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Selection of fitness tests for male basketball athletes at Industrial University Ho Chi Minh city

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Abstract
This study aims to select fitness tests for male basketball players at Industrial University Ho Chi Minh City. The paper has employed conventional sports research methodologies including document references, surveys, pedagogical tests, and statistical mathematics, to accomplish three important phases of document synthesis, survey, and reliability test. The results ended up choosing 13 tests to assess the strength and power of male athletes at the university. The thirteen selected fitness tests are to measure nine major strength aspects, as follows: Explosive strength: spot jumps (cm); Acceleration and Deceleration: T-test of agility (s); Resistance: pushups (times/minute), supine flexion (times/minute); Maximum strength: weightlifting (kg), floor press (kg); Professional Speed: defensive slides (s), dribbles (s); Stamina: ball passing for 30 seconds (points/30s), moving to shoot a basketball at five 2-point positions (points/minute); Shooting accuracy: moving to shoot a basketball at five 3-point positions (successful shoots/minute); Speed: 20-meter sprint (s); Balance: hexagon jumps (s).

Keywords: test, strength, basketball, industrial university, ho chi minh city

Introduction

Basketball is one of the world's most popular sports. It is considered a fast-paced sport since the only way to score points is to put the ball into the opponent's basket, which can only be done by shooting one-, two-, and three-point free throws [4, 5]. Therefore, basketball players are required to be able to shoot the ball with a high degree of proficiency, regardless of their position (e.g., guard, forward, center) or rival's hindrance. Basketball players, as a result, must have a range of physical qualities, including strength, agility, and aerobic capacity, in order to handle the obstacles on courts (e.g., jumping, running, changing direction, shuffling) [6, 7]. In their recent research, Cabarkapa *et al*. [8] discovered that total body strength and lower extremity strength in men's basketball players were positively connected to amateur competition possibilities, with greater values associated with higher levels of professional competition [9].

Basketball is also a direct contact sport, thus professional athletes must be physically active, especially in terms of strength. Thus, it is necessary to evaluate the effectiveness of current exercises utilized in improving physical strength for basketball players. To do it, it is required to have scientific and thorough fitness tests for an accurate assessment of one basketball player's physical prowess. Given its importance, the researchers attempted to research on:

"Selection of fitness tests for male basketball athletes at Industrial University Ho Chi Minh City".

The aim of the study is to select appropriate fitness tests for male athletes of the Industrial University Ho Chi Minh City's basketball team.

Methodology

To achieve the stated aim, the authors utilized document references, questionnaire surveys, pedagogical tests, and statistical methods during the research process.

Research subjects include 12 male basketball players from Industrial University Ho Chi Minh City.

Surveyees include 12 individuals who are 04 basketball teachers, 03 basketball coaches in Ho Chi Minh City, 03 managers, and 02 experts with coaching and teaching experience.

Results

To determine professional -fitness tests for male athletes of the Ho Chi Minh City University of Industry's basketball team, the following steps are employed:

- **Step 1:** Synthesizing domestic and international tests being utilized to evaluate basketball players' physical prowess and technical abilities
- **Step 2:** Surveying twelve experts, coaches, and sports officials with the expertise of basketball fitness tests
- **Step 3:** Examining the reliability of the selected tests

3.1 Synthesizing domestic and international tests being utilized to evaluate basketball players' physical prowess and technical abilities

Different fitness tests designed by prominent researchers in the country and across the world, such as Nguyen Ngoc Hai (2004) [1], Nguyen Ngoc Hai (2012) [2], Nguyen Ngoc Hai, Le Minh (2013) [3], Chaouachi, A *et al* (2009) [10], Delextrat A *et al* (2008) [11], Ben Abdelkrim N *et al* (2010) [12], Ben Abdelkrim N *et al* (2010) [13], Gomes JH (2017) [14], Jakovljevic ST *et al* (2012) [15], Bloomfield J *et al* (2007) [16], Pareja-Blanco F *et al* (2016) [17], García-Gil M *et al* (2018) [18] and others, were comprehensively gathered. Through the synthesis process, it was discovered that some fitness tests are widely acknowledged to be appropriate for assessing basketball athletes' physical prowess. Nonetheless, several tests have yet to gain widespread acceptance.

Two following principles were followed to select the suitable fitness tests for male athletes of the Industrial University Ho Chi Minh City's basketball team:

- Choosing the fitness tests that are approved by a large number of writers (at least 50%).

- Choosing the fitness tests that are seldom used but are appropriate for basketball characteristics and the current situation of the locale.

Following the above principles, 13 fitness tests were chosen, including spot jumps (cm), pushups (times/minute), supine flexion (times/minute), weightlifting (kg), floor press (kg), defensive slides (s), dribbles (s), ball passing for 30 seconds (points/30s), moving to shoot a basketball at five 2-point positions (points/minute), moving to shoot a basketball at five 3-point positions (successful shoots/minute), 20-meter sprint (s), hexagon jumps (s), T-test of agility (s).

3.2 Surveying twelve experts, coaches, and sports officials with the expertise of basketball fitness tests

The authors constructed the questionnaire and delivered it to 12 experts. They were surveyed twice a month apart, with the same questionnaire and answering form as agree and disagree. The first and second interviewees comprised 12 people: 04 basketball lecturers, 03 basketball coaches in Ho Chi Minh City, 03 managers, and 02 specialists with coaching and teaching experience. Afterward, the squared test (X^2) was used to measure the difference between the results, obtaining the data shown in Table 3.1.

Table 3.1: Results of the expert consultation on the thirteen chosen fitness tests for male athletes of Industrial University Ho Chi Minh City's basketball team

	TEST	Results				X^2	P
		1st (n = 12)		2nd (n = 12)			
		Agree	%	Agree	%		
1	Spot jumps (cm)	12	100.0	12	100.0	0.00	>0.05
2	Pushups (times/minute)	10	83.33	11	91.67	3.18	>0.05
3	Supine flexion (times/minute)	10	83.33	11	91.67	3.18	>0.05
4	Weightlifting (kg)	10	83.33	9	75.00	2.10	>0.05
5	Floor press (kg)	10	83.33	10	83.33	0.00	>0.05
6	Defensive slides (s)	12	100.0	12	100.0	0.00	>0.05
7	Dribbles (s)	10	83.33	11	91.67	3.18	>0.05
8	Ball passing for 30 seconds (points/30s)	10	83.33	11	91.67	3.18	>0.05
9	Moving to shoot a basketball at five 2-point positions (points/minute)	10	83.33	9	75.00	2.10	>0.05
10	Moving to shoot a basketball at five 3-point positions (successful shoots/minute)	12	100.0	12	100.0	0.00	>0.05
11	20-meter sprint (s)	10	83.33	11	91.67	3.18	>0.05
12	Hexagon jumps (s)	10	83.33	11	91.67	3.18	>0.05
13	T-test of agility (s)	10	83.33	9	75.00	2.10	>0.05

Table 3.1 reveals that all of the fitness tests receive at least 75.00% agreement from the experts. Both surveys indicate that $X^2_{calculated} < X^2_{table} = 3.84$ at the probability threshold $P > 0.05$, implying that the difference between the two observed values was not statistically significant at $P > 0.05$. In other words, all of the twelve experts, coaches, and teachers have a high consensus on their answers throughout the two surveys.

The study has chosen 13 fitness tests for male athletes of the Industrial University Ho Chi Minh City's basketball team, with a total number of votes in favor of 75.00% of the respondents via both interviews, as follows: Spot jumps (cm), pushups (times/minute), supine flexion (times/minute), weightlifting (kg), floor press (kg), defensive slides (s), dribbles (s), ball passing for 30 seconds (points/30s), moving to shoot a basketball at five 2-point positions (points/minute), moving to shoot a basketball at five 3-point positions (successful shoots/minute), 20-meter sprint (s), hexagon jumps (s), T-test of agility (s).

3.3. Test of reliability

It is believed that there should be a reliability coefficient test on the research subjects to check the reliability of the chosen fitness tests. The test was done in two batches with a 5-day gap, with the conditions between the two sessions being the same. The authors then calculated the correlation coefficient (r) of the two tests and obtained the data shown in Table 3.2.

If the correlation coefficient $r > 0.8$ and $P < 0.05$, the content is sufficiently reliable.

If the correlation coefficient $r < 0.8$, the content is not reliable.

Table 3.2: Reliability coefficient of fitness tests for male athletes of the Industrial University Ho Chi Minh City's basketball team

N.	Test	1st		2nd (retest)		r	P
		X	S	X	S		
1	Spot jumps (cm)	53.85	2.91	54.85	3.04	0.91	< 0.05
2	Pushups (times/minute)	31.33	3.42	34.83	3.51	0.93	< 0.05
3	Supine flexion (times/minute)	34.42	2.02	36.50	2.50	0.90	< 0.05
4	Weightlifting (kg)	58.33	3.90	62.33	3.82	0.89	< 0.05
5	Floor press (kg)	34.33	2.69	37.58	2.63	0.92	< 0.05
6	Defensive slides (s)	10.88	0.55	10.34	0.57	0.85	< 0.05
7	Dribbles (s)	8.83	0.21	8.49	0.23	0.90	< 0.05
8	Ball passing for 30 seconds (points/30s)	58.17	2.73	60.33	2.62	0.93	< 0.05
9	Moving to shoot a basketball at five 2-point positions (points/minute)	16.67	1.60	18.58	1.66	0.86	< 0.05
10	Moving to shoot a basketball at five 3-point positions (successful shoots/minute)	1.83	0.69	3.00	1.08	0.86	< 0.05
11	20-meter sprint (s)	3.13	0.16	2.97	0.18	0.89	< 0.05
12	Hexagon jumps (s)	14.41	0.93	13.87	0.89	0.93	< 0.05
13	T-test of agility (s)	9.55	0.51	9.13	0.42	0.87	< 0.05

Table 3.2 demonstrates that the reliability coefficients of the two tests both have $r > 0.8$, and $P < 0.05$. It suggests that the above set of the chosen fitness tests has a strong correlation, and sufficient reliability, so they can be used to measure the strength of male basketball players at Industrial University Ho Chi Minh City.

In summary, 13 following fitness tests to measure physical prowess are selected for male players of the Industrial University Ho Chi Minh City basketball' team, based on the results of the document synthesis, surveys, and reliability test:

Explosive strength: spot jumps (cm)
Acceleration and Deceleration: T-test of agility (s)
Resistance: pushups (times/minute), supine flexion (times/minute)
Maximum strength: weightlifting (kg), floor press (kg)
Professional Speed: defensive slides (s), dribbles (s)
Stamina: ball passing for 30 seconds (points/30s), moving to shoot a basketball at five 2-point positions (points/minute)
Shooting accuracy: moving to shoot a basketball at five 3-point positions (successful shoots/minute)
Speed: 20-meter sprint (s) Balance: hexagon jumps (s).

Discussion

Strength is considered to be a vital factor in technical performance and motor activities in sports. Strength training is not simply to become muscularly built, it is also to fulfill the specific requirements of each sport.

Manifestations of maximum strength capacity in basketball performances

Basketball is widely acknowledged to be a direct contact sport in which maximal force capacity is usually represented through direct physical contact (insertion, encroachment, leaning against, etc.) between two or more players to take an advantageous position in the opponent's near-basket zone. It is not deniable the fact that the players with superior body weight and height always have an advantage in such battles, while those with slim figures frequently fail in the opponent's hoop. Therefore, physical prowess becomes one of the determinant factors directly affecting the effectiveness of attacking and defending tactics. Hence, it is not surprising that American basketball teams tend to favor tall and strong players for their teams.

Manifestations of strength-speed in basketball performances

Speed refers to the ability to express the maximum extent in the shortest period [22]. Basketball relies heavily on explosive speed because more than 70% of basketball movements are of the nature of speed.

Speed capacity is often seen in the passing of the ball which determines the ball's speed. Long passes in a swift counter-attack over defenders, or well-timed passes to teammates in ideal positions all necessitate incredibly high ball speed [20].

Manifestations of strength-resistance in basketball performances

A basketball game lasts 40 minutes (excluding rest and lost balls), whereas a high-intensity activity lasts 5 to 35 seconds, and the ratio of high-intensity to low-intensity activity is 1:1 [19]. As a result, one of the most crucial requirements is to retain stamina during each wave of high-intensity exercises until the end of the match.

An athlete's resistance ability is indicated by his/her ability to sustain the throwing power and the effectiveness of shooting throughout an extended period of time. Moreover, durable strength in the area of the body's center of gravity may ensure balance and stability when athletes sustain themselves at high intensity during competitions.

Conclusion

Via document synthesis, survey, and reliability testing methods, 13 fitness tests to assess the strength of male basketball players at Industrial University Ho Chi Minh City were selected, as follows

Explosive strength: spot jumps (cm)
Acceleration and Deceleration: T-test of agility (s)
Resistance: pushups (times/minute), supine flexion (times/minute)
Maximum strength: weightlifting (kg), floor press (kg)
Professional Speed: defensive slides (s), dribbles (s)
Stamina: ball passing for 30 seconds (points/30s), moving to shoot a basketball at five 2-point positions (points/minute)
Shooting accuracy: moving to shoot a basketball at five 3-point positions (successful shoots/minute)
Speed: 20-meter sprint (s) Balance: hexagon jumps (s).

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