

Selection Criteria and a Battery of Specific Physical Fitness Tests for Vietnamese University Students: A Case Study of Elective Basketball Courses

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Abstract:

Objective: This study aimed to establish scientific criteria and identify an appropriate battery of specific physical fitness tests with adequate reliability and validity for Vietnamese university students enrolled in elective basketball courses.

Methods: The study employed document analysis, expert consultation using a two-round Delphi process involving 30 experts, and a pedagogical experiment with 120 university students, comprising 60 males and 60 females. Test-retest reliability was evaluated using Pearson's correlation coefficient (r), while empirical validity was examined through correlations between test performance and actual game performance. Exploratory Factor Analysis (EFA) was used to optimize the test battery.

Results: Five fundamental criteria for test selection were identified: specificity, reliability, validity, feasibility, and safety. From an initial pool of 24 basketball-specific tests, seven tests met the predefined expert-consensus criterion and were subsequently evaluated for reliability and validity. Six tests demonstrated acceptable test-retest reliability, whereas the 20-m single-leg hop test showed insufficient reliability and was excluded. Of the remaining six tests, five demonstrated satisfactory empirical validity, while the 4 × 10-m shuttle run failed to meet the predefined validity criterion. The final battery therefore comprised five tests: (1) 30-s defensive shuffle; (2) 20-m variable-speed dribble sprint; (3) standing vertical jump to touch the backboard; (4) 20-s wall pass test; and (5) 1-min self-rebounding shooting test. The selected tests demonstrated high reliability ($r > 0.80$) and validity ($r > 0.60$). A 10-point evaluation scale based on the normal distribution ($M \pm SD$) was also established.

Conclusion: The five-test battery satisfies the predefined scientific and practical criteria and provides a feasible approach for assessing basketball-specific physical fitness among university students participating in elective basketball courses in Vietnam.

Keywords: Basketball; physical education; university students; specific physical fitness; test battery; reliability; validity.

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1. INTRODUCTION

Within the context of educational reform and integration in Vietnam, university physical education (PE) has increasingly shifted from a uniform compulsory model toward an elective, credit-based system. Basketball has become one of the popular elective choices among university students. However, the assessment of learning outcomes, particularly basketball-specific physical fitness, remains limited.

At present, many universities continue to rely predominantly on general physical fitness tests, such as the 100-m sprint, 1500-m run, and standing broad jump. Although these tests provide information about general physical capacity, they may not adequately capture the movement and physiological demands of basketball, which requires repeated explosive actions, rapid changes of direction, agility, speed, coordination, and technical execution under time constraints.

Previous studies have emphasized the importance of specific physical fitness in basketball performance. Delextrat and Cohen (2008) and Ostojic et al. (2006) reported associations between physical and physiological characteristics and basketball performance. Nevertheless, within the Vietnamese university context, there remains a lack of a standardized test battery specifically developed and statistically evaluated for non-major students participating in elective basketball courses.

Therefore, this study pursued three objectives:

To establish scientific criteria for selecting basketball-specific physical fitness tests for university students.

To identify a test battery demonstrating acceptable reliability and validity.

To establish standardized evaluation norms applicable to university students participating in elective basketball courses.

2. LITERATURE REVIEW

Physiological Characteristics and Basketball-Specific Physical Fitness

Basketball is characterized by intermittent high-intensity activity. Short-duration movement phases, including sprinting, jumping, defensive shuffling, and rapid directional changes, are repeatedly interspersed with brief recovery periods. These movement characteristics place substantial demands on explosive power, agility, speed, coordination, and anaerobic energy production.

Accordingly, physical fitness assessment in basketball should incorporate tests that reproduce, as far as practically possible, the movement patterns and physiological demands encountered during basketball participation. Tests involving changes of direction, explosive actions, ball control, passing, and shooting under time constraints may therefore provide more sport-specific information than conventional general fitness tests.

Criteria for Sports Testing

According to the principles of sports measurement and evaluation, a standardized physical fitness test should demonstrate adequate reliability, validity, and feasibility.

Reliability (r_{xx}): the degree to which repeated measurements produce consistent and stable results.

Validity (r_{xy}): the extent to which a test measures the intended physical capability and reflects the relevant performance criterion.

Feasibility: the extent to which the test can be practically implemented considering available facilities, equipment, time, and class size.

For university PE settings, feasibility is particularly important because large classes and limited access to sophisticated electronic measurement systems may restrict the use of highly technical testing procedures.

3. MATERIALS AND METHODS

Participants

Two participant groups were included.

Expert group: The expert sample consisted of 30 university PE lecturers specializing in basketball and national-level coaches, all with more than 10 years of professional experience.

Student group: The experimental sample comprised 120 non-major university students, including 60 males and 60 females aged 18–20 years. All participants were enrolled in elective basketball courses at three major universities in Ho Chi Minh City.

Research Procedures

Document Analysis and Synthesis

Domestic and international literature and educational curricula were reviewed to identify 24 commonly used basketball-related physical fitness tests.

Expert Consultation

A two-round Delphi procedure was conducted with 30 experts.

The first round was used to identify the fundamental criteria for test selection. The second round was conducted to screen and select individual tests according to the established criteria. Kendall's coefficient of concordance (W) was calculated to evaluate the degree of agreement among experts.

Pedagogical Testing

The selected tests were administered to the student sample according to a test–retest design.

First measurement: conducted at the end of the 10th academic week.

Second measurement: conducted three days after the first measurement.

The three-day interval was intended to allow sufficient physical recovery and minimize the influence of additional training between measurements.

Statistical Analysis

Data were processed using SPSS version 26.0.

Pearson's correlation coefficient was calculated to assess test–retest reliability and criterion-related validity:

$$R = \frac{(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{(x_i - \bar{x})(y_i - \bar{y})^2}}$$

The statistical significance level was set at $p < 0.05$.

4. RESULTS

4.1. Criteria for Selecting Basketball-Specific Physical Fitness Tests

The document analysis and first round of expert consultation identified five principal criteria.

Table 1: Evaluation of the importance of test selection criteria (N=30)

Rank	Selection criterion	Mean	SD	Agreement
1	Specificity	4.85	0.35	96.60%
2	Reliability	4.75	0.42	93.30%
3	Validity	4.6	0.48	90.00%
4	Feasibility	4.55	0.51	86.60%
5	Safety	4.4	0.6	83.30%

The level of agreement among experts was high ($W = 0.812$, $p < 0.01$).

Thus, the five criteria used for subsequent test selection were:

1. Basketball specificity;
2. Reliability;
3. Validity;
4. Feasibility;
5. Safety for non-major students.

4.2. Screening of Candidate Tests

From the initial pool of 24 tests, seven tests achieved an expert agreement rate of at least 75% and were retained for experimental verification.

Table 2: Expert interview results for test selection (Filtered for > 75%)

No.	Test	Main fitness component	Agreement	Decision
1	30-s defensive shuffle	Speed endurance; agility	96.60%	Selected
2	Standing vertical jump to backboard	Explosive leg power	93.30%	Selected
3	20-m variable-speed dribble sprint	Specific speed	90.00%	Selected
4	20-s wall pass test	Upper-limb speed-strength	86.60%	Selected
5	1-min self-rebounding shooting	Specific endurance	83.30%	Selected
6	4 × 10-m shuttle run	General agility	80.00%	Selected
7	20-m single-leg hop	Leg strength endurance	76.60%	Selected

The standing broad jump and 1500-m run did not reach the 75% consensus threshold and were therefore eliminated.

4.3. Reliability of the Selected Tests

Test-retest reliability was evaluated in the 120-student sample. A coefficient of $r \geq 0.80$ was defined as the criterion for acceptable reliability.

Table 3: Reliability verification results of 7 tests (Test-Retest)

No.	Test	Male r	Female r	Decision
1	30-s defensive shuffle	0.89	0.87	Passed
2	Standing vertical jump to backboard	0.92	0.91	Passed
3	20-m variable-speed dribble sprint	0.88	0.85	Passed
4	20-s wall pass test	0.86	0.84	Passed
5	1-min self-rebounding shooting	0.82	0.81	Passed
6	4 × 10-m shuttle run	0.84	0.82	Passed
7	20-m single-leg hop	0.65	0.62	Failed

The 20-m single-leg hop test failed to meet the predefined reliability criterion. The source attributes this result to unstable execution among non-major students, particularly balance-control difficulties that produced greater measurement variability between testing sessions. The test was consequently excluded.

4.4. Validity of the Tests

Criterion-related validity was examined by correlating the performance of the six remaining tests with an **actual game performance score**. The latter was independently assessed by three lecturers using a 10-point scale.

A correlation coefficient of $r \geq 0.60$ was defined as the criterion for satisfactory validity.

Table 4: Correlation coefficients between test results and actual game performance

No.	Test	Male <i>r</i>	Female <i>r</i>	Decision
1	30-s defensive shuffle	0.78	0.75	Passed
2	Standing vertical jump to backboard	0.68	0.65	Passed
3	20-m variable-speed dribble sprint	0.72	0.7	Passed
4	20-s wall pass test	0.66	0.63	Passed
5	1-min self-rebounding shooting	0.81	0.79	Passed
6	4 × 10-m shuttle run	0.45	0.42	Failed

The 4 × 10-m shuttle run was excluded because its correlation with actual game performance was below the predefined threshold. The source explains that, although the test assesses general agility, it does not incorporate ball control and therefore may be less representative of basketball-specific physical performance than the variable-speed dribble sprint.

4.5. Final Test Battery

Following the sequential screening, reliability, and validity analyses, five official tests were retained:

1. **30-s defensive shuffle** — repetitions;
2. **20-m variable-speed dribble sprint** — seconds;
3. **Standing vertical jump to touch the backboard** — centimetres;
4. **20-s wall pass test** — repetitions;
5. **1-min self-rebounding shooting test** — successful shots.

4.6. Development of Evaluation Norms

Based on the performance distribution of the 120 students, a 10-point evaluation scale was constructed using the normal distribution approach ($M \pm SD$). A score of 5 was defined as corresponding to the mean performance, with each score level separated by 0.5 SD.

Table 5: Basketball Specific Physical Fitness Evaluation Norms (For Male Students)

Score	Classification	Defensive shuffle	20-m dribble sprint	Vertical jump	Wall pass	1-min shooting
9–10	Excellent	≥25	≤4.20 s	≥55 cm	≥22	≥8
7–8	Good	22–24	4.21–4.50 s	48–54 cm	19–21	6–7
5–6	Average/Pass	18–21	4.51–4.90 s	40–47 cm	15–18	4–5
<5	Poor	<18	>4.90 s	<40 cm	<15	<4

The source indicates that corresponding norms for female students were constructed using the same approach, with performance parameters approximately 15–20% lower depending on the specific test.

5. DISCUSSION

The findings indicate a shift from assessing general physical fitness toward assessing basketball-specific physical fitness within university PE. The selected battery integrates physical capacities with movement patterns and technical demands characteristic of basketball.

Scientific Basis of the Selected Tests

The 30-s defensive shuffle showed a strong association with actual game performance ($r = 0.78$ in males and 0.75 in females). Its movement pattern reflects the repeated lateral movements required during defensive play.

The 1-min self-rebounding shooting test demonstrated the highest validity coefficient among the selected tests ($r = 0.81$ in males and 0.79 in females). The test combines repeated movement, deceleration, rebounding, and shooting, thereby integrating specific endurance and neuromuscular coordination under conditions of accumulated fatigue.

Practical Feasibility

The proposed battery was designed to accommodate the practical conditions of university PE in Vietnam. Unlike testing systems requiring photocells or other sophisticated electronic equipment, the five tests require only basic basketball facilities and equipment, including a basketball, stopwatch, and standard court markings.

This simplicity facilitates implementation in relatively large classes and may allow instructors to complete testing within approximately one to two teaching periods.

Elimination of Non-Specific or Unreliable Tests

The sequential exclusion of the 20-m single-leg hop and 4 × 10-m shuttle run illustrates the importance of empirically evaluating candidate tests rather than assuming that commonly used general fitness tests are automatically appropriate for basketball.

The single-leg hop demonstrated insufficient test-retest reliability, whereas the 4 × 10-m shuttle run demonstrated insufficient validity relative to actual game performance. These findings support the use of a screening process incorporating both measurement consistency and sport-specific validity.

6. CONCLUSION

The study identified five fundamental criteria for selecting basketball-specific physical fitness tests for university students: specificity, reliability, validity, feasibility, and safety.

Following expert screening and empirical verification, a five-test battery was established:

1. 30-s defensive shuffle;
2. 20-m variable-speed dribble sprint;
3. Standing vertical jump to touch the backboard;
4. 20-s wall pass test;
5. 1-min self-rebounding shooting test.

All five selected tests met the predefined reliability criterion ($r > 0.80$) and validity criterion ($r > 0.60$). Standardized evaluation norms based on the $M \pm SD$ approach were also developed.

The proposed battery provides a practical framework for assessing basketball-specific physical fitness among university students participating in elective basketball courses in Vietnam and may serve as a reference for PE assessment and curriculum implementation.

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