



RESEARCH ON THE CRITERIA FOR EVALUATING THE PHYSICAL FITNESS OF 10- TO 11-YEAR-OLD MALE ATHLETES ON THE HO CHI MINH CITY SWIMMING TEAM, VIETNAM

Nguyen Van Vui,
Tran Hoang Anh

University of Labour and Social Affairs (Campus II),
Vietnam

Abstract:

In the context of high-performance sports increasingly focusing on youth training, the development of a physical fitness evaluation system that aligns with age characteristics and specific sports is of great significance for swimming training. Male athletes aged 10–11 are in a stage of rapid physical and motor skill development, requiring scientific, objective, and practical evaluation criteria. The purpose of the study is to identify tests through which the physical fitness assessment of male athletes on the swimming team in District 6, Ho Chi Minh City, Vietnam can be applied. The study employs research methods such as literature review, interviews, pedagogical testing, and statistical analysis to address the research content. The research subjects are 24 male athletes aged 10-11 from the District 6 Swimming Team, Ho Chi Minh City, who have been training for 1 year, and 40 experts, professionals, coaches, and instructors with experience in teaching and coaching swimming. The research results have identified 06 tests to assess the physical fitness of 10 to 11-year-old male athletes on the Ho Chi Minh City swimming team, including: 30m high start run (s), standing long jump (cm), standing high jump (cm), 400m freestyle (s), shoulder flexibility with a stick (cm), 200m medley (s). The current state of physical fitness tests for male athletes aged 10-11 on the Ho Chi Minh City swimming team shows a high level of consistency ($C_v < 10\%$) and ensures the reliability and representativeness of the sample set ($\varepsilon < 0.05$).

Keywords: test, physical fitness, athlete, swimming, District 6 - Ho Chi Minh City, Vietnam.

1. Introduction

In the context of the rapid development of high-performance sports today, the training of young athletes is considered a crucial foundation that determines the quality and achievements of each country's sports. The strategic goal of developing sports and physical education in Vietnam is to build a sustainable and professional sports and

physical training foundation. All citizens have access to and benefit from sports and physical training services; they voluntarily exercise to improve their health, fitness, and quality of life. Improve the achievements of Vietnamese sports, gradually approaching and striving to reach the level of countries with developed sports in Asia. Expanding the sports market, mobilizing and effectively utilizing resources in the development of physical education and sports careers [1].

Swimming is an attractive sport that is loved by many people of all ages. With many advantages, such as creating balance for practitioners, almost no risk of injury during training, being very good for cardiovascular health, and helping to reduce stress, swimming is a sport that can be practiced for a lifetime [2]. Besides its advantages as a means of physical exercise, swimming is also one of the basic skills everyone should have in life. The ancients had a saying: "*Blessed are those who give birth to children who can swim, cursed are those who give birth to children who can climb,*" which shows how important swimming is, as it relates to human life.

Swimming is a cyclic sport and primarily takes place in a water environment, so when swimming, athletes must overcome the resistance of water more than athletes in other land sports due to the density of water being 800 times that of air [3]. Swimming is a cyclic sport that requires synchronized development of physical fitness, technique, physiological function, and motor coordination. According to Bompa and Haff (2009) [4], physical fitness is an important foundation that helps athletes acquire techniques, maintain their ability to move, and improve their competition performance during long-term training. Therefore, accurately assessing the physical fitness level of young athletes is particularly important for the selection and training of modern sports.

At the age of 10–11, children are in a period of rapid development of the neuromuscular system, height, cardiovascular function, and motor coordination. This is considered a "sensitive period" for the development of basic motor qualities such as speed, strength, endurance, and flexibility (Malina et al., 2004) [5]. In swimming, physical qualities not only affect the effectiveness of technique execution but also determine the ability to adapt to the amount of exercise in training and competition [6].

Many countries with developed sports systems, such as the United States, Australia, and Russia, have established specialized physical fitness assessment criteria for young swimmers based on age and training level. The studies by Platonov (2005) [7] and Maglischo (2003) [8] show that the use of highly reliable and informative assessment tests helps coaches accurately determine the athletes' fitness levels, adjust training programs accordingly, and predict the potential for performance development. In addition, Wilmore and Costill (2004) [9] emphasized that regular fitness testing also helps to limit exercise overload and enhance the physiological adaptation efficiency of the body during youth sports training.

In Vietnam, along with the development of high-performance sports, swimming has achieved many notable accomplishments in regional and international arenas. Ho Chi Minh City is one of the strongest swimming training centers in the country, where many young athletes with high potential for professional development are concentrated.

However, practical training shows that the physical fitness testing and evaluation for young swimming athletes still have certain limitations. The selection of evaluation tests mainly relies on the experience of coaches or is inherited from previous documents, lacking a systematic approach and not fully aligning with the age characteristics and practical training conditions.

Some domestic studies have addressed the issue of evaluating the physical fitness and training levels of young athletes, such as: Đỗ Trọng Thịnh (2008) [10], Bùi Thị Xuân and Đỗ Trọng Thịnh (2002) [11]; Vũ Chung Thuỷ (2000) [12]. However, to date, there have not been many in-depth research projects to develop a system of physical fitness evaluation criteria specifically for male athletes aged 10-11 in talent teams, especially the Ho Chi Minh City swimming team.

In the context of modern sports, the establishment of a scientific physical fitness evaluation system not only serves the purpose of regular testing but also creates a database for selection, performance forecasting, and management of young athletes' training. According to Rushall (2011) [13], an appropriate specialized fitness assessment system will help coaches effectively control the adaptation process and develop the professional skills of young swimming athletes in long-term training. Therefore, the study of physical fitness assessment criteria for 10-11 year old male Swimming athletes on the Ho Chi Minh City swimming team is a requirement with high scientific and practical significance. The research results will contribute to the theoretical foundation of sports training science, while also assisting coaches in evaluating, monitoring, and adjusting training programs to suit the age characteristics and professional levels of athletes. Thereby contributing to the improvement of the training quality for young athletes, laying the foundation for the development of swimming achievements in Ho Chi Minh City in particular and Vietnam in general in the current period. With the above importance, we chose the research direction titled: "Research on the criteria for evaluating the physical fitness of male athletes aged 10-11 in the Ho Chi Minh City swimming team, Vietnam".

2. Research materials and methods

2.1 Methods

The research uses the following research methods to achieve the objectives:

- **Literature review method:** This method is commonly used in research projects to synthesize, select, and inherit documents, and systematize recognized research works related to athlete fitness and swimming fitness, such as: theoretical basis, identifying and addressing research content, verifying results during implementation, and discussing research outcomes.
- **Interview method:** aimed at consulting experts, coaches, and instructors with experience in swimming training and teaching to select fitness assessment tests for the research subjects.

- **Pedagogical testing method:** The study uses the method of testing the performance of physical fitness assessment tests in swimming for male athletes of the swimming team in District 6, Ho Chi Minh City, Vietnam.
- **Statistical methods** to process and analyze the collected data with the support of SPSS 22.0 software.

2.2 Participants:

- Research subjects: 24 male athletes from the District 6 swimming team aged 10-11, who have been training for 1 year.
- Interview subjects: 40 experts, specialists, coaches, and instructors with experience in teaching and coaching swimming.

3. Results

3.1. Identify the physical fitness tests for 10-11-year-old male athletes of the Ho Chi Minh City swimming team, Vietnam

The project proceeds as follows:

- **Step 1:** Compile physical fitness assessment tests in swimming from research works by authors both domestically and internationally.
- **Step 2:** Interview coaches, experts, and specialists to identify the physical fitness assessment tests for male athletes of the 10-11 swimming teams in Ho Chi Minh City, Vietnam.
- **Step 3:** Test the test's reliability.

3.1.1. Summary of fitness assessment tests in swimming from research works by domestic and international authors

Summarizing the physical fitness assessment indicators in swimming from research works by both domestic and international authors, such as: Nguyen The Truyen - Nguyen Kim Minh - Tran Quoc Tuan (2002) [14], Vo Tan Phat (2023), "Evaluating the effectiveness of strength and speed development exercises for male national youth swimming athletes in the 200m freestyle after 6 months of training" [15]; Nguyen Viet Trung (2018), "Research on the development of specialized physical fitness and techniques of male swimming athletes aged 8-10 in the training class at the Kiên Giang Provincial Children's House after 1 year of training" [16]; Nguyen Kieu Oanh (2017), "Research on a system of methods and exercises to enhance aerobic and anaerobic capacity for young swimming athletes aged 12 – 14 in Ho Chi Minh City" [17]; Do Tang Truong (2017) "Application of some exercises to improve breaststroke and freestyle performance for talented swimming athletes aged 11-12 in My Tho city, Tien Giang province" [18]; Vu Cong Truong (2015) "Research on developing specialized physical training exercises for male swimming athletes aged 11-12 in District 5, Ho Chi Minh City after one year of training" [19]; Nguyễn Nhật Huy Hoàng (2015), "Research on the application of exercises to develop general endurance (aerobic) for Swimming athletes

aged 9 – 11 training in Ho Chi Minh City” [20]; Ngu Chi Thanh (2014) “Study on the physical development of male swimming athletes in the District 6 Swimming Team aged 10 - 11 after one year of training” [21], Nguyen Manh Kha (2011), “Research on some constitutive factors and competition achievements of swimming athletes aged 9-15 in Ho Chi Minh City preparing to participate in the 6th National Phu Dong Health Festival”, [22]; Do Trong Think (2008), “Development of aerobic and anaerobic capacity of high-level Vietnamese short-distance swimming athletes in 2008” [10]; Le Nguyet Nga (2002), “Experimental study of training level assessment standards for young swimming athletes (female 13 – 15, male 13 -17) in the deep specialization phase” [23]... As part of their training and coaching process, the author has compiled 26 commonly used tests to assess the physical fitness of swimming team athletes.

3.1.2. Interview coaches, experts, and specialists

Based on the summary above, proceed to develop a questionnaire and survey with 40 experts, specialists, coaches, and instructors with extensive experience currently working in swimming training at sports centers and clubs in Ho Chi Minh City.

The interview method is divided into 3 levels as follows (Appendix 1):

- Frequently used: 3 points
- Used: 2 points
- Not used: 1 point

The results are shown in Table 3.1.

Table 3.1: Results of interviews on physical fitness assessment tests for male athletes aged 10-11 on the Ho Chi Minh City swimming team, Vietnam

	Test	Interview Result N = 40	
		Total score	Percentage (%)
1	Run 30m from a high start (s)	92	76.6
2	3 x 10m running (s)	85	70.8
3	4 x 25m - 4 styles swimming (s)	69	57.5
4	3 x 25m freestyle swimming (s)	60	50.0
5	50m freestyle swimming (s)	82	68.3
6	Standing high jump (cm)	95	79.1
7	Standing long jump (cm)	114	95
8	Pull-up bar (times)	25	20.8
9	Grip strength (kg)	20	16.6
10	Back strength (kg)	79	65.8
11	300m running (s)	86	71.6
12	600m running (s)	35	29.1
13	5 minutes own pace running (m)	85	70.8
14	12 minutes running (m)	51	42.5
15	200m freestyle swimming (s)	87	72.5
16	400m freestyle swimming (s)	120	100.0
17	800m freestyle swimming (s)	83	69.1

18	4 x 100m - 4 styles swimming (s)	79	65.8
19	Range of motion for ankle extension and flexion (cm)	19	15.8
20	Bend body forward. (cm)	78	65.0
21	Flexibility of the shoulder joint with a stick (cm)	118	98.3
22	Bend (cm)	86	71.6
23	Zic zac 30m running (s)	65	54.1
24	Burpee test (s)	54	45.0
25	2 x 100m individual medley (s)	87	72.5
26	200m individual medley (s)	106	88.3

Based on the results in Table 3.1, the study selects tests with a total score >75% of the total score interviewed (>90 points). The results selected the physical fitness tests for male athletes aged 10-11 on the Ho Chi Minh City swimming team, Vietnam, as follows:

- Run 30m from a high start (s),
- Standing long jump (cm),
- Standing high jump (cm),
- 400m freestyle swimming (s),
- Flexibility of the shoulder joint with a stick (cm),
- 200m individual medley (s),

3.1.3 Testing the reliability of the tests

The reliability of a test is the degree of consistency between the results of multiple test administrations on the same experimental subject under the same conditions.

Even after strict standardization and very precise measuring instruments, the same test used for the same research subject under the same conditions still shows slight variations in the test results. The main causes of this variation are:

- Changes in the state of the experimental subject (fatigue, motivation, attention focus, etc.).
- The change in external conditions and non-standardized measuring instruments (temperature, wind, humidity, power supply, etc.) refers to what is related to the term "natural measurement error."
- The change in the state of the person conducting the measurement or evaluation.
- The incompleteness of test construction techniques.

According to Trinh Huu Loc and Do Vinh (2010) [24], Duong Nghiep Chi (2004) [25]: "Using the retest method to assess the degree of similarity or correlation between two test repetitions." The first time (test) and the second time (retest) are conducted under the same conditions, with the same subject; the interval between the two executions is sufficient for the subject to fully recover. The appropriate interval is usually from 1 to 7 days, after which the two sets of results obtained (test and retest) are compared via correlation analysis using the Pearson method.

The reliability of the test is divided into the following levels:

- $r < 0,7$: Cannot be used.
- $0,7 \leq r < 0,8$: Low reliability.

- $0,8 < r \leq 0,9$: Average reliability.
- $0,9 < r \leq 0,95$: High reliability.
- $0,95 < r \leq 1$: Very high reliability.

The reliability coefficient is essentially the correlation of the test with itself, so this coefficient is always less than 1. If the coefficient equals 1, then it is an ideal case that is very rare in reality.

A test is used to evaluate the research subjects only when it ensures reliability. To determine the reliability of 10 fitness assessment tests for male athletes aged 12-14, swimming 50 meters at freestyle swimming, Long An Province. The study conducted research subject tests, with two tests carried out within 7 days. The testing conditions between the two times are the same. The results of the reliability tests of the tests are presented in Table 3.2.

Table 3.2: Reliability coefficients of physical fitness assessment tests for 10-11 year old male swimmers on the Ho Chi Minh City swimming team, Vietnam

Test	First time $\bar{x} \pm S$	Second time $\bar{x} \pm S$	r	P
Run 30m from a high start (s)	7.26 ± 0.31	7.25 ± 0.30	0.98	< 0.01
Standing long jump (cm)	156.67 ± 6.29	158.50 ± 6.63	0.97	< 0.01
Standing high jump (cm)	162.38 ± 4.42	164.33 ± 4.33	0.93	< 0.01
400m freestyle swimming (s)	350.92 ± 26.84	347.25 ± 26.96	0.99	< 0.01
Flexibility of the shoulder joint with a stick (cm)	35.87 ± 3.44	35.23 ± 3.26	0.97	< 0.01
200m individual medley (s)	175.50 ± 11.78	172.96 ± 11.77	0.96	< 0.01

If the correlation coefficient $r \geq 0.8$ and $P \leq 0.05$, then the criteria are reliable. If the correlation coefficient $r < 0.8$, the target is not reliable.

The results of all 6 tests showed a correlation coefficient $r > 0.8$, indicating a strong correlation with $P < 0.01$, so the above tests are reliable enough to assess the physical fitness of 10-11-year-old male swimmers on the Ho Chi Minh City swimming team, Vietnam.

Through the steps of document compilation, interviews, and reliability testing of the tests, the project has identified the physical fitness tests for male athletes aged 10-11 on the Ho Chi Minh City swimming team.

- Run 30m from a high start (s),
- Standing long jump (cm),
- Standing high jump (cm),
- 400m freestyle swimming (s),
- Flexibility of the shoulder joint with a stick (cm),
- 200m individual medley (s).

In sports training, in addition to technical skills, psychology, ethics, and willpower, physical fitness is one of the key factors determining sports performance. The physical fitness of each person depends on their motor abilities and physical qualities, collectively referred to as physical capacity. The higher the physical fitness level, the more

refined the motor activities and the higher the sports achievements. Indeed, the process of forming and developing physical qualities is always closely related to the formation of motor skills and the level of development of the body's organs. The level of development of physical qualities depends on the structural and functional state of many organs and systems of the body. The process of training to develop physical qualities is also the process of developing and perfecting the functional systems that play a major role in all muscle activities. [26]

Swimming competitions are becoming increasingly intense and fierce, with high intensity and density, requiring athletes to have high physical capabilities, especially strength, endurance, and the ability to coordinate smoothly, as well as flexibility, dexterity, and agility.

Swimming is a cyclic sport, so endurance plays a dominant role, contributing significantly to performance improvement. Due to the requirement of repeating movements multiple times, the strength that swimmers need is endurance strength and a combination of strength and speed in different stages of the swimming distance, such as the start and finish.

In sports, the combination of physical qualities such as strength and endurance to become strength endurance is the ability to perform an action multiple times and overcome a predetermined resistance (additional weight) over a long period. Different sports require athletes to have endurance strength for varying durations, which are distinguished by their clear differences, and these differences will determine the type of strength that needs to be developed in each sport (Bompa, 2019) [27].

The results of the synthesis of research projects both domestically and internationally show that the selection of fitness assessment tests in swimming not only needs to fully reflect the basic physical qualities, such as speed, strength, endurance, flexibility, and coordination, but also ensure the specificity of the water sport. The studies of Nguyen The Truyen, Nguyen Kim Minh, and Tran Quoc Tuan (2002) [14], Le Nguyet Nga (2002) [23], Nguyen Manh Kha (2011) [22], Ngu Chi Thanh (2014) [21], Vu Cong Truong (2015) [19], Nguyen Nhat Huy Hoang (2015) [20], Nguyen Kieu Oanh (2017) [17], and Vo Tan Phat (2023) [15] all agree that the assessment test system needs to be suitable for the biological development characteristics, training level, and professional requirements of each age group of athletes. For swimsuits aged 10-11, this is the stage of establishing technical foundations and developing basic physical qualities. Therefore, the selection of tests should prioritize criteria that reflect overall motor skills, while ensuring safety and suitability for the child's physical development characteristics.

Based on previous research, the study has compiled 26 tests commonly used in assessing the physical fitness of young swimmers. This test system includes both land and water tests, thereby providing a relatively comprehensive assessment of the athletes' specialized physical qualities. According to Tudor O. Bompa (2002) [27], in the initial training and early specialization phase, physical fitness testing should aim to simultaneously assess the functional capacity, motor coordination ability, and potential for specialized development of young athletes. This shows that the use of a combination

of strength, speed, flexibility, and endurance tests in research is in line with modern training trends.

The results of interviews with 40 experienced experts, coaches, and instructors show that the selected 6 tests include: 30m high-start sprint, standing long jump, standing high jump, 400m freestyle swimming, shoulder flexibility with a stick, and 200m individual medley. These are the tests with the highest selection rates, reflecting relatively fully the physical qualities that play a decisive role in swimming performance for the age group of 10-11 years.

Among them, the 30m high-start run test reflects the ability of explosive strength and the capacity to mobilize the movement speed of the neuromuscular system. Although it is a land-based test, for young swimmers, reaction speed and the ability to generate force quickly play an important role during the start and acceleration phase after leaving the starting block. The selection of this test is appropriate for the characteristics of motor-neural development in adolescents, when the speed of nerve conduction and the ability to coordinate movements are rapidly developing.

Two tests, the standing long jump and the standing high jump, were chosen to assess the speed strength of the leg muscle group. In swimming, especially in short-distance and mixed events, the ability to generate strong leg power plays an important role in starts, turns, and maintaining body position in the water. According to Maglischo (2003) [28], the leg drive during the start phase directly affects the initial speed of the athlete. Therefore, land jump tests not only reflect lower limb strength but also have predictive value for the water propulsion ability of young swimmers.

The shoulder flexibility test with a selected stick shows that experts highly value the role of flexibility in swimming technique. The shoulder joint is the joint that operates with the greatest range of motion in swimming styles, especially freestyle and butterfly. Good flexibility helps athletes increase the length of their strokes, improve the efficiency of their movements, and reduce the risk of overload injuries. For athletes aged 10-11, this is also a favorable stage to develop flexibility due to the high elasticity of their musculoskeletal system. Vì vậy, việc lựa chọn test linh hoạt khớp vai với gậy là phù hợp cả về cơ sở sinh lý lứa tuổi lẫn đặc điểm kỹ thuật chuyên môn của môn bơi.

In the underwater test group, the 400m freestyle test was chosen to assess specialized endurance. This is a fundamental quality in training young swimmers, as the main goal at this stage is to develop aerobic capacity, enhance circulatory and respiratory functions, and lay the foundation for advanced training in later stages. The 400m freestyle swimming requires athletes to maintain a steady pace over a relatively long period, thereby accurately reflecting their endurance and the effectiveness of their technical coordination under fatigue.

In addition, the 200m individual medley test is considered a highly comprehensive test because it requires athletes to continuously perform various swimming styles. This test not only reflects specialized endurance but also assesses coordination, overall technical proficiency, and the ability to switch activities between different muscle groups. For young athletes, the ability to perform well in the 200m individual medley indicates a

relatively comprehensive development of physical fitness and technique, aligning with the training approach of diversifying skills in the initial stage.

The test selection results of the study are similar to the research of Nguyen Kieu Oanh (2017) [17], Nguyen Nhat Huy Hoang (2015) [20], and Vu Cong Truong (2015) [19], as the authors all emphasize the role of the jump strength, specialized endurance, and shoulder flexibility test group in evaluating young swimmers. This shows that the chosen testing system is not only theoretically sound but also aligns with the current practical training of young swimmers in Vietnam.

After selecting the tests through expert interviews, the study proceeded to verify reliability using the retest method. According to Duong Nghiep Chi (2004) [25] and Trinh Huu Loc, Do Vinh (2010) [24], reliability is a mandatory condition for a test to be used in sports science evaluation, as a test is only valuable when the results obtained are stable and less affected by random errors. The research results show that all 6 tests have very high correlation coefficients ($r = 0.93 - 0.99$; $P < 0.01$), demonstrating that the tests have good stability and repeatability. Especially, the 400m freestyle test achieved a correlation coefficient of $r = 0.99$, indicating that this test has very high stability in assessing the professional endurance of young swimmers.

Thus, the system consists of 6 tests: 30m high-start run, standing long jump, standing high jump, 400m freestyle, shoulder flexibility with a stick, and 200m individual medley, which have a solid scientific and practical basis for use in assessing the physical fitness of 10-11-year-old male swimmers on the Ho Chi Minh City swimming team. These tests relatively comprehensively reflect the important physical qualities for swimming, while also aligning with the physical and physiological development characteristics and the specialized training orientation of athletes in the initial training and early specialization stages.

3.2. Đánh giá thực trạng thể lực của vận động viên nam 10-11 tuổi đội tuyển bơi lội TP.HCM, Vietnam

The project proceeds to check the tests identified in section 3.1 and then calculates the parameters \bar{X} , S , $V\%$, ϵ obtained the results in Table 3.3 as follows:

Table 3.3: Current physical condition of male athletes aged 10-11 on the Ho Chi Minh City swimming team

TT	Test	Tham số			
		\bar{X}	S	C_v	ϵ
1	30m high-start run (s)	7.26	0.31	4.29	0.02
2	Standing long jump (cm)	156.67	6.29	4.01	0.02
3	Standing long jump (cm)	162.38	4.42	2.72	0.01
4	400m freestyle swimming (s)	350.92	26.84	7.65	0.03
5	Shoulder flexibility with a stick (cm)	35.87	3.44	9.60	0.04
6	200m individual medley (s)	175.50	11.78	6.71	0.03

The research results in Table 3.3 fully present the basic statistical indicators, such as the mean value (\bar{X}); standard deviation (S); coefficient of variation (C_v); relative error of the mean value (ϵ), which shows:

- Coefficient of variation (C_v), the parameter reflects the variation in oscillation between individuals in the sample set, population. All evaluation indices show: All indicators show high uniformity (equivalent to low variability) among the studied individuals. ($C_v < 10\%$).
- Relative error of the mean value (ϵ): The average value of all indicators has $\epsilon < 0.05$, so the average values are sufficiently representative. The above analysis, it shows that all physical fitness indicators of 10-11-year-old male athletes of the Ho Chi Minh City swimming team have good homogeneity and sufficient reliability.

4. Conclusions

Thru the steps of document synthesis, interviews, and reliability testing, 06 physical fitness tests for 10–11-year-old male athletes of the Ho Chi Minh City swimming team have been identified, including: 30m high-start run (s), standing long jump (cm), standing high jump (cm), 400m freestyle (s), shoulder flexibility with a stick (cm), 200m individual medley (s).

The current state of physical fitness assessment tests for 10-11 year old male athletes on the Ho Chi Minh City swimming team shows a high level of consistency ($C_v < 10\%$) and ensures the reliability and representativeness of the sample set ($\epsilon < 0.05$).

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Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author(s)

Nguyen Van Vui has been a physical education teacher at University of Labour and Social Affairs (Campus II), Vietnam.

Tran Hoang Anh has been a physical education teacher at University of Labour and Social Affairs (Campus II), Vietnam.

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