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CURRENT STATUS OF PHYSICAL FITNESS OF MALE ATHLETES IN THE 100M RUNNING TEAM AT TRÀ VINH UNIVERSITY, VIETNAM

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Abstract:
Athletics is often referred to as the "queen of sports," and the 100-meter sprint is one of its most popular and closely followed events. Elite 100m sprinters require not only explosive speed and speed endurance but also technical proficiency and optimal body morphology. This study aims to provide insights into the physical fitness status of male athletes on the 100m sprint team at Tra Vinh University, Vietnam. The research employed methods including literature review and analysis, interviews, pedagogical testing, and statistical mathematics to address the study objectives. The research subjects included eight male sprinters from the university's 100m team. The study identified 13 tests that effectively evaluate the physical fitness of these athletes. Results indicate that most of the selected tests exhibit high consistency and are representative of the sample population.

Keywords: physical fitness, 100m sprint, male athletes, Tra Vinh University, Vietnam

1. Introduction

Athletics encompasses a variety of events, including walking, running, jumping, throwing, and combined disciplines. It is the sport with the most medal events in both national and international competitions. Vietnamese athletics has achieved notable success in international tournaments such as the Asian Games (Asiad) and the Southeast Asian Games (SEA Games). Among these events, short-distance sprinting, particularly the 100-meter dash, is not only one of the most captivating but also serves as a key discipline in developing speed for athletes across multiple sports. As a result, sprinting is of great interest to scientists, coaches, and physical education professionals.

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In sports where performance outcomes are highly dependent on specific physical qualities, such qualities become decisive. For events emphasizing speed and endurance, physiological function plays a key role; for strength-based events, body morphology is often the determining factor, while endurance-based sports rely heavily on tactical capability. The 100m sprint, a high-speed event, requires superior physical fitness and physiological capacity, along with technical skill and favorable morphology—particularly as body morphology contributes significantly to speed-strength, one of the key elements in sprinting performance.

Physical qualities are shaped by the nature of the sport and are determined by the structural and functional state of various body systems. The process of physical conditioning is essentially the development and optimization of these functional systems that support specific muscular activities. For 100m sprint training, athletes must develop both general and sport-specific physical attributes such as speed, strength, endurance, coordination, agility, and flexibility—these capabilities are developed through purposeful, targeted training.

Many studies have concluded that sprint performance is determined by speed, speed-strength, and speed endurance. According to Duong Nghiep Chi [4], elite sprinters (those who can complete 100m in 10.4 seconds or less) can be assessed using indicators such as 30m sprint, 60m sprint with crouch start, flying 30m sprint, and 150m sprint. However, the most informative metric for 100m performance is the time for the final 20 meters (from 80m to 100m), as top sprinters must focus on minimizing this segment to improve overall times. Speed, defined as the ability to perform actions in a short time frame, reflects both motor reaction time and movement frequency—functions closely linked to the central nervous system [5], [6].

Sprint speed depends on how quickly an athlete responds to the starting signal, activates muscular contractions, and sustains high-frequency movements throughout the race. It involves all three types of speed: reaction time, single-movement speed, and movement frequency. Speed development relies on rapid excitation-inhibition processes in the cerebral cortex, reducing motor reaction latency and improving neuromuscular coordination. Additional influencing factors include muscle fiber composition (fast-twitch vs slow-twitch) and contraction velocity. To develop sprint speed, athletes should perform high-speed strength drills, repetitive reaction drills, maximum-speed sprints, or downhill running [7], [8]. Sprinting speed is also reflected in ground contact time and stride frequency.

For instance, elite 100m sprinters achieve ground contact times of 0.08–0.09 seconds (compared to the average of 0.15–0.17 seconds), and optimal stride frequencies range from 4.5 to 4.8 steps per second (average being 3.8–4.0). Vietnamese athletes such as Le Ngoc Phuong (4.21), Vu Thi Huong (4.34), and Nguyen Van Huynh (4.15) have demonstrated impressive stride rates. Comparative data from national and international top sprinters (as shown in Appendix 15) further highlight the importance of sprint speed. Given the significance of these factors, this study was conducted under the title: *The Current Status of Physical Fitness Among Male 100m Sprinters of Tra Vinh University, Vietnam.*

The primary goal is to identify relevant testing methods for assessing sport-specific physical fitness, thereby contributing to improved sprinting capacity, speed, strength, and endurance for male sprinters at Tra Vinh University. The findings will serve as a foundation for designing appropriate training programs, helping the team improve performance and achieve higher results in future competitions.

2. Methodology

2.1 Research Methods

2.1.1 Method of Analyzing and Synthesizing Documents

To refer to documents is a method of collecting information through reading, recording, analyzing, synthesizing documents related to the topic. This method is widely used in scientific research works of a theoretical and pedagogical nature. This method aims to synthesize documents, systematize knowledge related to the research topic, form a theoretical basis, build scientific hypotheses, determine research objectives and verify results during the implementation process.

2.1.2 Interview Method

This method was employed to select appropriate physical fitness tests for male sprinters of the 100m team at Tra Vinh University. A structured questionnaire was used, allowing experts to classify each test based on its relevance ("Highly applicable", "Potentially applicable", "Not applicable"). The respondents included coaches, lecturers, and sports administrators with experience in 100m sprint training.

2.1.3 Pedagogical Testing

This method involves using tests and assessments to gather data on various indicators of motor ability. It was utilized to evaluate the physical fitness levels of male 100m sprinters at Tra Vinh University using the selected test battery.

2.1.4 Statistical Analysis

Mathematical statistics were applied to summarize and process data obtained from the interviews and physical tests. The software SPSS was used to assist in statistical analysis and interpretation of the research results.

2.2 Research Subjects

2.2.1 Testing Subjects

Eight male athletes from the Tra Vinh University 100m sprint team, all of whom followed the experimental training program.

2.2.2 Interview Participants

20 individuals, including experts, coaches, lecturers, and sports administrators with experience in sprint training.

3. Results and Discussion

To assess the physical fitness status of male athletes in the 100m running team at Trà Vinh University, the study will proceed with the following steps:

- **Step 1:** Identify the fitness tests for male athletes in the 100m running team at Trà Vinh University.
- **Step 2:** Evaluate the current status of physical fitness for male athletes in the 100m running team at Trà Vinh University.
- **Step 3:** Reliability Assessment of Fitness Tests for Male Athletes in the 100m Running Team at Trà Vinh University.

3.1. Identification of Physical Fitness Tests for Male 100m Sprinters of Tra Vinh University

To assess the physical fitness of male athletes on the 100m sprint team at Tra Vinh University, the research followed a three-step process:

- **Step 1: Compilation of Relevant Physical Fitness Tests**

Tests were gathered from national and international sources, including published studies and sports science literature by authors such as Nguyen The Truyen, Nguyen Kim Minh, Tran Quoc Tuan (2002) [12], Le Nguyet Nga (2018) [13], Duong Nghiep Chi et al. (2000) [14], and George Dintiman, Bob Ward, Tom Tellez (1998) [15], among others. Based on the objectives of the study, the characteristics of the 100m sprint event, feasibility conditions, and expert consultations, non-relevant tests were eliminated. Ultimately, 34 physical fitness tests were selected - 17 for general physical fitness and 17 for sprint-specific physical fitness.

- **Step 2: Interview and Select Physical Fitness Tests for Male Athletes of the 100m Running Team of Tra Vinh University**

The study conducted two interviews 2 weeks apart, with the same assessment method, the same test system and the same subjects. The results of both interviews on opinions of physical fitness tests for male athletes of the 100m running team of Tra Vinh University are presented in Table 3.1 as follows:

Table 3.1: Interview Results to Select Physical Fitness Tests for Male Athletes of the 100m Running Team of Tra Vinh University

No.	Test	Round 1 n = 20		Round 2 n =20		χ^2	P
		$\sum diem$	Percentage (%)	$\sum diem$	Percentage (%)		
General Fitness							
1	Simple Reaction Time (ms)	16	80	15	75	0.14	> 0.05
2	200m Run (s)	18	90	19	95	0.36	> 0.05
3	400m Run (s)	17	85	18	90	0.23	> 0.05
4	800m Run (s)	18	90	17	85	0.23	> 0.05
5	1500m Run (s)	13	65	12	60	0.11	> 0.05

6	High Knee Raises in Place for 20 Seconds (reps)	17	85	18	90	0.23	> 0.05
7	Flexibility Test (cm)	12	60	10	50	0.40	> 0.05
8	Back Strength (kg)	15	75	16	80	0.23	> 0.05
9	Supine Sit-Ups for 30 Seconds (reps)	18	90	19	95	0.36	> 0.05
10	Prone Back Extensions for 30 Seconds (reps)	13	65	12	60	0.11	> 0.05
11	Fast Rope Jumping for 30 Seconds (reps)	20	100	20	100	0.00	> 0.05
12	Rope Jumping for 1 Minute (reps)	15	75	16	80	0.14	> 0.05
13	Single-Leg Hopping (Left and Right) for 20m (s)	16	80	14	70	0.53	> 0.05
14	Hexagonal Jumping (s)	16	80	16	80	0.00	> 0.05
15	Lateral and Longitudinal Splits (cm)	13	65	12	60	0.11	> 0.05
16	Overhead Medicine Ball Throw (cm)	16	80	15	75	0.14	> 0.05
17	30kg Barbell Carry with Ankle Jumps (reps/30s)	16	75	15	75	0.14	> 0.05
Specialized Fitness							
18	Simple Reaction Time (ms)	14	70	14	70	0.00	> 0.05
19	Arm Swings in Place for 10 Seconds (reps)	16	80	14	70	0.53	> 0.05
20	Low Start, Sprint for 10m (s)	16	80	15	75	0.14	> 0.05
21	Stationary Run for 15 Seconds (reps)	18	90	19	95	0.36	> 0.05
22	30m High-Speed Run (s)	20	100	20	100	0.00	> 0.05
23	30m High-Start Run (s)	18	90	17	85	0.23	> 0.05
24	60m High-Start Run (s)	17	85	18	90	0.23	> 0.05
25	100m High-Start Run (s)	20	100	20	100	0.00	> 0.05
26	4 x 10m Run (s)	12	60	11	55	0.10	> 0.05
27	Speed Variation Run for 40-60m (s)	16	80	15	75	0.14	> 0.05
28	5 Runs of 30m (s)	15	75	13	65	0.48	> 0.05
29	Speed Variation Run for 40-60m (s)	15	75	14	70	0.13	> 0.05
30	Zigzag Run (s)	11	55	13	65	0.42	> 0.05
31	Standing High Jump (cm)	16	80	14	70	0.53	> 0.05
32	Standing Long Jump (cm)	18	90	19	95	0.36	> 0.05
33	Three-Step Long Jump Without Running (cm)	19	95	20	100	1.03	> 0.05
34	Ten-Step Long Jump (cm)	11	55	13	65	0.42	> 0.05

The research results from Table 3.1 indicate that all results from the two interview sessions of the tests show a value of < 3.84 at the significance level P > 0.05. Therefore, the difference between the two observed values is not statistically significant at the significance level P > 0.05. Thus, the results from the two interviews with experts, coaches, and specialized lecturers demonstrate a high level of consensus in their responses.

Based on the interview results, the study selected tests with a total score >80% of the total score in both interviews:

a) **General Fitness (6 tests):** 200m run (s), 400m run (s), 800m run (s), High knee raises in place for 20 seconds (reps), Supine sit-ups for 30 seconds (reps), Fast rope jumping for 30 seconds (reps)
b) **Specialized Fitness (7 tests):** Stationary run for 15 seconds (reps), 30m sprint (s), 30m high-start run (s), 60m high-start run (s), 100m high-start run (s), Standing long jump (cm), Three-step long jump without running (cm).

- **Step 3: Reliability Assessment of Fitness Tests for Male Athletes in the 100m Running Team at Trà Vinh University**

According to Trinh Huu Loc and Đo Vinh (2010) [24], Duong Nghiep Chi [25], Le Van Lam, and Pham Xuan Thanh (2007) [26]: "*The retest method is used to evaluate the degree of similarity or correlation between two repetitions of the test. The first instance (test) and the second instance (retest) are conducted under the same conditions, with the same subjects; the rest period between the two performances should be sufficient for complete recovery... The appropriate rest period typically ranges from 1 to 7 days, after which the two sets of results (test and retest) are compared using Pearson correlation analysis*."

To determine the reliability of the fitness tests for specialized and general fitness of male athletes in the 100m running team at Trà Vinh University, the study conducted tests on the subjects twice within 7 days, ensuring that the testing conditions remained the same between the two instances. The results of the reliability assessment of the tests are presented in Table 3.2.

Table 3.2: Results of the Reliability Assessment of Fitness Tests for Male Athletes in the 100m Running Team at Trà Vinh University

No.	Test	Initial (n=8)		Retest (n=8)		r	P
		$\overline{X}$	S_x	$\overline{X}$	S_x		
General Fitness							
1	200m run (s)	26.56	0.90	26.54	0.89	0.98	<0.05
2	400m run (s)	54.60	1.86	54.58	1.87	0.98	<0.05
3	800m run (s)	142.82	3.28	142.73	3.21	0.97	<0.05
4	High knee raises in place for 20" (reps)	37.63	2.26	38.88	2.47	0.96	<0.05
5	Supine sit-ups for 30" (reps)	24.25	1.83	24.88	2.59	0.94	<0.05
6	Fast rope jumping for 30" (reps)	80.75	4.33	81.75	4.80	0.98	<0.05
Specialized Fitness							
7	Stationary run for 15 seconds (reps)	52.00	2.88	52.75	3.58	0.93	<0.05

8	30m sprint (s)	4.17	0.15	4.16	0.15	0.99	<0.05
9	30m high-start run (s)	4.41	0.18	4.38	0.16	0.94	<0.05
10	60m high-start run (s)	8.60	0.32	8.56	0.31	0.98	<0.05
11	100m high-start run (s)	12.92	0.50	12.87	0.50	0.98	<0.05
12	Standing long jump (cm)	241.00	11.74	241.88	13.58	0.99	<0.05
13	Three-step long jump without running (cm)	717.25	55.08	719.00	56.20	0.98	<0.05

If the correlation coefficient $r \geq 0.8$ and $P < 0.05$, the test is reliable. If the correlation coefficient $r < 0.8$ and $P > 0.05$, the test is not reliable.

The results in Table 3.2 show that the reliability coefficients between the two testing sessions for the fitness tests of male athletes in the 100m running team at Trà Vinh University range from 0.93 to 0.99 (with $P < 0.05$). Thus, the tests assessing the fitness of male athletes in the 100m running team at Trà Vinh University have high to very high reliability. This indicates that all 13 tests are sufficiently reliable and feasible for evaluating the fitness of these athletes.

Through the research steps, 13 fitness tests for male athletes in the 100m running team at Trà Vinh University have been selected as follows:

- **General Fitness (6 tests):** 200m run (s), 400m run (s), 800m run (s), High knee raises in place for 20 seconds (reps), Supine sit-ups for 30 seconds (reps), Fast rope jumping for 30 seconds (reps)
- **Specialized Fitness (7 tests):** Stationary run for 15 seconds (reps), 30m sprint (s), 30m high-start run (s), 60m high-start run (s), 100m high-start run (s), Standing long jump (cm), Three-step long jump without running (cm)

3.2. Assessment of the Physical Fitness Status of Male Athletes in the 100m Running Team at Trà Vinh University

To assess the current physical fitness status of the research subjects, the study conducted tests on the fitness tests identified for male athletes in the 100m running team at Trà Vinh University. The results of the tests and the calculated values of the mean, standard deviation, coefficient of variation, and relative error ($\overline{X}$, Sx, CV, ε) are presented in Table 3.3 as follows:

Table 3.3: Physical Fitness Status of Male Athletes in the 100m Running Team at Trà Vinh University

No.	Test	$\overline{X}$	S_x	C_v	ε
General Fitness					
1	200m run (s)	26.56	0.90	3.40	0,03
2	400m run (s)	54.60	1.86	3.41	0,03
3	800m run (s)	142.82	3.28	2.29	0,02
4	High knee raises in place for 20″ (reps)	37.63	2.26	6.02	0,05
5	Supine sit-ups for 30″ (reps)	24.25	1.83	7.56	0,06
6	Fast rope jumping for 30″ (reps)	80.75	4.33	5.37	0,04
Specialized Fitness					
7	Stationary run for 15 seconds (reps)	52.00	2.88	5.54	0.05

8	30m sprint (s)	4.17	0.15	3.55	0.03
9	30m high-start run (s)	4.41	0.18	4.09	0.03
10	60m high-start run (s)	8.60	0.32	3.75	0.03
11	100m high-start run (s)	12.92	0.50	3.87	0.03
12	Standing long jump (cm)	241.00	11.74	4.87	0.04
13	Three-step long jump without running (cm)	717.25	55.08	7.68	0.06

Table 3.3 shows:

a. General Fitness Assessment Tests:

1) **200m Run (s)** Mean value = 26.56 seconds, Standard deviation (Sx) = 0.90, Coefficient of variation (Cv) = 3.40 (< 10% - high homogeneity), Relative error (ε) = 0.03 (ε < 0.05). The mean value of the 200m run test is representative of the sample population.
2) **400m Run (s)** Mean value = 54.60 seconds, Standard deviation (Sx) = 1.86, Coefficient of variation (Cv) = 3.41 (< 10% - high homogeneity), Relative error (ε) = 0.03 (ε < 0.05). The mean value of the 400m run test is representative of the sample population.
3) **800m Run (s)** Mean value = 142.82 seconds, Standard deviation (Sx) = 3.28, Coefficient of variation (Cv) = 2.29 (< 10% - high homogeneity), Relative error (ε) = 0.02 (ε < 0.05). The mean value of the 800m run test is representative of the sample population.
4) **High Knee Raises in Place for 20 Seconds (reps)** Mean value = 37.63 reps, Standard deviation (Sx) = 2.26, Coefficient of variation (Cv) = 6.02 (< 10% - high homogeneity), Relative error (ε) = 0.05 (ε ≤ 0.05). The mean value of the high knee raises test is representative of the sample population.
5) **Supine Sit-Ups for 30 Seconds (reps)** Mean value = 24.25 reps, Standard deviation (Sx) = 1.83, Coefficient of variation (Cv) = 7.56 (< 10% - high homogeneity), Relative error (ε) = 0.06 (ε > 0.05). The mean value of the supine sit-ups test is not representative of the sample population.
6) **Fast Rope Jumping for 30 Seconds (reps)** Mean value = 80.75 reps, Standard deviation (Sx) = 4.33, Coefficient of variation (Cv) = 5.37 (< 10% - high homogeneity), Relative error (ε) = 0.04 (ε < 0.05). The mean value of the fast rope jumping test is representative of the sample population.

b. Specialized Fitness Assessment Tests:

7) **Stationary Run for 15 Seconds (reps)** Mean value = 52.00 reps, Standard deviation (Sx) = 2.88, Coefficient of variation (Cv) = 5.54 (< 10% - high homogeneity), Relative error (ε) = 0.05 (ε ≤ 0.05). The mean value of the stationary run test for 15 seconds is representative of the sample population.
8) **30m High-Speed Run (s)** Mean value = 4.17 seconds, Standard deviation (Sx) = 0.15, Coefficient of variation (Cv) = 3.55 (< 10% - high homogeneity), Relative error (ε) = 0.03 (ε < 0.05). The mean value of the 30m high-speed run test is representative of the sample population.

9) **30m High-Start Run (s)** Mean value = 4.41 seconds, Standard deviation (Sx) = 0.18, Coefficient of variation (Cv) = 4.09 (< 10% - high homogeneity), Relative error (ε) = 0.03 (ε < 0.05). The mean value of the 30m high-start run test is representative of the sample population.
10) **60m High-Start Run (s)** Mean value = 8.60 seconds, Standard deviation (Sx) = 0.32, Coefficient of variation (Cv) = 3.75 (< 10% - high homogeneity), Relative error (ε) = 0.03 (ε < 0.05). The mean value of the 60m high-start run test is representative of the sample population.
11) **100m High-Start Run (s)**
12) Mean value = 12.92 seconds, Standard deviation (Sx) = 0.50, Coefficient of variation (Cv) = 3.87 (< 10% - high homogeneity), Relative error (ε) = 0.03 (ε < 0.05). The mean value of the 100m high-start run test is representative of the sample population.
13) **Standing Long Jump (cm)**
14) Mean value = 241.00 cm, Standard deviation (Sx) = 11.74, Coefficient of variation (Cv) = 4.87 (< 10% - high homogeneity), Relative error (ε) = 0.04 (ε < 0.05). The mean value of the standing long jump test is representative of the sample population.
15) **Three-Step Long Jump Without Running (cm)** Mean value = 717.25 cm, Standard deviation (Sx) = 55.08, Coefficient of variation (Cv) = 7.68 (< 10% - average homogeneity), Relative error (ε) = 0.06 (ε > 0.05). The mean value of the three-step long jump test without running is not representative of the sample population.

Through the synthesis of documents, interviews, and reliability testing of the research tests, 13 tests have been identified to assess the fitness of male athletes in the 100m running team at Tra Vinh University. These tests are deemed suitable for the conditions and characteristics of the athletes. The fitness tests are diverse and delve into the specifics of the 100m running event, with a focus on speed as the primary component. However, strength and speed endurance are also highly valued by specialists.

The analysis shows that the mean values of most fitness assessment tests for male athletes in the 100m running team at Trà Vinh University exhibit high homogeneity and representativeness for the sample population, as ε ≤ 0.05. However, the two tests—supine sit-ups and three-step long jump without running—show average homogeneity, and the relative error does not represent the population. These two tests are highly regarded by experts, coaches, lecturers, and managers for their reliability; thus, they have been selected for further evaluation in this study.

4. Conclusion

A total of 13 fitness assessment tests for male athletes in the 100m running team at Trà Vinh University have been identified:

- **General Fitness (6 tests):** 200m Run (s), 400m Run (s), 800m Run (s), High Knee Raises in Place for 20 Seconds (reps), Supine Sit-Ups for 30 Seconds (reps), Fast Rope Jumping for 30 Seconds (reps).

- **Specialized Fitness (7 tests):** Stationary Run for 15 Seconds (reps), 30m High-Speed Run (s), 30m High-Start Run (s), 60m High-Start Run (s), 100m High-Start Run (s), Standing Long Jump (cm), Three-Step Long Jump Without Running (cm).

The current status shows that most fitness assessment tests for male athletes in the 100m running team at Trà Vinh University exhibit high homogeneity and representativeness for the sample population, as $\varepsilon \leq 0.05$.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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