



**SELECTION OF TESTS FOR EVALUATING SPECIALIZED
PHYSICAL FITNESS IN MALE TALENTED BADMINTON
STUDENTS AT THE FACULTY OF PHYSICAL EDUCATION,
HO CHI MINH CITY UNIVERSITY OF EDUCATION, VIETNAM**

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Abstract:

Badminton is widely favoured across many world countries, predominantly Asian nations. In Vietnam, it is acknowledged not only as a sport but also as a means to enhance physical health and promote the cultural development of the populace. This study aims to identify several tests to evaluate the professional physical fitness of talented male badminton students at the Faculty of Physical Education, Ho Chi Minh City University of Education. The study utilized the standard research methods, including literature synthesis, interviews, and pedagogical assessments with statistical methods. Ten chosen tests were then used to measure the current fitness of the students. A scoring scale was also established to evaluate their performance thoroughly. Results indicate that 25% of the students have good fitness, 60% average, and 15% below average, but no students evaluated as excellent or extremely poor.

Keywords: tests, professional physical fitness, talented students, badminton, Faculty of Physical Education, Ho Chi Minh City University of Education

1. Introduction

Badminton is one of the most popular sports globally, attracting participants of all ages and skill levels annually [1]. In Vietnam, badminton has been officially included in the National Sports Games and the National Phu Dong Health Festival competitions. Within several years, Vietnam has trained several outstanding players such as Minh Nguyen Tien (ranked seventh globally), Linh Nguyen Thuy (ranked 22nd globally), Nam Duong Phuong, Nhung Le Ngoc Nguyen, etc.

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Badminton is a complex sport as it requires a collaborative combination of intelligent tactics, excellent technical skills, and stable psychology [2]. More importantly, the players need good physical fitness to effectively perform skills during matches [3]. It is inferred that physical fitness is directly related to an individual's performance [4]. The required physical fitness items for a modern badminton athlete include speed, strength, agility, balance, reflex, and coordination [5].

Researchers have demonstrated that physical fitness is related to motor skills, so it plays a crucial role in badminton competitions. Badminton players are required to perform a variety of movements, such as swift acceleration and deceleration, quick changes of direction over short distances, and explosive upper and lower limb movements [2]. Hence, physical training programs for badminton athletes are often designed to focus on developing strength, agility, and speed [6–8].

The forehand smash is the most effective scoring technique in badminton competitions, accounting for up to 54% of all "direct winning shots" [9]. Moreover, jumping ability is an essential factor influencing the success of a badminton player's smash [8]. In other words, excellent playing styles and movements are two essential factors of an excellent badminton player [10]. Furthermore, due to the shuttlecock's speed of light and unpredictable landing points, the player must make an accurate and fast decision to execute the return shot against his opponent [11]. This indicates that physical fitness is indispensable for a high-level badminton athlete.

Ho Chi Minh City University of Education is one of the significant universities in southern Vietnam. The university is known to have achieved outstanding success in training thousands of students who currently work in education and scientific research. Among its faculties, the newly established Faculty of Physical Education is responsible for training physical education teachers for high schools and secondary schools.

Although the faculty has not been established for long, it has strived to train many generations of talented badminton students. However, through practical teaching experiences at Ho Chi Minh City University of Education, the writers noticed that the professional physical fitness of talented badminton students is not satisfying. Specifically, they exhibit weaknesses in techniques, tactics, psychology, and especially in professional physical fitness, which cause them many difficulties in prolonged matches.

Hence, it can be seen that improving the professional physical fitness of the talented badminton students of the Faculty of Physical Education at Ho Chi Minh City University of Education becomes highly necessary. Although the teachers have applied various teaching methods, the issue lies in the fact that the system of physical exercises is not consistent and logically arranged. This is also considered a major factor that has led to the suboptimal development of professional physical fitness among athletes. Hence, this study aims to develop professional physical fitness and enhance the quality of badminton teaching for talented students in the Faculty of Physical Education at Ho Chi Minh City University of Education.

2. Material & methods

2.1 Methods:

This study employed the following research methods to achieve its objective:

- Literature synthesis: to synthesize documents and systematize recognized research works related to the research topic, providing a theoretical foundation to compare and contrast the study's results
- Interview: to select appropriate physical fitness evaluation tests based on the consultation with experienced lecturers at Ho Chi Minh City University of Education and the Faculty of Physical Education
- Pedagogical assessment: to evaluate the quality of the professional physical fitness tests for badminton athletes
- Statistical method: to analyze the collected data with the support of SPSS 20.0 software

2.2 Participants

- Testsees: 20 talented male badminton students from the Department of Physical Education, Ho Chi Minh City University of Education.
- Interviewees: 30 coaches, teachers, experts, people with experience in teaching and coaching badminton.

3. Results

3.1. Synthesis of professional physical fitness tests for talented male badminton students of the Department of Physical Education, Ho Chi Minh City University of Education

3.1.1. Theoretical basis for collecting professional physical fitness tests of talented male badminton students

To enhance athletes' motor abilities, their trainers must design suitable exercises based on their existing physical fitness. The reason is that developing physical fitness, especially professional physical fitness, is the basis for mastering badminton techniques. In other words, the effective application of badminton tactics can only be achieved by a strong foundation of general and professional physical fitness.

The development of professional physical fitness also ensures the sustainability of psychological items, which positively impacts the willpower of the trainees. This is manifested in the efforts to complete dense training volumes and cultivate resilience in training and competition.

Assessments need to be conducted regularly throughout training sessions to ensure training quality. This is why test selection is given great consideration.

The process of selecting the tests follows the adherence to the following three principles [12], [13]:

- Principle 1: The test can assess comprehensively the professional physical fitness,
- Principle 2: The test aims to evaluate which of the following abilities:
 - maximum speed,
 - endurance and explosive strength,
 - coordination ability,
 - agility,
 - mental capacity,
 - other specialized skills (blocking, smashing, lobbing, etc.).
- Principle 3: The test has clear evaluation standards; the required utensils for testing are available at the site.

3.1.2. Practical basis for selecting the professional physical fitness tests for talented male badminton students

The process of choosing tests was conducted in three following phases:

- Synthesis of professional physical fitness tests from previous research,
- Consultation with experts to determine the appropriateness of the tests, and
- Reliability testing on the selected tests.

3.1.2.1 Synthesis of professional physical fitness tests from national and international research

The writers synthesised a large number of Bo's scientific works. Omosegard (1990) [14], Vinh Tran Van, Thanh Dao Chi (1998) (2003) [15], [16], Le Banh My, Khanh Hau Chinh (2000) [17], Thuy Nguyen Hac, Binh Nguyen Quy (2000) [18], Gunalan D.P (2001) [19], Sports Committee (2001) [20], Huy Nguyen The (2005) [21], Son Le Hong (2006) [22], Huy Chau Vinh (2007) [23], Tung Mai Thanh (2007) [24], Hau Tran (2011) [25], Khoi Dam Tuan (2012) [26], Binh Nguyen Xuan (2014) [27], Nga Le Nguyet, Vinh Nguyen Quang, De Nguyen Thanh (2016) [28], Phuong Pham Thai (2023) [29].

Through the synthesis, the authors identified 10 tests that are most widely used, including 20 shuttlecock drills along the sideline (times), single jump rope (30 seconds), 20 side-to-side shuttle runs (seconds), forward and backward movement simulating badminton stroke for one minute (times), weighted racket drills for forehand stroke for 30 seconds (times), 20 targeted smash drills (times), push-ups for 30 seconds (times), 10 four-corner court drills (seconds), 20 shuttlecock targeting drills (times), box jumps at 50cm height for one minute (times).

3.1.2.2 Consultation with experts to determine the appropriateness of the tests

Thirty experts, coaches, and lecturers have a number of years of training badminton at universities and sports training centers. The interviewees were asked to mark the necessity of a certain test based on the following levels:

- Very necessary 3 points
- Necessary 2 points

- Unnecessary 1 point
 The results are presented in Table 1.

Table 1: Interview results on the use of ten professional physical fitness tests on the talented male badminton students at Ho Chi Minh City University of Education (n = 30)

No.	Test	Interviewees		Results			
		N	%	Very necessary	Necessary	Unnecessary	Total
1	Box jumps at 50cm height for one minute (times)	28	93.33	25	2	1	80
2	Push-ups for 30 seconds (times)	29	96.66	24	4	1	81
3	Weighted racket drills for forehand stroke for 30 seconds (times)	28	93.33	25	2	1	80
4	Single jump rope (30 seconds)	29	96.66	25	2	2	81
5	20 side-to-side shuttle runs (seconds)	30	100	28	1	1	87
6	10 four-corner court drills (seconds)	28	93.33	25	2	1	80
7	20 shuttlecock drills along the sideline (times)	29	96.66	25	2	2	81
8	20 targeted smash drills (times)	28	93.33	25	2	1	81
9	20 shuttlecock targeting drills (times)	28	93.33	24	4	-	80
10	Forward and backward movement simulating badminton stroke for one minute (times)	29	96.66	25	3	1	82

As seen in Table 1, more than 90% of the experts marked all of the tests necessary, with a total score of 80 points or more. Hence, the above tests were all to be selected.

3.4 Reliability testing on the selected tests

The reliability of a test refers to the degree of consistency between multiple test administrations on the same experimental subject under the same conditions [30]. However, it is notable that despite how rigorously standardized the process and measurement tools are, test results still exhibit some variability. The term used for this phenomenon is the natural error of measurement. These errors are caused by the fluctuating state of the experimental subject (such as fatigue, motivation, attention span, etc.), or changes in external conditions such as temperature, wind, humidity, and power supply.

Testing was conducted on 20 talented male badminton students from the 12th cohort. Each test was conducted twice, with a 3-day interval between each test. The testing conditions were consistent between the two. The reliability of the tests was determined by the degree of similarity between the results of repeated test administrations on the same subject under the same conditions. To assess the reliability of the tests, the study calculated each test's correlation coefficient (r) and compared the results of two assessments.

The results are presented in Table 2.

The test has sufficient reliability when the correlation coefficient $r \geq 0.8$ and $p \leq 0.05$. The test has insufficient reliability when the correlation coefficient $r < 0.8$.

Table 2: Reliability of the selected professional physical fitness tests (n = 20)

No.	Test	1st	2nd	r	P
		$(\bar{X} \pm \sigma)$	$(\bar{X} \pm \sigma)$		
1	20 shuttlecock drills along the sideline (times)	8.05±1.00	8.20±0.83	0.87	<0.05
2	Single jump rope (30 seconds)	58.25 ± 5.57	59.10 ± 5.74	0.92	<0.05
3	20 side-to-side shuttle runs (seconds)	82.94±5.89	82.70±6.00	0.95	<0.05
4	Forward and backward movement simulating badminton stroke for one minute (times)	13.50 ± 1.24	13.70 ± 1.03	0.87	<0.05
5	Weighted racket drills for forehand stroke for 30 seconds (times)	21.70±3.66	21.60±3.52	0.97	<0.05
6	20 targeted smash drills (times).	9.45±1.54	9.70±1.53	0.89	<0.05
7	Push-ups for 30 seconds (times)	17.50±2.74	17.90±3.06	0.96	<0.05
8	10 four-corner court drills (seconds)	112.97±7.71	111.95±7.01	0.97	<0.05
9	20 shuttlecock targeting drills (times)	10.10±1.92	9.95±1.54	0.91	<0.05
10	Box jumps at 50cm height for one minute (times)	70.80±12.80	70.70±12.79	0.99	<0.05

Table 2 shows that all of the tests have sufficient reliability ($r > 0.8$ and $P < 0.05$). Hence, it can be concluded that through the synthesis of literature, interviews, and reliability testing, the study identified 10 tests for assessing the professional physical fitness of talented male badminton students at the Faculty of Physical Education, Ho Chi Minh City University of Education. The tests include 20 shuttlecock drills along the sideline (times), single jump rope (30 seconds), 20 side-to-side shuttle runs (seconds), forward and

backward movement simulating badminton stroke for one minute (times), weighted racket drills for forehand stroke for 30 seconds (times), 20 targeted smash drills (times), push-ups for 30 seconds (times), 10 four-corner court drills (seconds), 20 shuttlecock targeting drills (times), box jumps at 50cm height for one minute (times).

3.2. Standard to evaluate the professional physical fitness of talented male badminton students at Ho Chi Minh City University of Education

3.2.1 Current professional physical fitness of talented male badminton students at Ho Chi Minh City University of Education

The study utilized the selected tests to assess the professional physical fitness of talented male badminton students at Ho Chi Minh City University of Education. The test results were then used to calculate sample characteristics such as mean value, standard deviation, coefficient of variation, and relative error.

The results are presented in Table 3.

Table 3. Current professional physical status of talented male badminton students at Ho Chi Minh City University of Education

No.	Test	\bar{X}	SD	C _v %	ϵ
1	20 shuttlecock drills along the sideline (times)	8.05	1.00	12.42	0.05
2	Single jump rope (30 seconds)	58.25	5.57	9.56	0.04
3	20 side-to-side shuttle runs (seconds)	82.94	5.89	7.10	0.03
4	Forward and backward movement simulating badminton stroke for one minute (times)	13.50	1.24	9.18	0.04
5	Weighted racket drills for forehand stroke for 30 seconds (times)	21.70	3.66	16.87	0.07
6	20 targeted smash drills (times)	9.45	1.54	16.29	0.07
7	Push-ups for 30 seconds (times)	17.50	2.74	15.66	0.07
8	10 four-corner court drills (seconds)	112.97	7.71	6.82	0.03
9	20 shuttlecock targeting drills (times)	10.10	1.74	17.22	0.08
10	Box jumps at 50cm height for one minute (times)	70.80	13.45	18.99	0.08

As shown in Table 3:

- Tests with high homogeneity (CV < 10%) include single jump rope (30 seconds), 20 side-to-side shuttle runs (seconds), forward and backward movement simulating badminton stroke for one minute (times), and 10 four-corner court drills (seconds).
- Tests with moderate homogeneity (10% < CV < 20%) include 20 shuttlecock drills along the sideline (times), Weighted racket drills for forehand stroke for 30 seconds (times), 20 targeted smash drills (times), Push-ups for 30 seconds (times),

20 shuttlecock targeting drills (times), and Box jumps at a 50cm height for one minute (times).

The relative errors of some tests are greater than 0.05 ($\mathcal{E} > 0.05$), indicating a lack of representativeness. However, due to the small sample size ($n = 20$) and the proven high reliability, the tests are eligible to be used.

3.2.2 Scale to evaluate the professional physical fitness of talented male badminton students at Ho Chi Minh City University of Education

The use of appropriate scales to accurately assess the physical fitness level of learners plays a crucial role in the work of sports training. Based on the mean value and standard deviation of the performance in the tests assessing the professional physical fitness of the research subjects, the study established scoring criteria C, as shown in Table 4.

Table 4: Scale to evaluate the professional physical fitness level of talented male badminton students of the Department of Physical Education, Ho Chi Minh City University of Education

No.	Test	Scores									
		10	9	8	7	6	5	4	3	2	1
1	20 shuttlecock drills along the sideline (times)	10.55	10.05	9.55	9.05	8.55	8.05	7.75	7.05	6.55	6.05
2	Single jump rope (30 seconds)	72.18	69.39	66.61	63.82	61.04	58.25	55.47	52.68	49.90	47.11
3	20 side-to-side shuttle runs (seconds)	68.22	71.16	74.11	77.05	80.00	82.94	85.89	88.83	91.78	94.72
4	Forward and backward movement simulating badminton stroke for one minute (times)	16.60	15.98	15.36	14.74	14.12	13.50	12.88	12.26	11.64	11.02
5	Weighted racket drills for forehand stroke for 30 seconds (times)	30.85	29.02	27.19	25.36	23.53	21.70	19.87	18.04	16.21	14.38
6	20 targeted smash drills (times)	13.30	12.53	11.76	10.99	10.22	9.45	8.68	7.91	7.14	6.37
7	Push-ups for 30 seconds (times)	24.35	22.98	21.61	20.24	18.87	17.50	16.13	14.76	13.39	12.02
8	10 four-corner court drills (seconds)	93.70	97.55	101.41	105.26	109.12	112.97	116.83	120.68	124.54	128.39
9	20 shuttlecock targeting drills (times)	14.45	13.58	12.71	11.84	10.97	10.10	9.23	8.36	7.49	6.62
10	Box jumps at 50cm height for one minute (times)	104.43	97.70	90.98	84.25	77.53	70.80	64.08	5.35	50.63	43.90

3.2.3 Classifications

Based on the system of testing, the study established 5 classified levels, including excellent, good, average, below average, and very poor, based on the standard deviation as follows:

- Excellent $> \bar{X} + 1.5 SD+$
- Good $\bar{X} + 0.5 SD$ to $\bar{X} + 1.5 SD$
- Average $\bar{X} - 0.5 SD$ to approximately $\bar{X} + 0.5 SD$
- Below Average $\bar{X} - 1.5 SD$ to approximately $\bar{X} - 0.5 SD$
- Very poor $< \bar{X} - 1.5 SD$

Note: define oppositely if the tests use time units to measure.

The study also designed a scoring scale to assess the physical level of talented male badminton students of the Department of Physical Education at Ho Chi University of Education, as presented in Table 5.

Table 5: Scorecard to assessing the physical level of talented male badminton students of the Department of Physical Education, Ho Chi Minh City University of Education

Scores and Levels				
Excellent	Good	Average	Below Average	Very poor
>80 points	80-60 points	60-40 points	40-20 points	<20 points

The assessment of the overall physical fitness level of talented male badminton students followed two steps:

- Step 1: Calculating the scores attained by each student in each criterion,
- Step 2: Summing up the criteria scores and comparing them with the established table.

Based on the performance in the tests assessing professional physical fitness, the evaluation proceeded as follows:

- Excellent: None of the students achieved this rating, accounting for 0.0%,
- Good: 5 students attained this rating, representing 25%,
- Fair: 12 students reached this rating, comprising 60%,
- Poor: 3 students received this rating, making up 15%,
- Very Poor: None of the students achieved this rating, accounting for 0.0%.

4. Conclusions

Through the synthesis of literature, interviews, and reliability testing, the study selected 10 tests for assessing the professional physical fitness of talented male badminton students at the Faculty of Physical Education, Ho Chi Minh City University of Education. The tests include 20 shuttlecock drills along the sideline (times), single jump rope (30 seconds), 20 side-to-side shuttle runs (seconds), forward and backward movement simulating badminton stroke for one minute (times), weighted racket drills for forehand

stroke for 30 seconds (times), 20 targeted smash drills (times), push-ups for 30 seconds (times), 10 four-corner court drills (seconds), 20 shuttlecock targeting drills (times), and box jumps at a 50cm height for one minute (times).

The study also formulated a scoring system (C scale) to assess the current professional fitness levels of the talented male badminton students at the Faculty of Physical Education, Ho Chi Minh City University of Education. The assessment results revealed that 25% of them demonstrated good physical fitness, 60% showed average physical fitness, and 15% exhibited below-average physical fitness. Notably, no students were classified as having excellent or very poor physical fitness.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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