

## SELECTING AND VALIDATING FITNESS TESTS TO ASSESS UNDERGRADUATES' FITNESS LEVELS AT VIETNAM NATIONAL UNIVERSITY, HO CHI MINH CITY

**HOANG HA**

*Vietnam National University Ho Chi Minh City Center for Sport, VIETNAM.*

*Email: vinhqn@upes.edu.vn*

**How to cite this article:** Ha, H. (June 2022). Selecting and validating fitness tests to assess undergraduates' fitness levels at Vietnam National University, Ho Chi Minh city. Journal of Physical Education Research, Volume 9, Issue II, 29-39.

**Received:** May 02, 2022

**Accepted:** June 29, 2022

### ABSTRACT

*The study was conducted to identify the standard criteria to assure the authenticity and objectivity of evaluating the undergraduates' fitness at Vietnam National University of Ho Chi Minh City (VNUHCM). The authors have utilized traditional sports research procedures, including document synthesis, expert interviews, reliability checks, and factor-analyzing approaches with the support of SPSS software to assess the collected data. The research paper has identified 8 reliable criteria which were valid for assessing the fitness of VNUHCM undergraduates, comprising- 30-meter sprint (s); long jump (cm), crunches in 30 seconds (times), push-ups in 30 seconds (times) (for males), and knee push-ups in 30 seconds (times) (for females); 1000-meter run and walk (s); seated stretch (cm); and 4x10 meter shuttle run (s).*

**Keywords:** Criteria, fitness, undergraduates, VNUHCM.

### 1. INTRODUCTION

Adolescent fitness tests have been extensively employed in physical education (PE) classes at schools all over the world for a variety of reasons (Harris & Cale, 2006). It has a significant impact on students' short- and long-term exercise habits (Mercier & Silverman, 2014), attitudes toward PE (Pasek, Michalowska-Sawczyn, & Nowak-Zaleska, 2014; Mohammad, Abraham, & Singh, 2011), appraisal of PE programs (Csányi et al., 2015), and sports participation (Cale & Harris, 2009). So far, a lot of academic practitioners have made the case that, when executed properly, a physical examination seems to be a useful tool for PE and serves as a supplement to PA exercise (Cvejic et al., 2013). As a result, many standards for evaluating juvenile fitness (such as FitnessGram, EuroFit, etc.) have been made and developed globally for more than 50 years (Castro-Piñero et al., 2010; Morrow et al., 2009). Additionally, it has been stated that modern health standards are centered on health fitness (Castro-Piñero et al., 2010; Vanheist et al. 2014).

While the value of young exercise in health education remains controversial (Silverman, Keating, & Phillips, 2008), modern technology has significantly impacted PE (Collins & Halverson, 2010). Numerous individuals have previously identified issues with physical examinations such as a lack of validity and reliability (Currell & Jeukendrup, 2008), limited awareness of young-aged fitness tests (Hopple & Graham, 1995), insufficient time to fully conduct fitness tests in class (Keating & Silverman, 2009; Ruiz et al., 2011), and students' anxiety when performing movements in front of their classmates (Garrett & Wrench, 2008). All of those issues can be handled by technology aids. Websites, for instance,

**Correspondence:** Hoang Ha (Ph.D.), Associate Professor, Nguyen Quang Vinh- Vice Principal, Ho Chi Minh City University of Physical Education and Sport, VIETNAM, Email: vinhqn@upes.edu.vn

can be utilized to distribute test materials and offer test results immediately (DeVilliers & van Staden, 2011). This could contribute to increasing parents, students, and teachers' awareness of teen fitness. As it is widely believed that every change in students' physical fitness can have an immediate impact on their academic performance (Scott et al., 2017).

Students from universities and colleges are concerned about the intellectual workforce in the near future. This force is critical to the country's rebirth, industrialization, and modernization. The level of their physical development is not only a matter of breeding but also of nurturing a vital workforce. As a result, for many years, the government has prioritized physical preparation for the entire population in general, and the younger generation in particular. It is represented in both policy guidelines and practical actions. Youth physical development is the responsibility of the entire society, in which sports and education have a large and direct impact on it. In addition, a comprehensive understanding of students' current physical state is required for adequate physical training preparation since it serves as the scientific foundation for the measures of physical growth. In Vietnam, during the period of 2000 and 2002, the Institute of Sports Science conducted a study to investigate the physical levels of Vietnamese citizens aged 6-60. However, the study did not focus on university students. Hence, this study carried out to standardized criteria to evaluate undergraduates' fitness levels so that this set of criteria can be used to improve the physical fitness of the countrymen.

## **2. METHODS AND MATERIALS**

### **2.1 Research Participants**

**2.1.1 Student Participants:** Four hundred students (200 males and 200 females) who were students of VNUHCM University of Science and VNUHCM University of Social Sciences and Humanities (members of VNUHCM) were recruited as student participants. All of them were freshmen who were mostly born in 2003. They were taking the first module in physical education among three modules at Vietnam National University Ho Chi Minh City Center for Sports.

**2.1.2 Expert Participants:** Twelve (12) PE experts and specialists nationwide were recruited to give consultancy on the tests.

### **2.2 Research Procedure**

By reviewing related studies such as European Community (1988), Bednarek, et al. (2016), Osipov, et al. (2020), (Canada, 2003), (ASEAN, 2016), USA (2008), Test ICPER (International Committee for Physical Education and Recreation), AFEA (Australia Fitness Education Award), (Liu et al., 2014), CNPFT (China's National Physical Fitness Testing), ALPHA-FIT (Assessing Levels of Physical Activity and Fitness) FitnessGram, Institute of Sports Science (2003), Decision No. 53/2008/QĐ-BGDĐT, Nguyen Thai Sinh (2002), Do Vinh and collaborators (2006), Nguyen Duc Thanh (2013), Nguyen Dang Chieu (2009), Le Truong Son Chan Hai (2012) Nguyen Dang (2015), Do Ngoc Cuong (2016) Nguyen Huu Vu (2016), Hoang Ha (2016), Nguyen Van Hoa (2016), Nguyen Viet Hoa (2019), Nguyen Thanh Hung (2017), Tran Ngoc Cuong (2018), Dang Minh Thanh (2019), Nguyen Chanh Thuc (2020), Nguyen Minh Cuong (2020), Vo Dinh Hop (2022) and consulting experts in the field, some fitness tests were selected including 30-meter sprint (s), long jump (cm), crunches in 30 seconds (times), push-ups in 30 seconds (times) (for males), and knee push-ups in 30 seconds (times) (for females), 4x10 meter shuttle run (s), 1000-meter run and walk (s), seated stretch (cm).

Then, the reliability and validity of these tests were conducted with the assistance of SPSS 22.0 software to get Internal Reliability Analysis, Descriptive Statistical Analysis, Factor Analysis, and Consistent Reliability Analysis. The testing time was in May 2022 at VNUHCM University of Science and VNUHCM University of Social Sciences and Humanities.

### 3. RESULTS

In order to evaluate the data, the range for different responses such as agree to disagree were set as - for agreed: distance = (Maximum – Minimum)/n = (5 – 1)/5 = 0.8. The scales: 1.00 – 1.80: Level 1 (strongly disagree); 1.81 – 2.60: Level 2 (Disagree); 2.61 – 3.40: level 3 (Neutral); 3.41 – 4.20: level 4 (agree); 4.21 – 5.00: level 5 (strongly agree).

#### 3.1. Synthesizing tests for assessing students' physical fitness from local and foreign academic papers and other sources

**Speed:** 30-meter sprint (s), 60-meter sprint (s)

**Strength:** Long jump (cm), crunches in 30 seconds (times), push-ups in 30 seconds (male) (times), and knee push-ups in 30 seconds (female) (times)

**Endurance:** 1500-meter run(s) (for males), 800-meter run(s) (for females) and 5-minute run (m)

**Flexibility:** Standing forward bend (cm), seated stretch (cm)

**Agility:** 8x5 meter shuttle run (s), run across piles (5 piles) (s).

#### 3.2. Interviewing Experts and Specialists

Twenty-three (23) tests were chosen and designed in a questionnaire form. Then the questionnaire was delivered to 12 PE experts and specialists across the country. The data are shown in Table 1 below.

**Table 1: Perceptions of 12 PE experts and specialists on the fitness criteria for VNUHCM students' physical health (1st) (n = 12)**

No.	Criteria	Results	
		$\overline{X}$	S
Speed			
1	30-meter sprint (s)	4.58	0.51
2	60-meter sprint (s)	3.33	0.49
Strength			
3	Long jump (cm)	4.58	0.51
4	Crunches in 30 seconds (times)	4.33	0.49
5	Push-ups in 30 seconds (male) (times)	4.25	0.45
6	Knee push-ups in 30 seconds (female) (times)	3.75	0.43
Endurance			
7	1500-meter run (male) (s)	3.33	0.49
8	800-meter run (female) (s)	3.33	0.49
9	5-minute run (m)	3.75	0.43
Flexibility			
10	Standing forward bend (cm)	4.17	0.39
11	Seated stretch (cm)	4.67	0.49
Agility			
12	8x5m shuttle run (s)	3.42	0.51
13	Run across piles (5 piles) (s)	3.08	0.29

According to Table 1, 5 items were strongly agreed upon by experts including 30-meter sprint (s), Long jump (cm), Crunches in 30 seconds (times), Push-ups in 30 seconds (times) and Seated stretch (cm); 4 items were Knee push-ups in 30 seconds (female) (times), 5-minute run (m), Standing forward bend (cm), 8x5m shuttle run (s) received agree on level; 4 left ones were chosen at Neutral level including 60-meter sprint (s), 1500-meter run (male) (s), 800-meter run (female) (s) and Run across piles (5 piles) (s).

The experts also consulted to add some more tests such as the 4x10m shuttle run (s) added by 7/12 experts, the 1000 m run (s) added by 5/12 experts, and the grip strength of the dominant hand (kg). Consequently, the tests chosen were further checked again such as-

**Speed:** 30-meter sprint (s)

**Strength:** Long jump (cm), crunches in 30 seconds (times), push-ups in 30 seconds (male) (times), and knee push-ups in 30 seconds (female) (times)

**Endurance:** 1000-meter run and walk (s) and 5-minute run (m)

**Flexibility:** Standing forward bend (cm), seated stretch (cm)

**Agility:** 8x5 meter shuttle run (s), 4x10m shuttle run (s)

Then the questionnaire was delivered to the group of professionals and the results were presented in Table 2 below.

**Table 2: Perceptions of 12 PE experts and specialists on the fitness criteria for VNUHCM students' physical health (2nd) (n = 12)**

No.	Criteria	Results	
		$\overline{X}$	S
	<b>Speed</b>		
1	30-meter sprint (s)	4.58	0.51
	<b>Strength</b>		
2	Long jump (cm)	4.58	0.51
3	Crunches in 30 seconds (times)	4.33	0.49
4	Push-ups in 30 seconds (male) (times)	4.25	0.45
	Knee push-ups in 30 seconds (female) (times)	3.75	0.43
	<b>Endurance</b>		
5	1000-meter run and walk (s)	3.92	0.67
6	5-minute run (m)	3.75	0.43
	<b>Flexibility</b>		
7	Standing forward bend (cm)	4.17	0.39
8	Seated stretch (cm)	4.67	0.49
	<b>Agility</b>		
9	8x5m shuttle run (s)	3.42	0.51
10	4x10m shuttle run (s)	4.33	0.49

Table 2 shows that there were six test items strongly agreed upon by experts including 30-meter sprint (s), Long jump (cm), Crunches in 30 seconds (times), Push-ups in 30 seconds (male) (times) and Seated stretch (cm), 4x10m shuttle run (s); 5 items were at Agree level including Knee push-ups in 30 seconds (female) (times), Standing forward bend (cm), 5-minute run (m), 8x5m shuttle run (s), 1000-meter run and walk (s).

The following tests were ultimately chosen for the fitness evaluation of VNUHCM undergraduates:

**Speed:** 30-meter sprint (s)

**Strength:** Long jump (cm), crunches in 30 seconds (times), push-ups in 30 seconds (male) (times), and knee push-ups in 30 seconds (female) (times)

**Endurance:** 1000-meter run and walk (s)

**Flexibility:** Seated stretch (cm)

**Agility:** 4x10 meter shuttle run (s).

### 3.3. Testing the Reliability and Validity

**Reliability Test:** The tests were examined to prove their reliability and validity. According to Chi (2004), and Vinh and Loc (2010) the tests ought to be checked twice, with a seven-day gap between two times. Both times should be under the same physical conditions. The results were then calculated by comparing the correlation coefficients ( $r$ ) of the two tests. Table 3 below displays the results.

**Table 3: The reliability coefficient of fitness assessment tests for VNUHCM students**

No.	Test	First		Second		Reliability coefficient (Pearson)	
		$\bar{X}$	S	$\bar{X}$	S	r	sig
Male (n = 200)	Seated stretch (cm)	13.81	4.67	13.99	4.38	0.98	.001
	Push-ups in 30 seconds (times)	12.09	4.09	12.39	3.83	0.98	.001
	Crunches in 30 seconds (times)	19.67	2.67	19.67	2.61	0.98	.001
	30-meter sprint (s)	4.86	0.48	4.85	0.49	0.97	.001
	Long jump (cm)	222.69	20.12	223.22	19.89	0.98	.001
	4x10 meter shuttle run (s)	10.49	0.85	10.46	0.86	0.98	.001
	1000-meter run and walk (s)	309.23	40.36	311.92	38.68	0.94	.001
Female (n = 200)	Seated stretch (cm)	12.57	5.36	12.60	5.10	0.96	.001
	Knee push-ups in 30 seconds (times)	14.32	2.88	14.32	2.82	0.98	.001
	Crunches in 30 seconds (times)	15.03	3.75	15.02	3.57	0.98	.001
	30-meter sprint (s)	5.68	0.55	5.69	0.54	0.97	.001
	Long jump (cm)	168.35	14.10	168.24	14.76	0.96	.001
	4x10 meter shuttle run (s)	11.81	0.79	11.83	0.79	0.98	.001
	1000-meter run and walk (s)	410.95	45.80	409.05	46.23	0.95	.001

The data in Table 3 demonstrates that  $\text{sig} = 0.001$  and the confidence coefficient for all fitness assessment tests are more than 0.9. As a result, the fitness evaluation tests used for research participants are valid.

**Validity Test:** To test the validity of the research criteria, the authors conducted the factor analysis (Vinh, & Khai, 2008), (Trong, & Ngoc, 2008) on VNUHCM students.

The samples for the validity test consisted of 400 VNUHCM undergraduates. IBM SPSS Statistics 22.0 was used to do factor analysis. Tables 4 and 5 illustrate the outcomes.

**Table 4: KMO and Bartlett's Test**

		Male	Female
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.610	.588
Bartlett's Test of Sphericity	Approx. Chi-Square	145.492	66.440
	Df	21	21
	Sig.	.000	.000

As shown in Table 4, the outputs of KMO (Kaiser-Meyer-Olkin) and Bartlett's Test on the applicability of factor analysis indicate that it is appropriate for this research (KMO 0.5 and  $\text{sig} = 0.001$ ). Consequently, the findings reported in Table 5 allow the study to run the correlation between the factors and the central factor through the factor rotation matrix.



**Table 5. Factor Rotations**

Factor (criteria)	Male		Female	
	r	Sig	r	Sig
Seated stretch (cm)	.653	<0.01	.571	<0.01
Push-ups in 30 seconds (male) (times)	.722	<0.01	.758	<0.01
Knee push-ups in 30 seconds (female) (times)	.651	<0.01	.690	<0.01
Crunches in 30 seconds (times)	.814	<0.01	.661	<0.01
30-meter sprint (s)	.806	<0.01	.805	<0.01
Long jump (cm)	.696	<0.01	.569	<0.01
4x10 meter shuttle run (s)	.751	<0.01	.832	<0.01
1000-meter run and walk (s)				

Table 5 displays the correlation coefficient between the criteria and the central factor (fitness criteria), with all seven items having correlations with  $r > 0.4$  and sig 0.01. In other words, all criteria are applicable for VNUHCM students' fitness assessment. In terms of males, the 30-meter sprint (0.814) has the highest validity, while the item of crunches in 30 seconds (0.651) has the lowest validity; the remaining criteria have validity ranging from 0.653 to 0.806. In terms of females, the item of 1000-meter run and walk (0.832) reaches the highest validity, while the lowest one belongs to the 4x10 meter shuttle run (0.569); the remaining criteria possess the validity ranging from 0.571 to 0.805. In conclusion, the above 07 criteria have sufficient validity to measure the physical fitness of VNUHCM undergraduates.

In short, through three steps of document synthesis, interview, reliability, and validity tests, eight fitness criteria were selected for both male and female students at VNUHCM as follows:

**Speed:** 30-meter sprint (s)

**Strength:** Long jump (cm), crunches in 30 seconds (times), push-ups in 30 seconds (male) (times), and knee push-ups in 30 seconds (female) (times)

**Endurance:** 1000-meter run and walk (s)

**Flexibility:** Seated stretch (cm)

**Agility:** 4x10 meter shuttle run (s).

#### 4. DISCUSSION

Eight fitness criteria with sufficient reliability and validity have been found for research subjects. The degree of assurance when a measured result (obtained through a test) accurately depicts the actual status of a particular ability is known as reliability. The consistency of the test outcomes when it is run again on the same item under the same circumstances is what determines test reliability. A test with high reliability should require that each participant's test results be comparable across tests conducted under the same conditions.

Even with thorough standardized and highly accurate measuring tools, the test results sometimes fluctuate slightly. The causes are mainly from changes in the state of experimental subjects (fatigue, motivation, attention span, etc.).

Variations in the environment and non-standard measuring devices such as temperature, wind, humidity, power supply, and so on. They are also referred to as natural errors of measurement. Changes in the state of those who conduct assessments.

Flaws in test-making procedures (Vinh, & Loc, 2010).

According to Chi (2004), and Vinh and Loc (2010) the correlation coefficient between two quantities (the results from the first and the second tests) is utilized to assess their reliability, in which repeating tests is a popular approach to evaluate it (Retest). This approach aims to evaluate the degree of correlation or similarity between the two test's outcomes. Both the first and the follow-up tests should be done under the same circumstances, and the interval is adequate for the subject to fully recover. It should be noted that the interval should not be

too large to impair the subject. Typically, the ideal period is between 1 and 7 days. Then, based on the properties of the measured sign, quantitative correlation analysis or rank correlation can be used to compare the two sets of data (test and retest). Finally, the correlation coefficient shall be employed as *the reliability coefficient* (Vinh, & Loc, 2010).

Validity tests evaluate the precision of each measurement item used to identify a certain trait (quality, capability, characteristic, etc.). Validity is frequently utilized in sports as experimental validity (also known as statistical validity). The association between test results and an intermediary indicator that is directly connected to the signal to be examined is what is meant by empirical validity. Central factors are the name given to these intermediary markers. Popular central factors in sports measurement are:

- Sports performance is measured by physical units of measurement (m, s, kg, times, etc.) or synthetic indications when no specific indicator is available, such as competition rank, the total score in matches, and so on.

- Quantifiable components of a complete competition (the frequency of steps and hand paddles when swimming, the force of stomps in long and high jumps, etc.) (Vinh, & Loc, 2010).

In reality, there may be cases when there is no central factor to determine validity while multiple tests are used for the same goal. In this paper, for particular, the criteria for assessing the physical fitness of VNUHCM undergraduates are identified based on the authors' personal experience, consultation with specialists, and qualitative analysis. However, no research has yet established the index as the central factor of the student's fitness.

The research findings have chosen seven fitness criteria. These criteria have been used to assess the fitness of various subjects, but are they typical criteria for assessing the undergraduate's fitness? That remains to be determined. As a result, it is necessary to determine the validity of these criteria regarding the VNUHCM students' physical fitness.

If fitness is thought of as a compositional factor, fitness tests (variables) must correlate with themselves. A statistical study known as factor analysis should be used to discover the composite factors that reflect the variables (criteria) in the research setting. In this case, the goal of factor analysis is to convert a collection of 07 original variables into a composite variable (fitness).

The correlation coefficient illustrates how each criterion contributes to the composite factor (fitness). That correlation coefficient is used to calculate the notification coefficient. The high coefficient indicates that the criteria contain a significant amount of fitness-related information. In sports practice, when the coefficient  $|r| \geq 0.4$ ,  $\text{Sig} < 0.05$ , that criterion is deemed valid and applicable (Vinh, & Loc, 2010).

The term factor analysis refers to a broad range of procedures employed to condense and summarize the data. A lot of variables are gathered in this study, and these variables are connected. Each criterion is viewed as ***an independent variable*** in factor analysis.

According to Trong and Ngoc (2008), factor analysis may be used to detect factors that explain the correlation relationships in a set of numerous variables, as well as to identify an outstanding factor or a group of notable variables from the larger group.

By dividing into groups of main factors, factor analysis may determine the weight or factor score coefficient of each variable for the fundamental factor. At the same time, factor analysis also identifies the variable with the highest factor weight in these groups.

The use of computers and specialized statistical software, particularly SPSS software, is necessary for factor analysis, a rather complex statistical analysis technique. The common factor can form a new independent variable whose values are calculated by multiplying the values of the original variables in the group by the factor coefficients. The values of this new variable are the factor score:

$$F_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + \dots + W_{ik}X_k$$

In which F stands for the estimated factor value (factor score), W for the weight or factor score coefficient, and X for the original variable values.

The factor coefficient matrix is estimated for each individual (also known as the multiplier). Thanks to this matrix, the study can calculate the multipliers (the value of the composite factor).

The research results established 08 fitness assessment criteria for VNUHCM students that are relatively comprehensive, consisting of 05 physical traits, including speed, strength, endurance, flexibility, and agility. When compared to domestic studies, the research findings demonstrate that the chosen assessment criteria are similar to 5 out of 8 criteria in the article Physical state of Vietnamese persons aged 6 to 60 produced by the Institute of Sports Science (2003), involving [30-meter sprint (s), long jump (cm), crunches in 30 seconds (times), seated stretch (cm) and 4x10 meter shuttle run (s)]. Furthermore, 4 out of 8 criteria are in accordance with Decision No. 53/2008/QĐ-BGDĐT, dated September 18, 2008, on Promulgating regulations on the assessment and grading of students' physical fitness (Ministry of Education and Training, 2008), involving [30-meter sprint (s), long jump (cm), crunches in 30 seconds (times), seated stretch (cm) and 4x10 meter shuttle run (s)]. These criteria can also be seen in a large number of domestic studies to evaluate schoolers' physical fitness, including Vinh et al. (2006), Chieu (2009), Hai (2012), Thanh (2013), Toan (2015), Cuong (2016), Vu (2016), Ha (2006), Hoa (2016), Giao (2017), Tuan (2017), Hung (2017), Cuong (2018), Thanh (2019), Hoa (2019), Thuc (2020), Cuong (2020), Hop (2022). Only the criterion of push-ups in 30 seconds (times) matches the study of Tuan et al. (2010).

Concerning international research works, the criteria of long jump, seated stretch, and crunches in 30 seconds are consistent with those of the Common European Community (1988), Bednarek, et al. (2016), American Alliance for Health and Physical Education, Recreation and Dance (2008), Test ICPER (International Committee for Physical Education and Recreation), Liu et al. (2017). Additionally, according to research by Keating, et al., youth fitness tests which are widely deployed in China CNPFT (China's National Physical Fitness Testing), European Union (EU) ALPHA-FIT (Assessing Levels of Physical Activity and Fitness), Russia and USA (Keating, et al. 2018), (Keating et al., 2019) agree with the selected criteria in this paper.

The selected criteria differ from domestic research works in the areas of measuring hand strength and general endurance. While other domestic writers use the grip strength of the dominant hand (kg) to test hand strength, this study uses the criteria of push-ups in 30 seconds (male) (times) and knee push-ups in 30 seconds (female) (times). Whereas other national writers utilize a 5-minute run to test general endurance, the study employs the criterion of 1000-meter run and walk (seconds). The difference between the selected criteria and the domestic research works is on the items of assessing hand strength and general endurance. While other domestic writers choose the grip strength of the dominant hand (kg) to assess the hand strength, this study selects [push-ups in 30 seconds (male) (times) and knee push-ups in 30 seconds (female) (times)]. While other domestic writers choose a 5-minute run to assess general endurance, the study uses [1000-meter run and walk (seconds)]. However, it is noted that the selected criteria are shared by a large number of foreign authors. The criterion of 1000-meter run (minute) is found in [Canadian Society for Exercise Physiology (CSEP), The Canadian Physical Activity Fitness & Lifestyle Approach (CPAFLA), 2003]; 30 seconds push-up (times) in ASEAN physical standard; and 1000-meter run and walk (minutes) in (Amornsriwatanakul et al., 2016), Association China's Sports and Physical Education Committee (1990). In 2014, they used the 1000-meter run (minutes) and push-ups criteria (China's National Sports and Physical Education Committee). The national fitness testing methods. Beijing, China: National Sports and Physical Education Committee, 1990], Test ICPER (International Committee for Physical Education and Recreation); the 1000-meter for males and push-ups criteria (Morrow et al., 2009).



Notably, the criterion of push-ups seems pretty simple to practice and test because no equipment is required, allowing students to build their own preparation for the assessment. In terms of the 1000-meter run criterion, students have certain distances from which to exercise and reach their greatest performance.

In summary, the eight fitness criteria chosen for VNUHCM undergraduates in this study are seen to be appropriate with the recent conditions and have inherited the merits of domestic and foreign articles.

## 5. CONCLUSION

For VNUHCM undergraduates, the article suggests 08 fitness assessment criteria with sufficient reliability and validity, including:

Speed: 30-meter sprint (s)

Strength: Long jump (cm), crunches in 30 seconds (times), push-ups in 30 seconds (male) (times), and knee push-ups in 30 seconds (female) (times)

Endurance: 1000-meter run and walk (s)

Flexibility: Seated stretch (cm)

Agility: 4x10 meter shuttle run (s).

## 6. ACKNOWLEDGEMENT

This research belonging to the project B2021-76-01 is funded by Vietnam National University Ho Chi Minh City.

## 7. REFERENCES

- American Alliance for health, Physical Education, Recreation and Dance. (2008). *Adapted Physical Education assessment scale II*, Reston, VA: Author.
- Australia Council for Health Physical Education and Recreation (ACHPER). *Handbook for the Australian Fitness Education Award manual*. Hindmarsh, Australia: ACHPER, 1996.
- Bednarek, J., Pomykała, S., Bigosińska, M., & Szyguła, Z. (2016). Physical activity of Polish and Turkish university students as assessed by IPAQ. *Central European Journal of Sport Sciences and Medicine*, 16(4), 13-22.
- Cale, L., & Harris, J. (2009). Fitness testing in PE: A misdirected effort in promoting healthy lifestyles and physical activity. *Physical Education & Sport Pedagogy*, 14(1), 89-108.
- Canadian Society for Exercise Physiology (CSEP). *The Canadian Physical Activity Fitness & Lifestyle Approach (CPAFLA): CSEP – Health & fitness program's health-related appraisal and counseling strategy*, 3rd ed., Ottawa, Canada, CSEP, 2003.
- Castro-Piñero, J., Attero, E. G., Espan˜a-Romero, V., Ortega, F. B., Sjostrom, M., Suni, J., & Ruiz, J. R. (2010). Criterion-related validity of field-based fitness tests in youth: A systematic review. *British Journal of Sports Medicine*, 44, 934-943.
- Chi, D. N. (2004). *Sports Measurement*, Sports Publishing House, Hanoi.
- Chieu, N. D. (2009). The current situation and solutions of physical education work of some universities in Ho Chi Minh City, scientific topics at ministerial level.
- Collins, A., & Halverson, R. (2010). The second educational revolution: Rethinking education in the age of technology. *Journal of Computer Assisted Learning*, 26(1), 18-27.
- Council of Europe Committee for the Development of Sport. *Eurofit Handbook for the EUROFIT tests of physical fitness*. Rome, Italy: Edigraf Editoriale Grafica, 1988.
- Csányi, T., Finn, K. J., Gregory, J., Zhu, W., Karsai, I., Ihasz, F., ... Molnar, L. (2015). Overview of the Hungarian National Youth Fitness Study. *Research Quarterly for Exercise and Sport*, 86(Suppl. 1), S3-S12.
- Cuong, D. N. (2016). Research on building advanced sports programs for students of Thai Nguyen University, PhD thesis in Educational Science, Institute of Sports Science, Hanoi.
- Cuong, N. M. (2020). Research and develop some solutions to improve the quality of physical education work of Phu Yen University, Doctoral thesis in Education, University of Sports, Ho Chi Minh City.

- Cuong, T. N. (2018). Research on building elective sports programs according to the club model in credit training of students at Saigon University, Doctoral thesis in education at University of Sports and Physical Education Ho Chi Minh City.
- Currell, K., & Jeukendrup, A. E. (2008). Validity, reliability and sensitivity of measures of sporting performance. *Sports Medicine*, 38(4), 297-316.
- Cvejic, D., Pejovic, T., & Ostijic, S. (2013). Assessment of physical fitness in children and adolescents. *Physical Education and Sport*, 11(2), 135-145.
- Dang, N. (2015). Research on building a model of sport linkage between Hue University and sports organizations in Hue City, PhD thesis in Educational Science, Institute of Sports Science, Hanoi.
- De Villiers, C., & van Staden, C. (2011). Shareholder requirements for compulsory environmental information in annual reports and on websites. *Australian Accounting Review*, 21(4), 317-326.
- Giao, T. N. (2017). Measures to implement the Physical Education program under the credit system at the University of Social Sciences and Humanities, Ho Chi Minh City, Doctoral Thesis in Educational Sciences, Institute of Science School of Sports, Hanoi
- Ha, H. (2016). Research on solutions to improve the quality of physical education work in member schools of Vietnam National University, Ho Chi Minh City, Doctoral Thesis in Educational Science, Institute of Physical Sciences and Sports, Hanoi.
- Hai, L. T. S. C. (2012). Renovating the physical education program for students of pedagogical universities in the North Central region in the direction of fostering professional skills in organizing school sports activities, Doctoral thesis in education, Institute of Science School of Sports, Hanoi.
- Harris, J., & Cale, L. (2006). A review of children's fitness testing. *European Physical Education Review*, 12, 201-225.
- Hoa, N. V. (2016). Improving the curriculum of elective sports for non-specialized students at Can Tho University, Doctoral Thesis in Educational Science, University of Sports, Ho Chi Minh City.
- Hoa, N. V. (2019). Measures to improve the effectiveness of physical education learning activities for students at Vietnam National University, Hanoi in the direction of positive learners, Doctoral Thesis in Educational Science, Institute of Sports Science, Hanoi.
- Hop, V. D. (2022). Research on improving the quality of physical education in the University of Danang, Doctoral Thesis in Educational Science, Institute of Sports Science, Hanoi.
- Hopple, C., & Graham, G. (1995). What children think, feel, and know about physical fitness testing. *Journal of Teaching in Physical Education*, 14, 408-417.
- Hung, N. T. (2017). Building an elective and extra-curricular physical education program for students of Quy Nhon University, Doctoral Thesis of Educational Science, University of Sports, Ho Chi Minh City.
- Institute of Sports Science (2003), Physical status of Vietnamese people from 6 to 20 years old (2001), Sports Publishing House, Hanoi.
- Keating, X. D., Castro-Piñero, J., Centeio, E., Harrison, L. J., & Ramirez, T. (2010). Health-related fitness knowledge and its relation to student physical activity patterns at a large U.S. southern state university. *ICHPER-SD Journal of Research*, 5(2), 3-9.
- Keating, X. D., Smolianov, P., Liu, X., Castro-Piñero, J., & Smith, J. (2018). Youth fitness testing practices: Global trends and new development. *Sport Journal*, 21(1).
- Mercier, K., & Silverman, S. (2014). High school students' attitudes toward fitness testing. *Journal of Teaching in Physical Education*, 33(2), 269-281.
- Ministry of Education and Training (2008), Decision No. 53/2008/QĐ-BGDĐT, dated September 18, 2008, Promulgating regulations on assessment and grading of students' physical fitness.
- Mohammad, A., Abraham, B., & Singh, J. (2011). Attitude of college students towards physical education and sports. *International Journal of Physical Education*, 4(1), 45-52.
- Morrow Jr, J. R., Zhu, W., Franks, D. B., Meredith, M. D., & Spain, C. (2009). 1958–2008: 50 years of youth fitness tests in the United States. *Research Quarterly for Exercise and Sport*, 80(1), 1-11
- Osipov, A. Y., Potop, V., Nagovitsyn, R. S., Zemba, E. A., Knyazev, A. P., Orlova, I. I., ... & Iermakov, S. S. (2020). Indicators of physical activity and fitness of male students at Russian universities. *Physical Education of Students*, 24(1), 40-46.
- Pasek, M., Michalowska-Sawczyn, M., & Nowak-Zaleska, A. (2014). Changes in maximal aerobic fitness and students' attitude towards physical effort during outdoor and indoor school lessons of PE. *Baltic Journal of Health and Physical Activity*, 6(1), 24.
- Scott, S. P., De Souza, M. J., Koehler, K., & Murray-Kolb, L. E. (2017). Combined iron deficiency and low aerobic fitness doubly burden academic performance among women attending university. *The Journal of Nutrition*, 147(1), 104-109.
- Silverman, S., Keating, X. D., & Phillips, S. (2008). A lasting impression: A pedagogical perspective on youth fitness testing. *Measurement in Physical Education and Exercise Science*, 12(3), 146-166.
- Thanh, D. M. (2019). Innovating the content and methods of organizing extracurricular sports activities for students in Soc Trang province, Doctoral Thesis in Educational Science, Institute of Sports Science, Hanoi.

- Thanh, N. D. (2013). Developing the content and form of organizing extracurricular sports activities of students of some universities in Ho Chi Minh City, Doctoral thesis in Education, Institute of Sports Science, Hanoi.
- Thuc, N. C. (2020). Building a model of sports clubs for An Giang University, An Giang province, Doctoral thesis in Education, University of Sports, Ho Chi Minh City.
- Toan, N. V. (2015). Research on solutions and evaluate the effectiveness of physical education according to the credit system for college students of physical education pedagogy at Hong Duc University, Thanh Hoa, Doctoral thesis of Science Education, Institute of Sports Science, Hanoi
- Tuan et al. (2010). Research on building physical assessment standards for 19-22-year-old students in Ho Chi Minh City, City-level scientific research project, Department of Science and Technology of Ho Chi Minh City.
- Vinh, D. et al. (2006). Research on the physical status of young people in universities - colleges - high schools and vocational schools in Ho Chi Minh City, Ministry-level topic.
- Vinh, D., & Khai, H. T. (2008). Statistics in sports, Sports Publishing House, Ho Chi Minh City.
- Vinh, D., & Loc, T. H. (2010). Sports measurement, Hanoi Sports Publishing House.
- Vu, N. H. (2016). Application of some solutions to improve the quality of physical education for students of Hoa Sen Private University, Doctoral Thesis in Educational Science, Ho Chi Minh City University of Sports.
- Wrench, A., & Garrett, R. (2008). Pleasure and pain: Experiences of fitness testing. *European Physical Education Review*, 14(3), 325-346.