



## Physical fitness status of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam

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### Abstract

The purpose of this study was to identify appropriate tests and, based on them, assess the physical fitness status of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam. The study employed document analysis, survey, pedagogical testing, and mathematical statistics. The research subjects consisted of 06 male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam. The research has identified 10 physical fitness tests, including general physical fitness (5 tests) and specialized physical fitness (5 tests). It is also found that the performances of the athletes are at a high level of homogeneity and are representative of the study sample's physical fitness characteristics.

**Keywords:** Physical fitness status, physical fitness, athlete, table tennis, Ho Chi Minh City, Vietnam

### Introduction

Table tennis is one of the most popular sports worldwide, with approximately 300 million participants (Gu *et al.*, 2019) [1]. It has been recognized as an effective sport for brain development and is often described as a sport for people of all ages and for lifelong participation (Amen, 2010) [2].

In Vietnam, table tennis is considered both a traditional and favored sport. It is well-suited to the physical characteristics and training conditions of Vietnamese athletes, particularly at the primary school age. During the 1950s, Vietnamese table tennis developed strongly and achieved notable success at the regional and international levels. Prominent athletes such as Mai Van Hoa, Tran Canh Duoc, and Le Van Tiet contributed significantly to the reputation of Vietnamese table tennis during this period [3]. Since Vietnam rejoined international sporting events, particularly the SEA Games, Vietnamese table tennis players have continued to achieve encouraging results. Outstanding athletes such as Vũ Manh Cuong, Doan Kien Quoc, and Tran Tan Quynh have won gold medals in men's singles events. Most recently, at the 32nd SEA Games, Vietnamese table tennis made history when Tran Mai Ngoc and Dinh Anh Hoang defeated the Singaporean pair, securing a historic mixed doubles gold medal after 26 years [4].

Achieving such historic medals requires substantial effort, time, and the integration of multiple contributing factors. Among these, the selection and training of young sporting talents play a decisive role. Effective talent identification helps detect young athletes with suitable physical attributes and potential, thereby creating favorable conditions for systematic training and long-term development. When properly implemented, the interaction of these supporting factors significantly enhances the effectiveness of athlete selection and training programs [5].

Today, world table tennis has developed in a highly diverse and dynamic manner, with playing styles and technical characteristics varying markedly across countries and regions, showing strong transformation and creativity [6]. This diversity and variability are clearly reflected in the wide range of technical movements used during play.

During competition, table tennis players are often required to make rapid judgments, react quickly, execute fast arm swings, and frequently change movement direction. Hence, a modern table tennis athlete has to not only demonstrate well-rounded technical and tactical abilities and strong psychological stability, but also be capable of skillfully regulating spin, speed, power, and ball placement. To do it well, the players need to possess certain sport-specific physical qualities such as high-speed, non-cyclical movements (such as explosive arm swings with appropriate angles during strokes), and rapid body movement to reach incoming balls. As an individual combat sport, table tennis also places substantial demands on the central nervous system, especially during tournaments involving multiple matches over consecutive days. Since competition progresses into later stages, the level of tension tends to increase, which urges athletes to possess high sport-specific endurance to maintain optimal performance. The endurance required in table tennis is characterized by its continuously fluctuating intensity and a close integration of speed and agility. According to Khau Trung Hue *et al.* (1997), depending on the opponent's grip style, the working frequency of the arm during play ranges from 19 to 46 strokes per minute [7]. This indicates that physical load intensity in table tennis is variable rather than constant and largely depends on the opponent's playing level.

In table tennis competitions, athletes often have to play multiple matches in a single day with short recovery intervals between matches. Therefore, recovery capacity and sport-specific endurance are critically important, requiring table tennis players to maintain a high level of physical fitness. The above analysis highlights the vital role of physical fitness in table tennis training and competition, particularly for young athletes. Based on this significance, the present study is entitled

“Physical Fitness Status of Male Table Tennis Players Aged 12–13 in Ho Chi Minh City, Vietnam.”

The study aims to identify appropriate tests and, based on them, to assess the physical fitness status of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam.

## Materials and methods

### 1. Methods

The study employed the following research methods

**Document synthesis:** This method was used to collect, synthesize, and analyze information related to the physical fitness of young table tennis athletes through academic sources, research publications, and scientific journals. The synthesized literature helps to form the theoretical foundation for addressing the research objectives.

**Survey method:** This method aimed to obtain expert opinions from specialists and professionals with experience in table tennis training. The collected information supported the selection of appropriate physical fitness tests for male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam.

**Pedagogical testing:** This method was applied to implement standardized testing procedures and to record and validate the results of physical fitness tests conducted at the initial stage and during the re-test phase for the study participants.

**Statistical analysis:** This method was used to process, analyze, compare, and interpret the collected data with the support of SPSS 22.0 software.

### 2. Participants

#### Testees

6 male talented table tennis players aged 12–13 from Ho Chi Minh City, Vietnam; all of them use a shakehand grip

#### Surveyees

16 individuals participated in the survey, including 10 table tennis coaches, 02 sports administrators, and 04 table tennis lecturers from Ho Chi Minh City University of Physical Education and Sports and Ho Chi Minh City University of Physical Education and Sports Pedagogy.

### Results

To assess the physical fitness status of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam, the study addressed the following two stages:

- To identify appropriate physical fitness tests for male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam.
- To evaluate the current physical fitness status of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam.

#### 1. Identification of Physical Fitness Tests for Male Table Tennis Players Aged 12–13 in Ho Chi Minh City, Vietnam

The identification of physical fitness tests for male table tennis players aged 12–13 was conducted through the following three steps

**Step 1:** Compile physical fitness tests suggested by domestic and international research studies

**Step 2:** Survey experts, specialists, and table tennis coaches

**Step 3:** Assess the reliability and validity of the selected tests

#### Synthesis of fitness assessment tests for table tennis players from domestic and foreign research works.

Synthesis of fitness assessment tests in the selection and assessment of physical fitness of table tennis players by domestic and foreign authors such as: Khau Trung Hue – Sam Hao Vong – Tu Tien Sinh *et al.* (1997)<sup>[7]</sup>, A.N. Amelin [8], Nguyen Quang Vinh (2003)<sup>[9]</sup>, Nguyen Tien Tien (2001)<sup>[10]</sup>, Hoang Trung Thanh (1995)<sup>[11]</sup>, Nguyen Ngoc Cu (1998)<sup>[12]</sup>, Le Thiet Can (1997)<sup>[13]</sup>, Le Van An, Nguyen Quang Vinh (2018)<sup>[14]</sup>, Nguyen Tuan Cuong (1999)<sup>[15]</sup>, Nguyen Danh Hoang Viet (2005)<sup>[16]</sup>, Nguyen Danh Thai – Vu Thai Hong (2000)<sup>[17]</sup>, Nguyen Quang Vinh *et al.* (2014)<sup>[18]</sup>, Nguyen Danh Thai and Vu Thanh Son (1999)<sup>[19]</sup>, Nguyen Quang Vinh (2013)<sup>[20]</sup>, Liang Yang (2016)<sup>[21]</sup>, Pham Trung Hiep (2023)<sup>[22]</sup>, Nguyen Quang Vinh, Nguyen Quang Son (2020)<sup>[23]</sup>, 周星栋(2020),<sup>[24]</sup>.

To ensure a scientific and logical selection of physical fitness tests, the study was based on the following principles: (1) measurability and (2) the ability to compare and evaluate results at the individual, regional, and international levels<sup>[25]</sup>.

Based on practical research conditions, three criteria were applied for test selection: (1) the test is cited from published studies in reliable domestic and international sources; (2) the required testing equipment is available in the local area; and (3) the test is suitable for the physical characteristics and health status of the research participants.

In accordance with the research objectives and the physical, psychological, and physiological characteristics of the participants, as well as the specific demands of table tennis, and based on expert consultation, several overlapping or inappropriate tests were excluded. The study ultimately selected the following representative tests

**General physical fitness:** 30-meter sprint (s), 60-meter sprint (s), 100-meter sprint (s), 1500 m run (s), standing long jump (cm), standing trunk flexion (cm), sit-ups in 1 minute (times), push-ups in 1 minute (times), lateral jumps over a gym bench in 1 minute (times), 4 × 10 m shuttle run (s).

**Professional physical fitness:** Standing badminton shuttle throw (cm), single-rope skipping in 1 minute (times), one-hand forward Angte weight swing 1.5 kg in 1 minute (times), one-hand backhand Angte weight swing 1.5 kg in 1 minute (times), Angte weight swing simulating forehand topspin in 30 seconds (times), alternating bilateral Angte weight swings in 30 seconds (times), ball-picking movement test 4 m × 21 balls (s), ball-picking movement test 3 m × 21 balls (s).

Based on the synthesized results, a structured questionnaire was developed and administered (Appendix 1). The survey was conducted twice, with a one-month interval between administrations, using the same evaluation method, the same set of indicators, and the same respondents. Responses were rated on a five-point Likert scale: strongly agree (5 points), agree (4 points), neutral (3 points), disagree (2 points), and strongly disagree (1 point). To examine the consistency between the two survey rounds, the results were compared using the chi-square ( $\chi^2$ ) (see Table 1).

**Table 1:** Comparison of the results of two surveys of fitness assessment tests for male table tennis players aged 12 – 13 years, Ho Chi Minh City, Vietnam

Test	1 <sup>st</sup> n = 16		2 <sup>nd</sup> n = 16		$\chi^2$	P	
	$\sum$ diem	%	$\sum$ diem	%			
General physical fitness	30-meter sprint (s)	68	85	69	86.25	0.19	> 0.05
	60-meter sprint (s)	59	73.75	58	72.5	0.16	> 0.05
	100-meter sprint (s)	55	68.75	55	68.75	0.00	> 0.05
	1500-meter run (s)	72	90	73	91.25	0.15	> 0.05
	Standing long jump (cm)	74	92.5	74	92.5	0.00	> 0.05
	Standing trunk flexion (cm)	73	91.25	73	91.25	0.00	> 0.05
	Sit-ups in 1 minute (times)	55	68.75	55	68.75	0.00	> 0.05
	Push-ups in 1 minute (times)	56	70	55	68.75	0.15	> 0.05
	Lateral jumps over a gym bench in 1 minute (times)	50	62.5	51	63.75	0.16	> 0.05
	4 × 10 m shuttle run (s)	75	93.75	75	93.75	0.00	> 0.05
Professional physical fitness	Standing badminton shuttle throw (cm)	76	95	76	95	0.00	> 0.05
	Single-rope skipping in 1 minute (times)	75	93.75	75	93.75	0.00	> 0.05
	One-hand forward Angte weight swing (1.5 kg) in 1 minute (times)	75	93.75	75	93.75	0.00	> 0.05
	One-hand backhand Angte weight swing (1.5 kg) in 1 minute (times)	75	93.75	75	93.75	0.00	> 0.05
	Angte weight swing simulating forehand topspin in 30 seconds (times)	58	72.5	58	72.5	0.00	> 0.05
	Alternating bilateral Angte weight swings in 30 seconds (times)	54	67.5	54	67.5	0.00	> 0.05
	Ball-picking movement test (4 m × 21 balls) (s)	76	95	76	95	0.00	> 0.05
	Ball-picking movement test (3 m × 21 balls) (s)	59	73.75	58	72.5	0.16	> 0.05

The results presented in Table 1 indicate that, for all indicators, the calculated  $\chi^2$  values from the two survey rounds were smaller than the critical value ( $\chi^2 = 3.84$ ) at the probability level  $P > 0.05$ . Therefore, the differences between the two sample means were not statistically significant. This finding demonstrates a high level of consistency and agreement in the responses provided by experts, coaches, and sport administrators across the two survey rounds.

Based on the survey results, indicators achieving a total score greater than 75% of the maximum score in both surveys (> 60 points) were selected. According to this criterion, the physical fitness tests for male table tennis athletes aged 12–13 years in Ho Chi Minh City were identified as follows.

General physical fitness tests included the 30-meter sprint (s), 1500-meter run (s), standing long jump (cm), standing trunk flexion (cm), and the 4 × 10 m shuttle run (s).

Professional physical fitness tests included the standing

badminton shuttle throw (cm), single-rope skipping in 1 minute (times), one-hand forward Agte weight swing (1.5 kg) in 1 minute (times), one-hand backhand Angte weight swing (1.5 kg) in 1 minute (times), and the ball-picking movement test (4 m × 21 balls) (s).

**Assessment of the reliability of the tests**

To examine the reliability and informativeness of the selected tests, a reliability analysis was conducted. According to Le Van Lam (2007) [25], Duong Nghiep Chi (2004) [26], and Do Vinh & Trinh Huu Loc (2010) [27], test reliability is evaluated using the paired correlation coefficient between the results of the first and second testing sessions. Accordingly, all physical fitness tests were administered to the study participants on two occasions, with a 5-day interval between tests, under identical testing conditions. The correlation coefficients (r) between the two testing rounds were then calculated, and the results are presented in Table 2.

**Table 2:** Paired correlation coefficients between two testing sessions for physical fitness tests of male table tennis athletes aged 12–13 years, Ho Chi Minh City, Vietnam (n = 6)

No.	Test	1 <sup>st</sup>		2 <sup>nd</sup>		r	p
		$\bar{X}$	S	$\bar{X}$	S		
General physical fitness							
1	30-meter sprint (s)	4.88	0.11	4.91	0.09	0.90	<0.05
2	1500-meter run (s)	363.50	11.04	366.00	6.63	0.85	<0.05
3	Standing long jump (cm)	173.50	6.95	174.67	6.68	0.87	<0.05
4	Standing trunk flexion (cm)	17.67	2.58	17.83	1.94	0.98	<0.05
5	4 × 10 m shuttle run (s)	9.11	0.15	9.15	0.07	0.89	<0.05
Professional physical fitness							
6	Standing badminton shuttle throw (cm)	688.67	9.71	687.75	8.45	0.93	<0.05
7	Single-rope skipping in 1 minute (times)	142.83	4.67	141.84	3.71	0.96	<0.05
8	One-hand forward Angte weight swing 1.5 kg in 1 minute (times)	64.67	2.16	65.67	2.73	0.93	<0.05
9	One-hand backhand Angte weight swing 1.5 kg in 1 minute (times)	70.17	4.83	70.17	4.45	0.91	<0.05
10	Ball-picking movement test 4 m × 21 balls (s)	116.17	4.62	117.50	4.46	0.88	<0.05

Based on the results in Table 3.2, all 10 tested items showed correlation coefficients  $r > 0.8$  with  $p < 0.05$ , indicating that the tests have high reliability and objectivity. Therefore, all 10 tests were selected for subsequent research stages.

**Assessment of the validity of the tests**

Validity testing was conducted by calculating Spearman’s rank correlation coefficients between the results of each test and the competitive performance of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam. Competitive performance was determined through a single round-robin tournament used for ranking. The results are presented in Table 3.

**Table 3:** Spearman’s rank correlation coefficients between physical fitness tests and competitive performance of male table tennis players aged 12–13, Ho Chi Minh City, Vietnam (n = 6)

No.	Test	r	P
1	General physical fitness	30-meter sprint (s)	0.66 <0.05
2		1500-meter run (s)	0.70 <0.05
3		Standing long jump (cm)	0.63 <0.05
4		Standing trunk flexion (cm)	0.65 <0.05
5		4 × 10 m shuttle run (s)	0.75 <0.05
6	Professional physical fitness	Standing badminton shuttle throw (cm)	0.76 <0.05
7		Single-rope skipping in 1 minute (times)	0.75 <0.05
8		One-hand forward Angte weight swing 1.5 kg in 1 minute (times)	0.72 <0.05
9		One-hand backhand Angte weight swing 1.5 kg in 1 minute (times)	0.72 <0.05
10		Ball-picking movement test 4 m × 21 balls (s)	0.78 <0.05

The results in Table 3 indicate that all 10 tests show correlations with competitive performance, with absolute values of  $r > 0.6$ . According to the established criteria, these tests demonstrate sufficient validity in relation to competition results and were therefore selected to assess the physical fitness of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam.

Through the processes of literature review, expert consultation, reliability testing, and validity analysis, the study identified 10 physical fitness tests for male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam, including

**General physical fitness:** 30 m sprint (s), 1500 m run (s), standing long jump (cm), standing trunk flexion (cm), and 4 × 10 m shuttle run (s).

**Professional physical fitness:** standing badminton shuttle throw (cm), single-rope skipping in 1 minute (times), one-hand forward Angte weight swing 1.5 kg in 1 minute (times), one-hand backhand Angte weight swing 1.5 kg in 1 minute (times), and ball-picking movement test 4 m × 21 balls (s).

**2. Assessment of Physical Fitness Status of Male Table Tennis Players Aged 12–13 in Ho Chi Minh City, Vietnam.**

To evaluate the current physical fitness status of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam, the selected physical fitness tests were administered to the research participants. The test results and statistical calculations are presented in Table 4.

**Table 4:** Male table tennis players aged 12–13’s physical fitness results

No.	Test	Results			
		$\bar{X}$	S	Cv%	$\epsilon$
<b>General physical fitness</b>					
1	30-meter sprint (s)	4.88	0.11	2.16	0.03
2	1500-meter run (s)	363.50	11.04	3.04	0.04
3	Standing long jump (cm)	173.50	6.95	4.01	0.05
4	Standing trunk flexion (cm)	17.67	2.58	14.62	0.18
5	4 × 10 m shuttle run (s)	9.11	0.15	1.65	0.02
<b>Professional physical fitness</b>					
6	Standing badminton shuttle throw (cm)	688.67	9.71	1.41	0.02
7	Single-rope skipping in 1 minute (times)	142.83	4.67	3.27	0.04
8	One-hand forward Angte weight swing 1.5 kg in 1 minute (times)	64.67	2.16	3.34	0.04
9	One-hand backhand Angte weight swing 1.5 kg in 1 minute (times)	70.17	4.83	6.89	0.05
10	Ball-picking movement test 4 m × 21 balls (s)	116.17	4.62	3.98	0.05

The results in Table 4 show the following.

- **30 m sprint (s):** The mean performance was  $4.88 \pm 0.11$ , with a coefficient of variation (Cv%) of 2.16 (< 10%), indicating high homogeneity. The relative error  $\epsilon = 0.03$  (< 0.05), confirming that the mean value is representative of the sample.

- **1500 m run (s):** The mean performance was  $363.50 \pm 11.04$ , with  $Cv\% = 3.04$  (< 10%), indicating high homogeneity. The relative error  $\epsilon = 0.04$  (< 0.05), showing good representativeness.

- **Standing long jump (cm):** The mean result was  $173.50 \pm 6.59$ , with  $Cv\% = 4.01$  (< 10%), indicating high

homogeneity. The relative error  $\varepsilon = 0.05$  confirms representativeness.

- **Standing trunk flexion (cm):** The mean value was  $17.67 \pm 2.58$ , with  $Cv\% = 14.62$  ( $10\% < Cv\% < 20\%$ ), indicating moderate homogeneity. The relative error  $\varepsilon = 0.09$  ( $> 0.05$ ) suggests that the mean value is not fully representative of the sample. However, trunk flexion is a specific test commonly used by experts to assess flexibility and has adequate reliability and validity. Therefore, despite the higher relative error—partly due to the small sample size ( $n = 6$ )—this test was retained for subsequent analyses.
- **4 × 10 m shuttle run (s):** The mean performance was  $9.11 \pm 0.15$ , with  $Cv\% = 1.65$  ( $< 10\%$ ), indicating high homogeneity. The relative error  $\varepsilon = 0.02$  ( $< 0.05$ ) confirms representativeness.
- **Standing badminton shuttle throw (m):** The mean result was  $668.67 \pm 9.71$ , with  $Cv\% = 1.41$  ( $< 10\%$ ), indicating high homogeneity. The relative error  $\varepsilon = 0.02$  ( $< 0.05$ ) shows good representativeness.
- **Single-rope skipping in 1 minute (times):** The mean value was  $142.83 \pm 4.67$ , with  $Cv\% = 3.27$  ( $< 10\%$ ), indicating high homogeneity. The relative error  $\varepsilon = 0.04$  ( $< 0.05$ ) confirms representativeness.
- **One-hand forward Angte weight swing 1.5 kg in 1 minute (times):** The mean result was  $64.67 \pm 2.16$ , with  $Cv\% = 3.34$  ( $< 10\%$ ), indicating high homogeneity. The relative error  $\varepsilon = 0.04$  ( $< 0.05$ ) confirms representativeness.
- **One-hand backhand Angte weight swing 1.5 kg in 1 minute (times):** The mean performance was  $70.17 \pm 4.83$ , with  $Cv\% = 6.89$  ( $< 10\%$ ), indicating high homogeneity. The relative error  $\varepsilon = 0.05$  confirms representativeness.
- **Ball-picking movement test 4 m × 21 balls (s):** The mean result was  $116.17 \pm 4.62$ , with  $Cv\% = 3.98$  ( $< 10\%$ ), indicating high homogeneity. The relative error  $\varepsilon = 0.05$  confirms representativeness.

Overall, the analysis shows that the mean values of most physical fitness tests demonstrate high homogeneity and are representative of the sample, as  $\varepsilon \leq 0.05$ .

### Conclusion

The study has identified 10 physical fitness tests for male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam, as follows

- **General physical fitness:** 30 m sprint (s), 1500 m run (s), standing long jump (cm), standing trunk flexion (cm), and 4 × 10 m shuttle run (s)
- **Professional physical fitness:** standing badminton shuttle throw (cm), single-rope skipping in 1 minute (times), one-hand forward Angte weight swing 1.5 kg in 1 minute (times), one-hand backhand Angte weight swing 1.5 kg in 1 minute (times), and ball-picking movement test 4 m × 21 balls (s).

The current physical fitness status of male table tennis players aged 12–13 in Ho Chi Minh City, Vietnam, shows high homogeneity, and the test results are representative of the research sample.

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