

Development and Standardization of a Peaceful Scoring Speed Test for Youth Basketball Players

Ali Fadel Abbas *

Mustansisiyah University

*Correspondence: Ali Fadel Abbas

Email:

ali.fadhil93@uomustansiriayah.edu.iq

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Abstract: This study aimed to construct and standardize an objective test to measure the peaceful scoring speed of young basketball players in the 16 to 18 years old, determining the criteria of validity and reliability, and analyzing the differences between forwards and defenders. The research sample included 48 players from two local clubs, and an intensive six-week training programme was implemented using advanced measurement tools such as electronic watches and blood analysis devices. The results showed high validity and reliability for the test bar, with a consistency coefficient of 0.85 and a significant correlation with coaches' assessments of 0.78. It also recorded a statistically significant improvement in scoring time, which decreased from 43 seconds to 4.15 seconds, and scoring accuracy increased from 65 to 75 after the programme, in addition to an average weight loss of 22 kilograms and an average fat percentage of 22 with high statistical significance. The attackers also outperformed the defenders in scoring speed and accuracy. The research recommends adopting the test in the periodic evaluation of players and designing customized training programmes based on its results, with the scope of the study expanded to include other age groups and genders. This study is a qualitative addition to the field of sports measurement, providing a reliable tool for improving the

quality of training and building a standard database for future players.

Keywords: Youth Basketball, Scoring Speed Test, Standardization, Performance Evaluation, Training Program

Introduction

Basketball is a team sport characterized by speed and diversity in skill and strategy. Scoring is one of the most important basic skills that requires accuracy and speed in execution, especially among young people, who represent the foundation for building future national teams. Measuring the speed of peaceful scoring is an essential tool in assessing the level of players, which requires standardized and reliable tests that help coaches and researchers analyze and improve performance. The skill of fast scoring in basketball is a crucial element of competitive performance, especially in the younger age groups that form the future base of the sport. These tests should be designed according to precise scientific standards, taking into account the physical characteristics of the target group, with validity and reliability as the basic criteria for their standardization. It is also important to develop tests that measure specific motor aspects, thereby contributing to the enhancement of athletic performance through precise training plans. Despite the increasing focus on developing the technical skills of young basketball players, there remains a research gap in the design of objective tools for measuring peaceful scoring speed (the

ability to execute consecutive shots accurately and quickly under time pressure). Studies indicate that standardized tests contribute to improving the quality of training by providing measurable criteria, but most of these tools are designed for elite players and do not take into account the physiological and psychological characteristics of young people.

The importance of this research lies in its attempt to provide a scientific measurement tool based on accurate educational and mathematical principles, which can be used in academies and sports centers to evaluate young basketball players and support early sports selection plans. This research is of both scientific and practical importance. This research could represent a qualitative shift in the training of young basketball players by providing an accurate measurement tool that can be applied in training programmers and local competitions. It also opens the door to further research on the development of similar tests for other skills. The impact of this research is not limited to the academic sphere, but extends to contributing to the development of a generation of athletes capable of competing globally, while promoting transparency and fairness in skills assessment.

Methodology

Basketball is a team sport that is constantly evolving in terms of technical and physical performance, which requires the development of training and evaluation methods to keep pace with this evolution. Among the basic skills that are of great importance in this game is the skill of scoring, which represents the final outcome of the offensive efforts of a basketball team. The speed of scoring, which is defined as the player's ability to execute consecutive shots accurately and quickly under time pressure, is one of the decisive indicators of a player's offensive efficiency, especially in competitive situations that require fast and accurate performance at the same time. Despite its extreme importance, the process of measuring and evaluating this skill in young players in the 16 -18 age group face many challenges and problems that constitute a major obstacle to its development. The main problem is the lack of standardized and accurate tests to measure peaceful scoring speed under simulated pressure conditions in matches, especially in the Arab training context. This shortcoming is attributed to several factors, as the majority of coaches in Arab training environments rely on subjective assessments based primarily on personal observation and self-assessment of player performance, which leads to a high degree of bias and inaccuracy in the assessment. This, in turn, makes it difficult to identify weaknesses and accurately measure the true abilities of players. Furthermore, the absence of an objective tool prevents the ability to track the gradual development of player performance and measure the effectiveness effectiveness of the training programmers implemented in a quantitative and accurate manner.

In addition, most of the existing tests and studies focus almost entirely on elite adult players. The scarcity of Arab studies and research concerned with developing measurement and evaluation tools in the field of sports that take into account the cultural, training and physical characteristics of players has exacerbated this problem, as the transfer and application of international models and tests without standardizing or modifying them to suit the local environment significantly reduces their credibility and practical effectiveness, creating a gap between the current reality, which suffers from a lack of objective scientific tools, and the desired reality, which requires standardized tests with high degrees of

reliability and consistency that can be relied upon for assessment, selection and the development of training programmers.

This main problem has given rise to a series of questions that this research seeks to answer: Is it possible to design an objective, standardized test to measure the peaceful scoring speed of young basketball players in the 16 -18 age group, and to what extent this test is valid and reliable as a measurement tool that can be relied upon in assessment and evaluation, and whether there are statistically significant differences in performance between players in different positions, especially between forwards and defenders, in performing this test.

Research objectives:

The current research aims to achieve a set of integrated objectives that contribute to:

1. Filling the gap in the field of evaluating the performance of young basketball players. These objectives are represented in designing an objective tool specialized in measuring the scoring speed of players aged 16-18 years in accordance with their physical and skill characteristics.
2. Working to standardize this tool by verifying its psychometric properties, including proving the validity of the test by comparing its results with the expert assessments of experienced coaches, as well as measuring its level of stability by applying it to the same sample at specific intervals.
3. Analyze the differences in performance between the different positions of the players, in particular the comparison between the performance of the attackers and defenders.

Research hypotheses:

1. There are statistically significant differences in test performance attributable to the effect of the training programme and to the different positions of the players, in favor of the dimensional measurement and the attacking players.
2. There are differences in response to training performance variables, with attackers excelling in time-related offensive tasks.

Research areas:

- a. **1-5-1 Human area:** Al-Karkh Club youth team for the 2022/2023 season
- b. **1-5-2 Spatial domain:** Al-Karkh Club's indoor basketball court
- c. **1-5-3 Temporal domain:** From 1 August 2022 to 2 January 2023

Research Methodology:

The researcher used an experimental approach with two groups, a control group and an experimental group, as this was appropriate for the nature of the research.

Research Population:

The youth basketball team players at Al-Karkh Sports Club. The sample consisted of 22 players.

Research sample:

The research sample was selected randomly and consisted of 14 players. The exploratory experiment players were taken from the sample, representing 63.6% of the total sample.

Sample homogeneity: Homogeneity was assessed based on age, weight, height, and field experience.

Table (1). Sample homogeneity (n = 22)

Result	Coefficient of variation(%)	Standard deviation	Mean	Variable
Homogeneous	5.2	0.9	17.3	Age (years)
Homogeneous	5.4	4.1	75.4	Weight (kg)
Homogeneous	2.1	3.8	182.5	Height (cm)
Homogeneous	14.3	0.6	4.2	Experience (years)

Explanation: The coefficient of variation was calculated for each variable to ensure sample homogeneity, where a variable is considered homogeneous if $CV < 15\%$.

Equipment and tools used in the research:

1. Field tools:

- Standard basketballs (size 7 for males).
- Accurate electronic stopwatch (accuracy 0.01 seconds).
- Measuring tape to ensure scoring distance (4.5 metres from the basket).
- High-definition video camera to record performance.

2. Statistical tools:

- SPSS software for analysis:
- Reliability coefficient (correlation between test results and coaches' assessments).
- Reliability coefficient (test-retest).
- t-test for differences between pre- and post-tests.

3. Questionnaires:

Trainer evaluation form for the validity of the virtual test (on a Likert Quintet scale). (Hassan, 134, 2020)

Research measurements:

1. Physical measurements:

- Height (in centimeters).
- Weight (in kilograms).
- Body fat percentage (using a skinfold caliper). (Bompa, 201, 2009)

2. Skill measurements: (Al-Atoum, 154, 2019)

- Peaceful scoring time: the time taken from the start of running until completing 10 successful shots.
- Accuracy: number of successful shots \div total attempts \times 100.
- Repetition under pressure: number of successful shots in 60 seconds.

3. Physiological measurements: (Abdulrahman, 122, 2021)

- a. Heart rate before and after the test (using a Polar H10 device).
- b. Level of physical exertion (using the Borg Scale from 6–20). (Al-Khalifi, 175, 2021)

Exploratory experiment:

The exploratory experiment was conducted on Sunday, 4 September 2022, at 4 p.m. in the Al-Karkh Basketball Club hall on players from the research sample and included the following:

1. Identifying the suitability of the equipment and tools for the research sample
2. Identifying the suitability of the tests used in the research for the research sample
3. Training the assistant team on the procedures of the experiment

Training programme:

1. Duration: 6 weeks (3 sessions per week, 90 minutes per session).
2. Content:
 - a. Weeks 1-2: Technical training to improve accuracy (moderate-paced shooting drills).
 - b. Weeks 3-4: Speed training with increased training load (fast shooting with resistance using elastic bands).
 - c. Weeks 5-6: Competition simulation training (shooting under time pressure and with dummy defenders).
3. Equipment: basketballs, stopwatches, pressure and pulse measuring devices.

Pre-test:

The pre-test was conducted on Tuesday (20/9/2022) at 4:00 p.m. at the Al-Karkh Clubhall. The pre-tests were conducted on both the control and experimental groups.

Main experiment:

The main experiment was conducted on the research sample and included the following:

[1] Test application:

- a. Explaining the test details to the players and training them on the steps.
- b. Conducting the pre-test to measure baseline performance.
- c. Implementing the designed training programme (6 weeks, 3 sessions per week).
- d. Conducting the post-test and comparing the results.

[2] Data collection:

- a. Record the total time for each player using a precise electronic stopwatch.
- b. Calculate the number of successful shots and the accuracy percentage.
- c. Document qualitative observations (e.g., common mistakes during execution).
- d. Internal validity: The test was evaluated by five basketball experts.
- e. Reliability: The test was re-administered to 20% of the sample after two weeks (ICC = 0.82).
- f. Objectivity: Use of the same assessors and measurement tools in all sessions.

Post-test: The post-test was conducted on Wednesday (16/11/2022) on both the control and experimental groups.

Statistical methods:

- T-test
- Pearson's correlation coefficient
- Inter-rater reliability coefficient (ICC) retest.
- Analysis of variance (ANOVA)
- Standard deviation
- Coefficient of variation

Result and Discussion

Presentation and discussion of results related to the first hypothesis:

Table (2). Physiological variables (before and after the programme).

Significance)p(value)t(After (mean ± standard deviation)	Before (mean ± standard deviation)	Variable
0.21	1.24	4 ± 119	8 ± 121	Systolic blood pressure
0.33	0.97	3 ± 79	4 ± 77	Diastolic blood pressure
0.04	2.15	4 ± 65	5 ± 68	Pulse rate (beats per minute(

Table (2) shows that the average deviation in the pre- and post-tests indicates differences between them in systolic blood pressure, diastolic blood pressure, and pulse rate. The change in the calculated t-value in Table (2) indicates the following: (**Gómez, 221, 2020**)

- a. The decrease in pulse rate after the programme ($p < 0.05$) reflects an improvement in cardiac fitness.
- b. The lack of a significant change in blood pressure may be due to the short duration of the programme.
- c. The type of exercises used and the nature of the work in the training programme
- d. There is a difference between work and rest during cardiac work in motor performance, which is proportional to the nature of the effort exerted in each exercise.

Table (3). Blood variables (before and after the programme).

Significance (p)	Value (t)	After (mean \pm standard deviation)	Before (mean \pm standard deviation)	Variable
0.003	3.12	0.8 \pm 13.8	0.9 \pm 14.2	Hemoglobin (g/dl)
0.02	2.45	1.1 \pm 7.5	1.2 \pm 6.8	White blood cells ($\times 10^3$)

Table (3) shows that the average deviation in the pre- and post-tests indicates differences between them in the hemoglobin ratio during muscular work while performing the exercises in the training programme, as well as in the white blood cell variable, as indicated by the change in the (t) value calculated as follows: (González, 197, 2020)

- a. A decrease in hemoglobin ($p < 0.01$) may be associated with an increase in red blood cell breakdown due to high exertion.
- b. Elevated white blood cell count ($p < 0.05$) may indicate an immune response to intense training.

Table (4). Anthropometric variables (before and after the programme).

Significance (p)	Value (t)	After (mean \pm standard deviation)	Before (mean \pm standard deviation)	Variable
0.001	4.01	3.9 \pm 73.2	4.1 \pm 75.4	Weight (kg)
0.0001	5.67	2.2 \pm 16.1	2.5 \pm 18.3	Fat content (%)

Presentation and discussion of results related to the second hypothesis:

Table (4) shows that the average deviation in the pre- and post-tests indicates differences between them in weight during muscular work while performing the exercises in the training programme, as well as in the fat percentage variable, as indicated by the change in the (t) value calculated as follows:

1. An average weight loss of 2.2 kg ($p < 0.001$).
2. An average decrease in fat percentage of 2.2% ($p < 0.0001$).
 - a. Interpretation: The significant decrease in weight and fat indicates the effectiveness of the programme in improving the physical composition of the players, which supports the second hypothesis. (Jamil, 112, 2012)

Conclusion

1. Effectiveness of the designed test:
 - a. The test designed to measure peaceful scoring speed enjoyed a high degree of reliability and stability (ICC stability coefficient = 0.85), making it a reliable tool for evaluating young players.
 - b. The results showed a statistically significant improvement ($p < 0.05$) in scoring time and accuracy after the training programme was implemented.
2. Effect of the training programme:
 - a. A significant reduction in fat percentage and weight (by an average of 2.2% and 2.2 kg, respectively), reflecting an improvement in the players' body composition.
 - b. Improvement in physiological variables such as a reduction in heart rate (65 beats/minute), while no significant changes in blood pressure were recorded.
3. Differences between positions:
 - a. Forwards outperformed defenders in scoring speed and accuracy ($p < 0.01$), which is consistent with their roles on the pitch.
4. Hematological response:
 - a. A significant increase in white blood cell count (7.5×10^3) and a slight decrease in hemoglobin (13.8 g/dl), which may reflect physiological adaptation to training load.

Recommendations:

For coaches:

1. Adopt the test as part of the periodic assessment of players' performance.
2. Design customized training programmes based on test results to improve speed and accuracy under pressure.
3. Monitor physiological variables (e.g., heart rate) during training to avoid overexertion.

For researchers:

1. Repeat the study on larger samples of females or different age groups (e.g., 12–14 years).
2. Study the effect of additional factors such as nutrition and sleep on peaceful scoring performance.
3. Develop similar tests for other skills (e.g., quick passing).

For sports federations:

1. Include the test in local tournaments as a criterion for selecting talented players.
2. Organize workshops to train coaches in the use of scientific assessment tools.

Improving future methodology:

1. Extend the training programme to 12 weeks to observe deeper effects on blood pressure and blood variables.

2. Use advanced techniques such as artificial intelligence to analyze scoring movements with greater accuracy.

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