0.05
12	92m Illinois agility run (s)	25.21	1.34	5.32	0.03

The data in Table 3 indicate that the coefficient of variation (C_V), which reflects variability among individuals within the sample population, is below 10% for all the test indicators. This demonstrates a high level of homogeneity (i.e., low dispersion) across participants. These indicators tend to show consistent results because they are less influenced by external environmental factors such as nutrition, lifestyle, and working conditions. Moreover, they are measured using ratio scales with an absolute zero point to demonstrate high precision.

Although a few indicators show relatively higher variation among individuals, all sample mean values meet the required level of representativeness ($\varepsilon \leq 0.05$). The above analysis confirms that the mean values of most tests exhibit high consistency and are sufficiently representative of the overall sample. Since $\varepsilon \leq 0.05$, the sample used in this study is considered sufficiently reliable, consistent, and representative, providing a valid foundation for subsequent research.

4. Conclusion

The study has selected 12 tests to measure the specialized physical fitness of male volleyball players at Vinh Long University of Technology Education, Vietnam. These tests include 20m sprint (s), 4 x 10m shuttle run (s), 9-3-6-3-9 agility run (s), standing

broad jump (cm), vertical jump - static (cm), vertical jump - with approach (cm), handgrip strength - dominant hand (kg), sit-ups in 30 seconds (reps), overhead medicine ball throw (two hands, overhead, forward) (m), 1500m run (minutes), sit and reach (cm), and 92m Illinois agility run (s).

The evaluation has shown that the specialized physical fitness of the male volleyball athletes at Vinh Long University of Technology Education demonstrates a high level of homogeneity and is representative of the overall sample population.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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