

## TESTS FOR ASSESSING ACCURACY IN BASKETBALL - A SYSTEMATIC REVIEW

Srdan Prodanović<sup>1</sup>, Goran Jelaska<sup>2</sup>, Marta Tomljanović<sup>3</sup>

<sup>1</sup>PFC Botev Plovdiv, 4001 Plovdiv, Bulgaria; [srdan.prodanovic@gmail.com](mailto:srdan.prodanovic@gmail.com)

<sup>2</sup>County Hospital Čakovec, 40000, Čakovec, Croatia;; Faculty of Kinesiology, University of Split;  
[goran.jelaska@bolnica-cakovec.com](mailto:goran.jelaska@bolnica-cakovec.com)

<sup>3</sup>Faculty of Food Technology and Biotechnology, University of Zagreb, Pierottijeva 6, 10000, Zagreb;  
[marta21077@gmail.com](mailto:marta21077@gmail.com)

Corresponding author: [srdan.prodanovic@gmail.com](mailto:srdan.prodanovic@gmail.com)

### ABSTRACT

---

*Basketball is a sport where the success of sports performance is reflected in the possession of technical-tactical and motor skills. Basketball shooting, which is closely related to accuracy, was previously recognized as the most frequently used and most important technique in the game. When it comes to precision, in basketball we talk about situational precision, which is seen as an integral part of technique, and it is necessary to evaluate and develop it in this way. For this reason, precision screening is a very important parameter when developing a training program. The following index databases were used to collect adequate literature: GoogleScholar, PubMed, MEDLINE. During the search, the following keywords were used: basketball, accuracy, tests, basketball, accuracy, testing, shooting tests. During the analysis and evaluation of the research, 16 researches were selected that corresponded to the topic and were included in the research. All 16 studies completely met the inclusion criteria. It can be concluded that the most frequently applied measuring instruments/tests in assessing the accuracy of basketball players are: shooting from the free throw line in 60 seconds, dynamic test of free throws in 60 seconds, jump shot tests in static and dynamic conditions, test of throwing from the free throw line, but also throwing from the left and right side of the free throw line, i.e. in the 2-point area, as well as the throw/jump shot test from the 3-point line.*

**Key words:** basketball, accuracy, test

### Introduction

Basketball is a multifaceted and complex team game that combines cyclic and acyclic movement structures. Basketball has changed a lot over the years. From the relatively slow and simple game at the very beginning of its existence to today's very complex movement structures that are performed in an unimaginably faster rhythm, the dynamics of the game and dynamic and fast actions are the main feature of contemporary basketball (Narzaki, Berg, Stergiu & Chen, 2019). Movement structures consist of movements with and without the ball. Many basketball movements performed with or without the ball (such as short sprints, sudden stops, quick changes of direction, accelerations, different vertical jumps) have a very explosive character (Boddington, Cripps, Scanlan & Spiteri, 2019). The same is true for hand movements, such as dribbling, different shots and passes (Abdelkrim, El Fazaa & El Ati, 2007), which indicates that motor skills such as strength, speed, agility, coordination are important success factors in modern basketball. However, the main goal in basketball is to score as many points as possible by putting the ball into the basket, which shows that accuracy is the leading ability that determines success in basketball (Miller & Bartlett, 1996). Basketball shooting, which is closely related to accuracy, was previously recognized as the most frequently used and most important technique in the game. Likewise, many researchers state that shooting accuracy strongly determines the outcome of a basketball game (Boddington et al., 2019).

Precision, as a basic motor ability, is the subject of many explanations. There are many opinions on the way precision is manifested, as well as on the way it is developed. Jakovljević (2010) emphasizes precision as "perhaps the most important motor skill" for successful basketball. In addition to its importance in shooting the target (basket), it is considered that precision is extremely important when passing the ball to a teammate, who may be stationary or moving. He states that the high precision of basketball players is conditioned by a good sense of space and localization of the goal. He believes that for precision training it is important to realize its connection with the technique and tactics of basketball. To improve accuracy, a large number of exercises are used to improve shooting and passing. On the other hand, Nićin (2001) states that precision has long been considered a segment of coordination, because performing precise movements requires good coordination. In addition to the connection between precision and coordination, its connection with strength and the influence of gender, age, and training on this ability stand out.

The tests that are most often used to test the accuracy of basketball players in the existing literature will be presented.

### *Defining basic terms*

*Basketball* is a multifaceted and complex team game that combines cyclic and acyclic movement structures. Movement structures consist of movements with and without the ball. *Motor abilities* are abilities that are part of the anthropological status of man together with cognitive, functional abilities and conative characteristics. A positive result in sports depends on the degree of development of basic and specific motor skills, while how they will manifest themselves during the game depends primarily on the individual characteristics of the athlete. (Grbović, 2013)

*Accuracy* is the ability to hit a specific target. Nićin (2001) states that precision has long been considered a segment of coordination, because performing precise movements requires good coordination. In addition to the connection between precision and coordination, its connection with strength and the influence of gender, age, and training on this ability stand out.

*Tests* (measuring instruments) are procedures used in the field of sports diagnostics in order to determine the state of sports form (current state) of an athlete. Of course, before choosing a

test, it is necessary to clearly define the goal(s), i.e. the reason(s) for testing. The tests are divided into: (Vučetić, 2009, 166) laboratory and field tests. And with regard to the characteristics of the test: specific, non-specific. With regard to the type of load, they are divided into tests: fixed; progressive load. While, with regard to the method of execution, they are divided into: continuous (without breaks between individual load levels), discontinuous (with breaks between individual load levels).

### ***Aim of the Study***

First, it was intended to gain a systematic and detailed insight into the literature that studied precision testing in basketball,

Secondly, it was intended to identify the tests that are valid, reliable and most applicable in practice.

### **Methods**

#### ***Searches***

The following index databases were used to collect adequate literature: GoogleScholar, PubMed, MEDLINE. During the search, the following keywords were used: basketball, accuracy, tests, basketball, accuracy, testing, shooting tests.

The works that were analyzed were mostly published in English.

#### ***Inclusion criteria***

The literature for analysis included research on the given topic written and published in English and Serbian. The respondents were basketball players who were involved in competitive basketball, and all of them voluntarily participated in the research. Professional basketball players, semi-professional basketball players, female basketball players, juniors, cadets, elite basketball teams, national basketball teams were taken into account. The studies that were included in this review had to be based on precision testing in the mentioned sample (basketball players).

#### ***Exclusion criteria***

Studies were not taken into account during the analysis if they were based on surveys and interviews, if they were recreational players, if it was about wheelchair basketball, and if the research did not include precision testing. Also, studies that did not explain the testing procedures or show the tests were not included.

#### ***Data Extraction***

The analysis of published papers on the subject of tests for assessing accuracy in basketball players is tabulated (Table 1).

### **Results and Discussion**

Following database searches, 16 paper were considered appropriate for review.

Emphasis is placed on measuring instruments (tests) that were used in research. In addition, the following data: first author and year of publication of the work, sample, aim of the work, measuring instruments used in testing the sample, as well as research results.

## TESTS FOR ASSESSING ACCURACY IN BASKETBALL - A SYSTEMATIC REVIEW

**Table 1:** Summary of papers included in the review

Authors	Year	Sample	Objective of the paper	Measuring Instruments	Results
Fisk	2005	n = 37	The researcher examined the influence of the training program on the accuracy of basketball players	Shooting from the free throw line in 60 seconds, shooting in the 2-point area from different positions, shooting from the 3-point line from different positions	3 training sessions per week, lasting 5 week (shooting training) were effective in improving the accuracy of basketball players.
Watanabe et al.	2011	n = 5	Assesing biomechanics and throwing accuracy	The test was 10 throws from the free throw line.	Players who lowered the ball (dip) before throwing had more accurate shots
Myrtaj et al.	2012	n = 71	They investigated the influence of morphological characteristics on the accuracy of throwing from the free throw line.	Throwing from the free throw line in 60 seconds and the throwing test 2x3 times with 3-minute breaks in the space for 2 points	Arm length, wrist circumference, as well as height the players had positive influences on the precision of basketball players
Pojskić et al	2014	n = 38	Investigating the relationship between physical fitness and accuracy during 1 season	Only accuracy tests will be shown: 3x10 free throw test, 60 second free throws, dynamic and static 3-point line shooting	The relationship was stronger when dynamic shooting tests were applied compared to stationary tests.
Matulaitis et al.	2016	n = 1051	The researchers tested the morphological characteristics and accuracy of basketball players Speed Spot Shooting.	Speed Spot Shooting Test (shooting from the motion), 30 shots from the free throw line, 1 min of free-throw shooting,.	The researchers concluded that the best period for the development of accuracy was between 7 –10 and 12–13 years

Thakur & Mahesh	2016	n-30	They investigated the influence of meditation on the shooting accuracy of basketball players	Shooting accuracy of basketball players was measured for 2-point shots, 3-point line shots, and 5m jump shots, dribble shots, Box shots (2-block shots) after a priod of meditation training.	Six weeks of meditation practice for basketball players has a positive effect and improves their shooting accuracy in game situations.
Kelmendi et al.	2018	n-34	This study intended ot determine the accuracy as well as validity of tests	Using Free throws (3 times 10 throws with 3 minutes rest between sets); Free throws continuously for 60 seconds; Throwing from the area for 2 points with 5 different positions.	The researchers concluded that the tests are practical and valid
Uzun & Pulur	2018	n=30	This study examined the impact of shooting training on the accuracy of 30 basketball players of average age ( $14.82 \pm 1.0$ ).	Tests included: jump shot in the 2-point area, jump shot from the 3-point line, zigzag running and jump shot (dynamic test).	In the initial and final testing statistically significant differences were found in the experimental group.
Savau et al.	2018		This study investigated the outcome of explosive strength exercises on shooting performance	Explosive strength and shooting exercises were applied eight weeks before the basketball season, on the level of shooting percentage of elite basketball players, i.e. to the precision of basketball players. The following tests were used as measuring instruments to assess accuracy: free throw from a static position, jump shot from a similar free throw and jump shot against the defense (1on1, i.e. situational conditions).	Eight weeks of explosive strength exercises have a positive effect on shooting performance
Neumann & Hohnke	2018	n = 30	Researchers examined the percentage of hits in different shooting conditions.	Free throws in 60 seconds, shooting from the two-point area next to a defender (1on1 situational conditions) and shooting from the 3-point line with	Situational training is the most effective training in improving basketball players' shooting accuracy

## TESTS FOR ASSESSING ACCURACY IN BASKETBALL - A SYSTEMATIC REVIEW

				a defender's block (situational conditions).	
Boddington	2019	n = 30	Determining the validity and reliability of accuracy tests.	Two shots from five different locations: shooting from the 3-point line; Off the dribble shooting; Shooting after dribbling; shooting test in motion.	He established the validity and reliability of all presented tests
Li & Feng	2020	n=88	They investigated the influence of experience and physical fitness on the accuracy of basketball players.	60 seconds of shooting from the free throw line, shooting from the 3-point line from different positions	Players with more playing experience had more accurate shooting
Penner	2021	n=34	She examined the biomechanics of the shot and the relationship between biomechanics and accuracy.	Throwing from the free throw line in 60 seconds, test of throwing from the 3-point line from different positions, jump shooting from the spot and from the movement.	Players who lowered the ball (dip) before throwing, they had more accurate shots.
Li et al.	2021	n=32	n = 32 They examined the influence of fatigue on the accuracy of basketball players.	Free throw shooting test in 60 seconds, jump shot from a distance of 5 m from the basket.	The results showed that the height of the shot and the angle of movement (trajectory) of the ball were significantly reduced in fatigue conditions
Alwan	2021	n=62	They tested the accuracy of basketball players based on their position in the team among 62 young professional basketball players who played in the professional league in 2021/22.	The following tests were used as measuring instruments to assess accuracy: jump shot from the free throw line, also jump shot from the left and right side of the free throw line.	Players must access situational training to improve all aspects of shooting

Ayaz & Deniz	2021	n=11	This study investigates visual tracking strategies and free throw accuracy.	10 throws from the free throw line, 10 throws from the 3-point line and 10 throws from the 2-point field.	The findings of his study supported the phenomenon of prolonged eye rest. Namely, the visual part of the throw is an important part that affects the accuracy of the throw
--------------	------	------	---	---	--

## TESTS FOR ASSESSING ACCURACY IN BASKETBALL - A SYSTEMATIC REVIEW

In the Fisk (2005) study, 37 basketball players from South Dakota in the USA of average age (18-19 years) participated. All respondents participated in the study voluntarily. The aim of the study was to examine the accuracy of basketball players after the experimental program (given that conditioning and training are not the subject of this paper, the program will not be shown). The tests that the author used to assess the accuracy of basketball players are: shooting from the free throw line in 60 seconds, shooting in the 2-point area from different positions, shooting from the 3-point line from different positions, and these are tests that have already been seen in the previously presented studies.

Further, the study by Watanabe, Sato & Igawa (2011) examined the degree of accuracy of basketball players in free throw situations, as well as the analysis of basketball players' shots. After the warm-up, the subjects were asked to take the accuracy test. For shooting, subjects did not cross the free throw line. They also kept their feet in contact with the ground. Therefore, the 10-throw test from the free-throw line was used as a measuring instrument for assessing accuracy in this study.

Pojškic, Šeparović & Užičanin (2011) also applied the same tests in their research on a sample of 55 basketball players (19.1 years  $\pm$  3.1) from four Bosnian teams. The same results, without statistical deviations, were obtained by these authors 3 and 6 days after the initial testing, on the retest.

The study by Myrtaj (2012) examined the influence of morphological characteristics on basketball accuracy on a sample of 71 basketball players (15 years  $\pm$  6 months) in the territory of Kosovo (Giljana). Morphological characteristics are not the subject of this paper, so only precision tests will be listed. Tests of throwing from the free throw line in 60 seconds and a test of throwing 2x3 times with breaks of 3 minutes in the area for 2 points were used.

In the study conducted by Pojskić, Šeparović, Muratović & Užičanin (2014), on a sample of 38 basketball players from the Bosnian League, numerous tests were used to determine the anthropological characteristics of basketball players. Keeping in mind that only precision is the subject of this work, in this part only the tests that were used to determine precision will be presented. The following were used: the 60-second free throw test, the stationary 2-point shooting test, the dynamic 2-point shooting test (with position changes as described above), as well as the same stationary and dynamic variation of the 3-point shooting test points.

Thakur & Mahesh (2016) investigated the effect of meditation on the accuracy of basketball players. The meditation period lasted for 6 weeks, and the 2-point throw tests, the 3-point line throw, and the jump shot from the 5m line were used as measuring instruments to assess precision.

Further, the research of Matulaitis, Skarbalius & Abrantes (2016) included a larger sample of respondents, as many as 1051 basketball players of the basketball league in Lithuania. Namely, the authors, in addition to other anthropological characteristics, also tested precision. Tests were used as measuring instruments to assess precision: 30 shots from the free throw line, 1 minute of shooting, modified medium and long shots (The field is marked with 10 places from which the players shoot: 1, 3, 5, 7, 9 are on the projection at a distance of 5 m from the center of the basketball hoop, and 2, 4, 6, 8, 10 points are located at a distance of 6 m. The subject stands on the line of the first point with the ball, shoots, runs near the basket, catches a scored or rebounded ball, dribbles is to the second point, makes another shot, runs close to the basket and catches the ball, etc... The test includes two sets - 2  $\times$  10 throws. The sum of the throws in a limited time is registered. The duration of the test is different for young



basketball players of different ages: 11 -12 years – up to 145 s; 13–14 years – up to 135 s; 15–17 years – up to 130 s. For each inaccurate throw, the player gets one point if the ball falls on the hoop from above).

Twenty-four senior basketball players participated in the Cabarkapa study (2017). The goal of the research was to determine the relationship between "breakfast" (a meal before a test or a game) and accuracy in basketball. The previously presented standardized tests for testing precision in basketball were used as measuring instruments for accuracy assessment, namely: shooting from the free throw line (10 throws + free throws in 60 seconds), shooting from the area for 2 points from different positions and shooting from the 3-point line from different positions.

Uzun & Pulur (2018) examined the impact of shooting training on the accuracy of 30 basketball players of average age ( $14.82 \pm 1.0$ ). As measuring instruments for assessing accuracy, they used tests: jump shot in the 2-point area, jump shot from the 3-point line, zigzag running and jump shot (dynamic test).

Kelmendi, Myrtaj & Shakiri (2018) tested motor ability and precision on a sample of 34 basketball players who compete in the junior category. They used free throw tests (3 times 10 throws with 3 minutes of rest between sets); Free throws continuously for 60 seconds; Throwing from the area for 2 points with 5 different positions. They determined the reliability and validity of these tests, given that they repeated the test after 3 days, and thus determined that there is no inhomogeneity.

The study of Turkish scientists, conducted by Savaú, Yüksel & Uzun (2018), aimed to examine the effects of explosive strength and shooting exercises, which were applied eight weeks before the basketball season, on the level of shooting percentage of elite basketball players, i.e. to the precision of basketball players. The following tests were used as measuring instruments to assess accuracy: free throw from a static position, jump shot from a similar free throw and jump shot against the defense (1on1, i.e. situational conditions).

Neumann & Hohnke (2018), on a sample of 30 professional basketball players (24.67 years old), examined the percentage of hits in different throwing conditions. Tests, i.e. measuring instruments, which were used to assess precision, are: free throws in 60 seconds, two-point throws from space next to a defender (1-on-1 situational conditions) and 3-point line throws with a defender's block (situational conditions).

Further, researcher Boddington (2019), on a sample of 31 semi-professional players of the Australian League, used accuracy tests where basketball players shot two shots from five different locations in the two-point space without a time limit in three repeated attempts with a 3-minute break. between measurements. In the two-point shooting test, shots are attempted from both corners and wings, next to a spot just above the free throw line away from the basket. He also used the accuracy test (shooting from the 3-point line) from both corners, from both wings and from the top of the three-point line. Furthermore, in order to assess the accuracy of basketball, he used the Spot of Shooting test, Off the dribble shooting (Shooting after dribbling), as well as the test of shooting in motion. Spot of Shooting consists of five uncontested shot attempts from different distances and locations; however, it is unclear whether all five shots need to be fired at each location consecutively, and the exact location of each shot attempt is not explicitly defined. The dribble shooting test features 18 jump shots from three different areas of the court with each shot attempted after the dribble. While the test of shooting in motion consists of shooting after passing a teammate (the shot is performed while the player is still in motion) and the number of scored baskets in 10 attempts is measured.

## TESTS FOR ASSESSING ACCURACY IN BASKETBALL - A SYSTEMATIC REVIEW

Researchers Cripps & Scanla (2020) tested accuracy on a sample of 30 basketball players using shooting tests 2 times from 5 different positions in the 2-point space, as well as shooting from the 3-point line from different positions. From an early overview of the research presented so far, we can see that these tests are standardized and widely used in basketball.

The research by Li & Feng (2020) was conducted with a sample of 28 professional basketball players. Tests were used that proved to be standardized and frequent tests in studies of the accuracy of basketball players, namely: 60-second throws from the free throw line, throws from the 3-point line from different positions.

The study by Li, Li, Borović & Rupčić (2021) conducted on a sample of 32 female basketball players ( $22.11 \pm 4.92$  years old) investigated the impact of fatigue on shooting accuracy in basketball. The tests that were used were: the test of shooting free throws in 60 seconds (as in most of the presented studies), as well as the jump shot from a distance of 5 m from the basket.

Further, the Penner (2021) study examined the accuracy of basketball players on a sample of 34 professional junior league basketballs. The measuring instruments that were used to assess accuracy are: throwing from the free throw line in 60 seconds, as well as the test of throwing from the 3-point line from different positions.

The study by Alwan (2021) examined the accuracy of basketball players based on their position in the team. The sample consisted of 62 young professional basketball players who played in the professional league in 2021/22. The following tests were used as measuring instruments to assess accuracy: jump shot from the free throw line, also jump shot from the left and right side of the free throw line.

Ayaz & Deniz (2021) examined the accuracy of basketball players ( $n=11$ ) and recreational players ( $n=10$ ) participating in basketball. Thus, the total sample consisted of 22 subjects. The tests that were used as measuring instruments to assess precision are: 10 throws from the free throw line, 10 throws from the 3-point line and 10 throws from the 2-point area.

The study by Mancha, Reina, García-Rubio & Ibáñez (2021) aimed to examine the relationship between physical fitness and tactical elements of basketball, including basketball players' shooting accuracy. The sample consisted of 10 female basketball players of average age ( $24 \pm 3$ ) from the professional Spanish League (Liga Día). They used standardized accuracy tests: shooting in the 2-point area, shooting from the 3-point line and shooting from the free throw line.

The number of participants varied from study to study, so the smallest number of participants was 5, in the work of Watanabe et al. (2011), and the largest number was 1051 in the study by Matulaitis et al. (2016). The total sample from all the presented studies was made up of 1596 respondents (basketball players). All presented research included precision measurements using different measuring instruments, which will be discussed in the next part. Jakovljević (2010) emphasizes precision as "perhaps the most important motor skill" for successful basketball. In addition to its importance in shooting the target (basket), it is considered that precision is extremely important when passing the ball to a teammate, who may be stationary or moving. He states that the high precision of basketball players is conditioned by a good sense of space and localization of the goal. He believes that for precision training it is important to realize its connection with the technique and tactics of basketball. To improve accuracy, a large number of exercises are used to improve shooting and passing. In this regard, the main goal of this master's thesis was to present the tests that are most often used to assess precision in basketball, as well as to determine their validity and reliability.

When looking at the presented research, it should be noted that some precision tests are repeated. Namely, research by Fisk (2005); Myrtaj (2012); Pojskić et al. (2014); Kelmendi et al. (2018); Neumann & Hohnke (2018); Li & Feng (2020); Penner (2021); Li et al. (2021) approached the measurement of the accuracy of basketball players using the "shooting from the free throw line in 60 seconds" test, which was confirmed as a valid and reliable test in the work of Pojskić et al. (2011). In the same research, where the dynamic test of free throws in 60 seconds was used, the procedure was as follows: Each player performed five series of two free throws with a sprint between series. Each series had to be completed in 12 seconds. Each player started the test by sprinting 18 meters (sideline of the volleyball court), made a turn around the central part and ran 4.6 m to the free throw line. After two free throws, the player ran 4.6 m to the second cone, where he waited for the sound signal to start the next series. One meter measured 12 seconds using a stopwatch and gave a signal to the player. The second scorer counted the number of free throws made. The other two players passed the balls to the subject. Then the player makes a free throw in 60 seconds (Pojskić et al., 2011).

Next, research by Alwan (2021); Li et al. (2021); Penner (2021); Savau et al. (2018); Uzun & Pulur (2018) used the "jump shot test" to assess the accuracy of basketball players. The matrix characteristics of this test were confirmed by a study (Boddington, 2019). Some mentioned researches used the jump shot test from a static position Alwan (2021); Li et al. (2021), while the authors are Penner (2021); Uzun & Pulur (2018) used jump shot tests in motion/after motion. Research by Savaú et al. (2018) approached accuracy testing with a jump shot test in situational conditions, and the test proved to be a valid predictor of shooting success in real conditions (in a match/competition) (Csataljay, James, Hughes & Dancs, 2013) A battery of jump accuracy tests (jump shot) was developed by (Pojskić et al., 2011), where athletes threw two shots from five different locations without a time limit in three repeated attempts with a 3-minute break between trials. In the two-point shooting test, shots are attempted from both corners and wings, just above the free throw line away from the basket. In the three-point shooting test, athletes shoot from both corners, both wings and at the top of the three-point line. Athletes receive one point for each successful shot attempt (Pojskić et al., 2011).

In research by Fisk (2005); Watanabe et al. (2011); Myrtaj (2012); Pojskić et al. (2014); Matulaitis et al. (2016); Thakur & Mahesh (2016); Kelmendi et al. (2018); Savau et al. (2018); Alwan (2021); Ece Ayaz & Şimşek, Deniz (2021) approached the accuracy testing of basketball players using the free throw line test, which also proved to be a valid and reliable test in accuracy testing (De Groot, Balvers, Kouwenhoven & Janssen, 2012). The procedure for testing accuracy by throwing from the free throw line looked like this: in one of three series, each player performed two jumps from five different positions, i.e. a total of ten shots. The starting position of the player was at the free throw line. There was no time limit on shots. Two other players caught the ball and passed it to the subject. There was a three-minute break between each series of throws. The average percentage of all three tests was used for the analysis.

"When it comes to precision, in basketball we talk about situational precision, which is seen as an integral part of technique, and it is necessary to evaluate and develop it in this way". (Isaković, 2013, 32) In this regard, some research by Savaú et al. (2018); Neumann & Hohnke (2018) evaluated the accuracy of basketballs in situational conditions, which proved to be valid in previously conducted studies (Oudejans & Pjipers, 2009; Liao & Masters, 2002). The least repeated tests are: Box shot (shooting from 2 blocks) in the work of Thakur & Mahesh (2016) and the procedure looks like this: this is a timed test lasting 30 seconds. There are 2 blocks also called low posts marked on the field. At the tester's signal, time starts and the subject moves from block to block while trying to shoot into the basket. The assistant

## TESTS FOR ASSESSING ACCURACY IN BASKETBALL - A SYSTEMATIC REVIEW

continuously passes the balls to the subject. At the end of 30 seconds, the number of shots from the box that are correctly placed in the basket is counted as an individual score.

Further, in the research of Uzun & Pular (2018), the zigzag run and jump shot test (dynamic test) were used. The athlete was allowed to shoot 5 points in the 3-point and 2-point shooting areas consisting of 5 spots in 5 different areas with a distance of 6.75 m and 2 points of 4.225 m equally spaced at the midpoints of the circle in the course consisting of 3 points and 2 points for shooting. Rounds start with a 3-point shootout and end with a 2-point shootout. A total of 50 shots are taken, including 10 shots in one round, 25 two-point shots and 25 three-point shots in five rounds. Athletes are given 4 minutes to complete 5 rounds. This zig-zag test has proven to be valid and reliable in football (Kutlu, Yapıcı, Yoncalık & Celik, 2013), but there is no previous literature that proves its validity in basketball, except in the research of Ahmet & Pular (2018). Considering the works of Fisk (2005); Pojskić et al. (2014); Thakur & Mahesh (2016); Uzun & Pular (2018); Neumann & Hohnke (2018); Boddington (2019); Li & Feng (2020); Penner (2021) can be seen using the shooting test, or jump shot test, from the 3-point line. This test has also been confirmed as valid and reliable (Pojskić et al., 2011).

When all the presented information is considered, it can be concluded that the most frequently applied measuring instruments/tests in assessing the accuracy of basketball players are: shooting from the free throw line in 60 seconds, dynamic test of free throws in 60 seconds, jump shot tests in static and dynamic conditions, test throws from the free throw line, but also throws from the left and right side of the free throw line, i.e. in the 2-point area, as well as the throw/jump shot test from the 3-point line.

### **Conclusion**

Basketball is a multifaceted and complex team game that combines cyclic and acyclic movement structures. Basketball has changed a lot over the years. From a relatively slow and simple game at the very beginning of its existence to today's very complex movement structures that are performed in an unimaginably faster rhythm, the dynamics of the game and dynamic and fast actions are the main feature of contemporary basketball. Basketball shooting, which is closely related to precision, is earlier was recognized as the most frequently used and most important technique in the game. Likewise, many researchers state that shooting accuracy strongly determines the outcome of a basketball game. When it comes to precision, in basketball we talk about situational precision, which is seen as an integral part of technique, and it is necessary to evaluate and develop it in this way.

When all the presented information is considered, it can be concluded that the most frequently applied measuring instruments/tests in assessing the accuracy of basketball players are: shooting from the free throw line in 60 seconds, dynamic test of free throws in 60 seconds, jump shot tests in static and dynamic conditions, test throws from the free throw line, but also throws from the left and right side of the free throw line, i.e. in the 2-point area, as well as the throw/jump shot test from the 3-point line.

### **Importance of Research**

Basketball is a sport where the success of sports performance is reflected in the possession of technical-tactical and motor skills. When it comes to precision, in basketball we talk about situational precision, which is seen as an integral part of technique, and it is necessary to evaluate and develop it in this way. For this reason, accuracy screening is a very important parameter when developing a training program (accuracy evaluation is therefore crucial when developing training programs for basketball players). Tests must reproduce, as much as possible, the specific patterns of the sport for which they are adapted, either in laboratory conditions or on the field. This paper reviewed the available scientific literature in order to report on the reliability, validity, and usefulness of the most commonly used tests for

assessing the accuracy of basketball players. This will enable the formation of further guidelines for their use in basketball.

## Literature

- Abdelkrim, N., El Fazaa, S., and El Ati, J. (2007). Time motion analysis and physiological data of elite under 19 year old basketball players during competition. *British Journal of Sports Medicine*, 41: 69-75.
- Alwan, A. (2021). Role of the Learned Helplessness in Diminishing the Precision of Jump Shooting for Young Basketball Players, *Revista Iberoamericana de Psicología del Ejercicio y el Deporte*. 16(4), 92-94.
- Ayaz, K., Deniz, S. (2021). The 'Quiet Eye' and motor performance in basketball free throw shooting, *Physical education of students*. 25(2):103-9.
- Boddington, B. (2019). The validity and reliability of the Basketball Jump Shooting Accuracy Test. Master Thesis. South Bend. The University of Notre Dame.
- Boddington, B., Cripps, J., Scanlan, T., Spiteri, T. (2019). The validity and reliability of the Basketball jump shooting accuracy test. *Journal of Sports Sciences*, 37(14), 1648–1654.
- Vučetić, V. (2009). Dijagnostički postupci za procjenu energetske kapaciteta sportaša – pozvano predavanje. *Journal of Sports Sciences*, 3(1), 164–169.
- Cabarkapa, D. (2017) Relationship between breakfast and basketball shooting accuracy. Master's thesis. Harrisonburg. James Madison University.
- Cripps, A., Scanlan, A. (2020). Operation of the Basketball Jump Shooting Accuracy Test: Intra- and inter-rater reliability of scoring procedures and floor and ceiling effects for test performance, *International Journal of Sports Science & Coaching*, 15(2), 115-119.
- Csataljay, G., James, N., Hughes, M. & Dancs, H. (2013). Effects of defensive pressure on basketball shooting performance. *International Journal of Performance Analysis in Sport*, 13(3), 594-601.
- De Groot, S., Balvers, I., Kouwenhoven, S., Janssen, T. (2012). Validity and reliability of tests determining performance-related components of basketball. *Journal of Sports Sciences*. 30(9):879-87.
- Fisk, T. (2005). Development of Basketball Shooting Accuracy affected by Varying Goal Sizes. *International Journal of Human Sciences*, 1(3), 28–32.
- Grbović, M. (2013). Merenje agilnosti u različito defisanim uslovima. Doktorska disertacija, Beograd: Fakultet sporta i fizičkog vaspitanja.
- Isaković, M. (2013). Preciznost – motorička sposobnost koja opisuje uspešnog košarkaša. *TIMS Acta*. 7, 31-37.
- Jakovljević, S. (2010). Tehnologija košarkaškog treninga. Beograd: Fakultet sporta i fizičkog vaspitanja.
- Kelmendi, D., Myrtaj, N., Shakiri, K. (2018). Measure characteristics of precision tests with top basketball players from Kosovo. *Sport Science*, 11(1):89-91.
- Kutlu, M., Yapıcı, H., Yoncalık, O., Celik, S. (2012). Comparison of a new test for agility and skill in soccer with other agility tests. *Journal of Human Kinetics*. 3(1), 143-150.
- Li, F., Li, Z., Borović, B., Rupčić, T. (2021). Does fatigue affect the kinematics of shooting in female basketball?, *International Journal of Performance Analysis in Sport*, 21:5, 754-766.
- Li, Y., Feng, T. (2020). The effects of sport expertise and shot results on basketball players' action anticipation. *PLoS ONE*. 15(1): e0227521.
- Liao, M., Masters, W. (2002). Self focused attention and performance failure under psychological stress. *Journal of Sport and Exercise Psychology*, 24, 289-305.

## TESTS FOR ASSESSING ACCURACY IN BASKETBALL - A SYSTEMATIC REVIEW

- Mancha, D., Reina, M., García-Rubio, J., Ibáñez, S. (2021). Does physical fitness influence the technical-tactical performance indicators in a professional female basketball team? *Sport Science*, 1(2), 114-117.
- Matulaitis, K., Skarbalius, A., Abrantes, C., (2016). Fitness, Technical, and Kinanthropometrical Profile of Youth Lithuanian Basketball Players Aged 7–17 Years Old. *Frontiers in Psychology*, 21(1), 61-66.
- Miller, S., Bartlett, R. (1996). The relationship between basketball shooting kinematics, distance and playing position, *Journal of sports sciences*, 14, 243-253.
- Myrtaj, N. (2012). Effect of morphological characteristics of precision in basketball, *Sport Mont*, X(34-35-36), 298-304.
- Narazaki, K., Berg, K., Stergiou, N., & Chen, B. (2009). Physiological demands of competitive basketball. *Scandinavian journal of medicine & science in sports*, 19(3), 425-432.
- Neumann, D., Hohnke, E. (2018). Practice using performance goals enhances basketball free throw accuracy when tested under competition in elite players. *Journal of Human Sport and Exercise*, 13(2), 296-304.
- Nićin, Đ. (2001). *Antropomotorika*. Novi Sad: Fakultet fizičke kulture.
- Oudejans, R., Pijpers, R. (2009). Training with anxiety has a positive effect on expert perceptual-motor performance under pressure. *Quarterly Journal of Experimental Psychology*, 62, 1631-16.
- Penner, L. (2021). Mechanics of the Jump Shot: The "Dip" Increases the Accuracy of Elite Basketball Shooters. *Frontiers in Psychology*, 12:658, 102.
- Pojksic, H., Šeparović, V., Užicanin, E. (2011). Reliability and factorial validity of basketball shooting accuracy tests, *Sport SPA*, 8 1, 25-32.
- Pojškić, H., Šeparović, V., Muratović, M., Užicaninm E., (2014) The relationship between physical fitness and shooting accuracy of professional basketball players, *Revista de Educação Física*, 20(4), 408-417.
- Pojškić, H., Šeparović, V., & Užicanin, E. (2011). Reliability and factorial validity of basketball shooting accuracy tests. *Sport Scientific and Practical Aspects*, 8, 25-32.
- Safrit, J., & Wood, M.T (1989). *Measurement concept in physical education and exercise science*. Champaign. Human Kinetics.
- Savaú, S., Yüksel, M., Uzun, A. (2018). The Effects of Rapid Strength and Shooting Training Applied to Professional Basketball Players on the Shot Percentage Level, *Universal Journal of Educational Research* 6(7): 1569-1574.
- Thakur, T., Mahesh, C., (2016). Enhancement in Shooting ability of Basketball players through Meditation, *Research Journal of Physical Education Sciences*, 4(4), 1-4.
- Uzun, A., Pulur, A. (2018). The effect of shooting training on the development of the shot hit rate for basketball players, *International Journal of Human Sciences*, 15(4), 2426–2432.
- Watanabe, T., Sato, T., Igawa, S. (2011). Accuracy of Skill Performance in the Basketball Free Throw Shooting, *International Journal of Performance Analysis in Sport*, 5(1), 54-69.