European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejpe.v11i5.5675 Volume 11 | Issue 5 | 2024

PHYSICAL FITNESS CRITERIA FOR 10-AND-11-YEAR-OLD FEMALE TABLE TENNIS ATHLETES IN LONG AN PROVINCE, VIETNAM

Le Van An[1],
Nguyen Quang Vinh[i2],
Tran Thanh Tuyen[2],
Duong Van Phuong[3]
[1]Long An Provincial Sports School, Vietnam
[2]Ho Chi Minh City University of Physical Education and Sport, Vietnam
[3]Ho Chi Minh University of Banking, Vietnam

Abstract:
In table tennis, players are required to make quick decisions, swift reactions, flexible movements and fast swings. Physical fitness is, therefore, essential for success in this sport. This study aims to identify the key physical fitness criteria and standards for selecting female table tennis players aged 10–11 in Long An province. The research employed methods including document synthesis, expert survey, pedagogical testing, and statistical analysis. The participants included 15 young female table tennis athletes from Long An province. As a result, the study identified eight physical fitness criteria and developed a scoring scale (Scale C), and fitness classification standards for female table tennis players aged 10–11 in Long An.

Keywords: physical fitness criteria, standard, table tennis players, Long An, Vietnam

1. Introduction

Table tennis is characterized by a small playing area, an indoor setting, and a high level of skills and technical precision. It involves frequent movements at high intensity with short, continuous action periods interspersed with brief rest intervals. Given these characteristics, table tennis is a skill-intensive sport with high demands on technical accuracy and endurance. As modern techniques and strategies continue to evolve, physical fitness requirements for players have also become more rigorous.

In modern competitive table tennis, common offensive techniques include looping, smashing, and driving the ball—skills that athletes frequently practice during

[i] Correspondence: vinhqn@upes.edu.vn

training sessions. To perform well in these drills, players need sufficient strength and stamina to endure intensive training routines before competitions. Additionally, matches can extend over consecutive days, which can lead to significant fatigue from prolonged exertion. Consequently, having good physical fitness is essential for table tennis players to maintain their best performance throughout tournaments [1] [2] [3].

Specialized physical fitness for table tennis athletes has garnered significant attention from both domestic and international researchers. Many authors have conducted studies to identify the essential physical qualities required for this sport. In Modern Table Tennis, A.N. Amelin emphasizes that "*athletes need to develop physical qualities, particularly focusing on speed endurance, movement speed, and quick arm swings*" [4]. Associate Professor Nguyễn Danh Thai (1990) notes, "*Speed strength, flexibility, agility, and specialized endurance form the physical foundation for table tennis players*" [5]. Mai Duy Dien identifies necessary qualities, including "*speed, flexibility, agility, and coordination as basic, while speed strength, speed endurance, quick reflexes, and adaptive reactions being key factors*" [6].

These perspectives highlight the need for standardized criteria to holistically evaluate the physical fitness of table tennis athletes. Recognizing this importance, the researchers authored this article titled: *Physical fitness criteria for 10-and-11-year-old female table tennis athletes in Long An province, Vietnam*.

2. Materials and methods

2.1 Methods

The study employed the following methods:

- **Document Synthesis:** This method aimed to gather information relevant to the physical fitness of table tennis athletes through various literature sources, establishing a theoretical foundation for the research and providing a basis for analyzing and discussing the research results.
- **Survey Method:** This approach was used to consult with experts and specialists who have experience in selecting and training table tennis athletes. Their insights were collected to inform the selection of criteria for assessing the physical fitness of the study's participants.
- **Pedagogical Testing Method:** This method was applied to test and evaluate the physical fitness of the study's participants using specific assessment tests.
- **Statistical Analysis:** This method aimed to process, analyze, evaluate, compare, and discuss the collected data with the support of SPSS 20.0 software.

2.2 Participants

2.2.1 Physical test takers

15 gifted 10-11-year-old female athletes from Tan An City, Ben Luc District, and Thu Thua District.

2.2.2 Surveyees

16 experts, experts, managers, and lecturers of Ho Chi Minh City University of Physical Education and Sports, Hanoi University of Physical Education and Sports, Ho Chi Minh City University of Physical Education and Sports, University of Da Nang, Ho Chi Minh City University of Economics. They are those who have experience selecting and training table tennis athletes in various provinces such as Long An, Dong Thap, Vinh Long, Tay Ninh, and Ho Chi Minh City.

3. Results

In order to evaluate the physical state of 10-11-year-old female table tennis players in Long An province, Vietnam, physical fitness tests and standards were developed.

3.1 Physical fitness tests for 10-11-year-old female table tennis athletes in Long An province, Vietnam

This phase was s conducted in three steps as follows.

- **Step 1:** Synthesizing physical fitness tests recommended by domestic and foreign researchers such as A.N.Amelin – Pasinnhin [4], Le Van An, Nguyen Quang Vinh (2018) [7], Le Thiet Can (1997) [1], Nguyen Ngoc Cu (1998) [8], Nguyen Tuan Cuong (1999) [9], Bui Quang Hai (2007) [10], Pham Trung Hiep (2023) [11], Le Nguyet Nga et al (2016) [12], Bui Huy Quang (1997) [13], Nguyen Danh Thai and Vu Thanh Son (1999**)** [14], Nguyen Danh Thai (1994) [15], Nguyen Danh Thai and Vu Thai Hong (2000) [16], Hoang Trung Thanh (1995) 17], Nguyen Tien Tien (2001) [6], Nguyen The Truyen (1999) [18], Nguyen Danh Hoang Viet (2005) [19], Pham Ngoc Vien (1990) [20], Nguyen Quang Vinh et al (2014) [21], Nguyen Quang Vinh et al (2013) [22], Liang Yang (2016) [23], Nguyen Quang Vinh, Nguyen Quang Son (2020) [24], Huang Tie Hua (1999) [25], Liu Xin Min (2000) [26], Xing Wenhua (2001) [27], Tang Zhi Hua et al (2001) [28], Xing Wenhua (2008) [29], Zhou XingDong (2020) [30]. Through the analysis of documents, 16 initial physical fitness tests were identified.
- **Step 2:** Surveying experts: 16 experts and lecturers were invited to a survey to shortlist 09 physical fitness tests for 10-11-year-old female table tennis players in Long An province.
- **Step 3:** Checking the reliability and validity of the tests

A. Reliability Testing

To assess the reliability of the physical fitness tests, this study conducted two rounds of testing on the participants (athletes) at a five-day interval. The conditions were ensured to be identical for both rounds. Afterwards, the study calculated the correlation coefficient (r) for each test between the two rounds. The results are presented in Table 1.

Table 1: Reliability coefficient of the selected physical fitness tests

No.	Test	1st		2nd		Reliability coefficient	
		$\overline{X}$	S	$\overline{X}$	S	r	Sig
1	30m sprint (s)	5.70	0.25	5.69	0.26	0.97	.001
2	500m run (s)	122.74	4.93	122.57	4.79	0.96	.001
3	Standing long jump (cm)	158.60	5.75	158.87	5.54	0.97	.001
4	Shuttle throw (cm)	645.33	20.31	643.80	22.52	0.95	.001
5	Single rope jump in 30 seconds (reps)	68.60	2.90	68.33	3.33	0.94	.001
6	Wall ball bounces in 60 seconds (reps)	54.80	2.40	55.00	3.07	0.91	.001
7	Move and pick up 42 balls x 3m (s)	126.45	6.62	126.24	6.17	0.98	.001
8	1kg weight swing forehand in 30 seconds (reps)	24.60	2.10	24.73	2.02	0.97	.001
9	1kg weight swing backhand in 30 seconds (reps)	26.53	2.03	26.40	1.80	0.95	.001

Table 1 shows that all of the selected physical fitness tests have a confidence coefficient greater than 0.9 and sig equal to 0.001, indicating sufficient reliability to assess the physical fitness of the athletes.

B. Validity testing

To verify the validity of the physical fitness tests for female table tennis athletes aged 10–11 in Long An province, the study determined the relevance coefficient between the test results and the athletes' competitive performance (ranking results from round-robin matches). Spearman's correlation coefficient formulae results are presented in Table 2.

Table 2: Correlation coefficient between the test results and the competition performance of 10-11-year-old table tennis athletes in Long An province

No.	Test	r	P
1	30m sprint (s)	0.62	<0.05
2	500m run (s)	0.72	<0.05
3	Standing long jump (cm)	0.29	>0.05
4	Shuttle throw (cm)	0.78	<0.05
5	Single rope jump in 30 seconds (reps)	0.74	<0.05
6	Wall ball bounces in 60 seconds (reps)	0.78	<0.05
7	Move and pick up 42 balls x 3m (s)	0.77	<0.05
8	1kg weight swing forehand in 30 seconds (reps)	0.73	<0.05
9	1kg weight swing backhand in 30 seconds (reps)	0.69	<0.05

Table 2 indicates that of the nine tests, eight tests showed a significant correlation with competitive performance ($r > 0.4$ and $P < 0.05$), thus confirming their validity. The other test which exhibited little correlation ($r < 0.4$ and $P > 0.05$) deemed invalid, so it would be excluded from the study. Based on these validity assessments, eight tests were confirmed as reliable to measure the physical fitness of the female table tennis athletes aged 10–11 in Long An province.

In summary, through four steps of document synthesis, expert surveys, reliability checks, and validity testing, the study identified eight fitness tests for female table tennis athletes aged 10–11 in Long An, including 30m sprint (seconds), 500m run (seconds), shuttle throw (cm), single rope jumps in 30 seconds (reps), wall ball bounces in 60 seconds (reps), move and pick up 42 balls at 3m intervals (seconds), 1kg forehand swing in 30 seconds (reps), and 1kg backhand swing in 30 seconds (reps).

3.2. Standards for evaluating the physical fitness of 10-11-year-old female table tennis players in Long An province, Vietnam

The research attempted to develop a C scale, classification standards, and general classifications.

3.2.1 A C scale

A C scale (10-point scale) was developed to score each test for individual athletes and calculate the average score of each fitness test. The C-scale is a standardized scoring system, and thus, the test data should follow a normal or near-normal distribution. The study applied the Shapiro-Wilk (SW) test for normality. The results indicate that the test data for all selected physical fitness tests for female table tennis athletes aged 10–11 in Long An had $SW \geq {}^{SW_{05}}$, supporting the acceptance of the null hypothesis H_0. This confirms that the data follow a normal distribution at a significance level of $\alpha = 0.05$. The C-scale scores for each test were calculated, and the results are presented in Table 3.

Table 3: C-scale results of physical fitness tests of 10-11-year-old female table tennis athletes in Long An province

No.	Test	Scale									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	30m sprint (s)	6.20	6.07	5.95	5.83	5.70	5.58	5.46	5.33	5.21	5.09
2	500m run (s)	128.1	126.6	125.1	123.6	122.1	120.6	119.1	117.6	116.1	114.6
3	Shuttle throw (cm)	605	615	625	635	645	655	666	676	686	696
4	Single rope jump in 30 seconds (reps)	63	64	66	67	69	70	71	73	74	76
5	Wall ball bounces in 60 seconds (reps)	50	51	52	54	55	56	57	58	60	61
6	Move and pick up 42 balls x 3m (s)	139.6	136.3	133.0	129.7	126.4	123.1	119.8	116.5	113.2	109.9
7	1kg weight swing forehand in 30 seconds (reps)	20	21	23	24	25	26	27	28	29	30
8	1kg weight swing backhand in 30 seconds (reps)	22	23	25	26	27	28	29	30	31	32

3.2.2. Classification standards, and general classification

A. Classification standards

To quantify the various criteria in classifying table tennis athletes aged 10–11 in Long An, the study established standard classifications for each test, divided into five levels based on the following conventions:

- Very good from 9 to 10 points.
- Good from 7 to under 9 points.
- Average good from 5 to under 7 points.
- Below average from 3 to under 5 points.
- Weak from 0 to under 3 points.

B. General classification

In the C scale, each test has a maximum score of 10 points, so it can be inferred that the maximum total score of the eight tests is 80 points. According to the above convention, the study proceeded to build a classification score table for the physical fitness of the research subjects in Table 4.

Table 4: Scorecard of general classification of the physical fitness of 10-11-year-old female table tennis athletes in Long An province

Factor	Classification				
	Weak	Below average	Average good	Good	Very good
Physical fitness	0→<24	24 →<40	40→<56	56→<72	≥ 72

4. Discussion

In table tennis, athletes are required to be able to react quickly and swing their arms swiftly to intercept the ball. Therefore, when assessing the specialized physical qualities of table tennis players, it is essential to measure non-cyclic swing speed. The swinging action in table tennis is generated by the combination of the arm's weight (including the arm and the racket) and its movement speed, both of which create a certain level of force. The type of strength required for this action is explosive strength (high-speed force). The fast, offensive playing style in table tennis emphasizes forearm strength. From a biomechanical and muscular perspective, elbow flexion acts as a speed lever. The primary muscles involved in elbow flexion include the brachialis and biceps brachii, which originate in the upper arm and connect to the forearm or wrap around the side of the arm. When these muscles contract explosively, they make the racket hand move at a relatively high speed, thus increasing the swing velocity. The analysis shows that selecting the shuttle throw test to evaluate the explosive strength of table tennis athletes is appropriate.

Flexibility is another important quality for table tennis athletes. The flexibility required for this sport is a fast reaction capability, which refers to the ability to adapt quickly to unexpected circumstances, as athletes have only 0.3 to 0.5 seconds to evaluate

the ball's inbound speed, landing position, and spin while it is in midair [2]. Flexibility is also marked by the speed at which a player can transition from one movement to another. In actual table tennis matches, athletes often have to shift quickly to the right, to the left, and then back to the right; sometimes they need to step back or move forward to hit the ball in various positions. Thus, such a sport demands quick footwork and the ability to pivot rapidly.

Table tennis is an individual sport that requires high stamina, particularly during competitions that stretch over multiple days, which puts significant strain on the central nervous system. As matches grow increasingly tense towards the end, players must possess good endurance to maintain their performance. Thus, it can be seen that endurance is another essential physical quality for a modern table tennis player. The endurance must be adaptable and closely integrated with speed and flexibility. According to Khau Trung Hue et al. (1997), depending on the opponent's grip style, the workload intensity of a player's hand can range from 19 to 46 hits per minute [2]. This indicates that the intensity often fluctuates based on the opponent's play style. In tournaments, table tennis athletes often compete in multiple matches a day, with only short rest intervals, making their quick recovery ability essential. Therefore, good endurance is a prerequisite in this sport. Moreover, the player's endurance must be accompanied by speed and flexibility; otherwise, they cannot sustain these qualities until the match's final minutes. Considering the physiological and psychological traits of the age group, the study confirms that the eight physical fitness tests selected for evaluating 10- to 11-year-old female table tennis players are appropriate.

5. Conclusion

The study has identified the physical fitness tests for female table tennis players aged 10-11 in Long An province, including 30m sprint (s), 500m run (s), Shuttle throw (cm), Single rope jump in 30 seconds (reps), Wall ball bounces in 60 seconds (reps), Move and pick up 42 balls x 3m (s), 1kg weight swing forehand in 30 seconds (reps), 1kg weight swing backhand in 30 seconds (reps).

The C-scale, classification standards, and general classification for physical fitness assessment of female table tennis players aged 10-11 in Long An province have also been developed.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author(s)

Le Van An has been a coach of table tennis at Long An Provincial Sports School, Vietnam.
Nguyen Quang Vinh has been the Vice Principal of Ho Chi Minh City University of Fitness Education and Sports, Vietnam.

Tran Thanh Tuyen has been a physical education teacher at Ho Chi Minh City University of Fitness Education and Sports, Vietnam.
Duong Van Phuong has been Dean Faculty of National Defense-Security Education & Physical Education, Ho Chi Minh University of Banking, Vietnam.

References

1. Le Thiet Can (1997), *Research on the application of a number of exercises to develop physical qualities in the training process of male table tennis players 13-14 years old*, Thesis of Pedagogical Science – Psychology, Institute of Physical Education and Sports, Hanoi.
2. Khau Trung Hue – Sam Hao Vong – Tu Tien Sinh et al. (1997), *Modern Table Tennis*, Physical Education and Sports Publishing House, Hanoi.
3. Nguyen Quang Vinh (2003), *Research on the evaluation of the physical fitness level of senior table tennis players in Ho Chi Minh City after 1 year of training*, Master of Education Thesis, University of Physical Education II.
4. Amelin A.N (1985), *Modern Table Tennis*, Sports Publishing House, Hanoi.
5. Nguyen Danh Thai (1990), *Table Tennis Engineering*, University of Physical Education and Sports II.
6. Nguyen Tien Tien (2001), *Research on the evaluation of the training level of male table tennis players aged 12 – 15 years*, Ph.D. thesis in education, Institute of Physical Education Sciences, Hanoi, p. 14.
7. Le Van An, Nguyen Quang Vinh (2018), Research on physical fitness tests in the selection of 7-8-year-old male table tennis players in Tan An City, Long An Province, Journal of Sports Science and Training – Da Nang University of Physical Education and Sports.
8. Nguyen Ngoc Cu et al. (1998), *Science of Sports Talent Selection* Materials for Sports Coach Professional Training Class), Institute of Physical Education and Sports Sciences Volume 1, p.10.
9. Nguyen Tuan Cuong (1999), Evaluation of the training level of young table tennis players at the University of Physical Education and Sports 1 after 1 year of training, *Scientific Research Collection of the University of Physical Education and Sports 1*, Physical Education and Sports Publishing House, pp. 212 – 214.
10. Bui Quang Hai (2007), *Textbook for Selection of Sports* Talents, Bac Ninh University of Physical Education and Sports.
11. Pham Trung Hiep (2023), *Evaluation of training level for young female table tennis players aged 16-18 years in the southern provinces after 2 years of training*, Doctoral Thesis in Education, University of Physical Education and Sports, Ho Chi Minh City.
12. Le Nguyet Nga et al. (2016), *The Science of Sports Talent Selection*, Vietnam National University Press, Ho Chi Minh City.
13. Bui Huy Quang (1996), *Research on some pedagogical tests to assess the training level of table tennis players aged 9-11 years*, Doctoral thesis in pedagogical education, Hanoi.

14. Nguyen Danh Thai, Vu Thanh Son (1999), *Table Tennis*, Physical Education and Sports Publishing House, Hanoi.
15. Nguyen Danh Thai (1994) *Documents of the target program: 3-year table tennis aptitude training program*, General Department of Physical Education and Sports, Hanoi.
16. Nguyen Danh Thai – Vu Thai Hong (2000), *A Study on the Selection of Tests to Evaluate the Effectiveness of Foot Movement in Table Tennis Training and Competition in Male Athletes Aged 14 – 15*, Information on Physical Education and Sports, No. 2/2000.
17. Hoang Trung Thanh (1995), *Teaching materials for table tennis coaches,* Ho Chi Minh City Department of Physical Education and Sports.
18. Nguyen The Truyen (1999), *Pedagogical Methods for Testing and Evaluating the Training Level of Young Athletes (Materials for Professional Training Course for Sports Coaches, Volume 2*), Institute of Physical Education and Sports, pp. 72 – 73.
19. Nguyen Danh Hoang Viet (2005), *Research on exercise system to improve professional endurance for male table tennis players aged 12 – 14 years*, Ph.D. thesis in education, Hanoi, pp. 4 – 8.
20. Pham Ngoc Vien (1990), *Research Methods in Physical Education and Sports, Textbook of Scientific Research Methods in Physical Education and Sports*, Hanoi Physical Education and Sports Publishing House.
21. Nguyen Quang Vinh et al. (2014), *Table Tennis Textbook*, VNU Press, Ho Chi Minh City.
22. Nguyen Quang Vinh et al. (2013) *Developing criteria for the selection of table tennis players aged 8 – 11 years old, in Ho Chi Minh City;* City-level scientific research project, Department of Science and Technology of Ho Chi Minh City.
23. Liang Yang (2016), *Research on the Selection and Training of Table Tennis Candidate Players in China*, A thesis of Master, Zhengzhou University.
24. Nguyen Quang Vinh, Nguyen Quang Son (2020), *Study of physical fitness tests in the selection of 8 - 9-year-old females table tennis players in Ho Chi Minh City, Vietnam*, International Journal of Physical Education, Sports and Health 2020; 7 (2), 3.2020, pp 65-68.
25. **足**«谦（1999 “**身体?素**质训练法”**人民体?育** ç **出版社**.
26. **汪德秀**[1] (2000), **巢湖?市体?育** ç **局**业余体校??,**安徽巢湖**?238000.
27. **邢文**华主编（2001）“**奥?运**优秀运动员科??**学**选材的研??**究(下册)**，**北京体?育** ç **大学出版社**.
28. **梁焯**辉副其芳 (2001) “乒乓球” **人民体育出版社**.
29. **地八章** (2008), **体育才能**选择教?**材**，**人民体育出版社**, 346 页.4.
30. **周星**栋(2020),乒乓**球** 9～14 岁**运**动员阶**段**评**价**选**材模型的构建**, **北京体育大学的博士**论文.
31. Do Vinh – Huynh Trong Khai (2008), *Textbook of Statistical Methods in Physical Education and Sports*, Physical Education and Sports Publishing House.