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Design and Standardization a Test to Measure Speed Accuracy and Skill Level of Floor Defense for Libero in Volleyball

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ABSTRACT
The current study aims to designing a test to measure speed, accuracy, and skill performance level of libero's floor defense skill, Setting standard scores to test speed, accuracy, and skill level of libero's floor defense skill. The researcher used descriptive survey method as it was suitable for nature of study. Study community was defined as a number of volleyball players representing clubs in northern region participating in Elite League and Premier League for 2025/2026 Sports season, totaling 185 players distributed across 15 clubs. Sample was selected from study community purposively, consisting of 30 players Liberos, representing 16.85%. Results showed that reaching a test to measure speed and accuracy of skillful court defense performance of libero in volleyball Based on high scientific principles, to arrive at tables specific to grades and standard levels of test designed to measure speed and accuracy of skill performance of floor defense skill for Libero in volleyball. The researcher recommends that adopting the test that was designed and standardized to be a standard tool for measuring speed and accuracy of skill performance of floor defense skill for Libero in volleyball, in order to ensure objectivity and accuracy of results, Adopting standard grades and levels in evaluating level of players, with possibility of using these levels as a reference to determine strengths and weaknesses of Libero in skill of floor defending.

Keywords: Test Design; Volleyball; Libero; Floor Defense.

ABSTRAK
Studi saat ini bertujuan merancang tes untuk mengukur kecepatan, akurasi, dan tingkat performa keterampilan pertahanan lantai libero, menetapkan skor standar untuk menguji kecepatan, akurasi, dan tingkat keterampilan pertahanan lantai libero. Peneliti menggunakan metode survei deskriptif karena sesuai dengan sifat studi. Komunitas studi didefinisikan sebagai sejumlah pemain bola voli yang mewakili klub-klub di wilayah utara yang berpartisipasi dalam Elite League dan Premier League untuk musim olahraga 2025/2026, dengan total 185 pemain yang tersebar di 15 klub. Sampel dipilih secara sengaja dari komunitas studi, terdiri dari 30 pemain Libero, mewakili 16,85%. Hasil

menunjukkan bahwa mencapai tes untuk mengukur kecepatan dan akurasi pertahanan lapangan yang terampil, performa libero dalam bola voli. Berdasarkan prinsip ilmiah yang tinggi, untuk mencapai tabel yang spesifik untuk tingkat nilai dan standar yang dirancang untuk mengukur kecepatan dan akurasi keterampilan, kinerja pertahanan lantai untuk Libero dalam bola voli. Peneliti merekomendasikan untuk mengadopsi tes yang dirancang dan distandarisasi sebagai alat standar untuk mengukur kecepatan dan akurasi performa keterampilan pertahanan lantai untuk Libero dalam bola voli, guna memastikan objektivitas dan akurasi hasil, mengadopsi nilai dan tingkat standar dalam mengevaluasi tingkat pemain, dengan kemungkinan menggunakan tingkat tersebut sebagai acuan untuk menentukan kekuatan dan kelemahan Libero dalam keterampilan bertahan di lantai.

Kata Kunci: Desain tes; Bola Voli; Libero; Pertahanan lantai.

INTRODUCTION

Measurement plays a vital and fundamental role in field of sports, we find that practical and theoretical research in field of physical education and training science is based on measurement and specialized, scientifically standardized tests (Argueta et al., 2025; Sheng, 2025). It has made possible through it solution of many sports problems, and progress in sports training processes requires that measurement be involved in all areas of sports science in order to collect data on players of different levels, as measurement process contributes to knowing level and preparing appropriate programs for each type and each level in order to plan and train appropriately (Liu et al., 2019). Many sources have noted that physical and skill requirements, particularly in volleyball, are linked to regular testing. Testing serves as a tool for motivating players, fostering excellence, and ensuring continuous progress, results can be used for regular evaluation, assessment, and guidance (Abu Al-Yazid, 2007, p. 71) .

Accuracy in performing any volleyball skill depends on appropriate tests that allow both players and coaches to assess skill performance and determine necessary guidance and training for improvement (Gabbett & Georgieff, 2006). One of the most important duties of a volleyball coach is to measure and evaluate complex skills that require precision combined with speed and reaction time, such as court defense (Fatahi et al., 2022). Floor defense is a skill shared by almost all team players. Due to its importance, difficulty, fact that a large percentage of players do not master it, rules allow for a substitute player to perform this role: libero, also known as defensive player, is a player who can be substituted for a backcourt player without being bound by six legally permitted substitutions. libero is not allowed to play offensively; their role is limited to court defense, receiving, and setting (Hassanein, 2011, p. 81) It is crucial that this player possesses a balanced level of physical and technical skill, coach must measure this skill periodically to track player levels and progress rates, and to evaluate player's performance in fulfilling their defensive duties on court, importance of researching a method to measure skill of a professional player in multiple situations becomes clear, as most available tests measure only one aspect of skill performance in isolation, such as receiving a serve, defending court against a spike, or deep defending from a specific position. These tests, by their very nature, are not suitable for complex defensive role of this player (Fatahi et al., 2022; Rifki et al., 2022).

Due to scarcity of a test that is similar to player's performance in defending court, the researcher decided to design a test that is used as a new indicator for measurement and evaluation in order to reach objective results that contribute to achieving the best evaluation of free player's level in volleyball (Rifki et al., 2022).

For free player to perform (Libero) a well-rounded player must possess a high level of skill and physical attributes in order to accurately perform his various defensive duties during match, it is necessary to find a specific skill test for libero player that is similar to playing situation, which coach and player rely on to measure and evaluate level during training program, research problem addressed design of a test specific to libero player that contributes to measuring speed, accuracy and level of skill performance of skill of defending court in game of volleyball.

This study aims to designing a test to measure speed, accuracy, and skill performance level of libero's court defense skill. Establishing standard scores to test speed, accuracy, and skill performance level of libero's court defense skill.

METHODS

The researcher used descriptive survey method with its steps and procedures, as it was suitable for nature of research and appropriate for achieving its objectives, method is " way or method that scientific researcher takes in investigating scientific facts in any branch of knowledge and in any field of science" (Enaya, 2008, 11). Research community was defined as a number of volleyball players who represent clubs of northern region participating in Elite League and Premier League for sports season 2025/2026, and their number is 185, Players distributed across 15 club, sample was selected from population using a purposive method, and its number was 30 players (Libero). With a percentage 16.85% of players of clubs that represented research community, "Data is collected according to this method from a part of community called sample, which must be representative in its characteristics of characteristics of community under study in a true, sound and correct manner" (Al-Fartousi, 2022, 44). Tables (1,2) show research community and its sample.

Table 1. Clubs and number of players

No.	Club	Player number	Libero players	Percentage
1	Solaf	12	2	16.66%
2	Hidia	12	2	16.66%
3	Northern Masafi	12	2	16.66%
4	Al-Habbaniyah	12	2	16.66%
5	Al-Muqdadiyah	12	2	16.66%
6	Al-Dhuluia	12	2	16.66%
7	Balad	12	2	16.66%
8	Abu Risha	12	2	16.66%
9	Rabia	13	2	16.66%
10	Heet	12	2	16.66%
11	Sinjar	12	2	16.66%
12	Khak	12	2	16.66%
13	Bastamli	12	2	16.66%
14	Al-Shurjah	12	2	16.66%
15	Al-Dooz	10	2	20%

Total	15	178	30	16.85%

Table 2. Research sample

Samples	No.	Percentage
Construction sample	20	66.66%
Reliability sample and pilot study	10	33.33%
Total	30	100%

Designing a test of speed, accuracy, and skill performance level

Initial formula for test design: By reviewing numerous studies and research in field of volleyball, which examined the most important physical and skill-based abilities of libero, and by consulting with a number of specialists and professors in field of game and tests where variables and test situations were determined based on their opinions and observations on technically designed model and method of performance.

The test begins upon hearing timekeeper's signal, player is ready at position (1). Assistant hits ball with a spike from position (2) on opposite side of court. Assistant is standing on a 1x2m platform, 1m high, behind net, facing position (1). After receiving spike from player, assistant directs ball to 2x2m mat at position (3). Player then runs to front area to receive ball dropped at position (2) and directs it to mat at position (3). Player then returns to position (6) and prepares to receive a spike from second assistant, who is standing on platform, and directs ball to mat at position (3). Player then runs to position (3) to receive ball dropped by second assistant around perimeter of mat and directs it to mat at same position. Player then runs in same manner to position (5) and prepares to receive a spike from third assistant and directs ball to mat at position (3). Player then runs towards Position (4) involves receiving ball dropped by third assistant and directing it to mat at position (3). This concludes first attempt for participant, test has thus encompassed all playing positions in defending court at multiple stations, utilizing ability to receive spikes and cover dropped balls. The researcher based design of test on following: Availability of devices and tools used in measurement, tests are appropriate for chronological age and gender of sample, test should stimulate test-taker's motivation to perform, test should be similar to playing conditions, approval rate for selection by experts should not be less than 70%.

Final version of the test: Test Name: Defending floor from back and front zones, aim of test is to measure speed, accuracy, and performance level of skill of defending field from back and front areas. Equipment used: Volleyball court, 6 regulation balls, tape measure, measuring tape, 3 x 1m high platforms, whistle, registration form, 2 timers, 2 x 2m foam mat. Performance Description: test begins with timekeeper's signal, with examinee ready at position (1). assistant hits ball with a smash from position (2) on other side of court, standing on a 1*2m platform, 1m high, behind net towards position (1). After receiving smash from player, directs it to mat, which measures 2*2m at position (3). Then runs to front area to receive ball dropped at position (2) and directs it to mat at position (3). then returns to position (6) and prepares to receive smash from second assistant, who is standing on platform, and directs ball to mat at position (3). examinee then runs to position (3) to receive ball dropped by second assistant around perimeter of mat and directs it to mat at same position. examinee then runs in same way to position (5) and prepares to receive smash from third assistant and directs ball to mat at position (3).

Test score calculation: time is calculated from moment signal is given until test is completed, player receives (2) points if ball falls on mat in position (3). player receives (1) point if ball falls within boundaries of position (3). Accuracy score is deleted if ball falls outside designated spot at center number (3) during connection, balls whose height is below head level during connection are deleted, and test time continues to be calculated. Accuracy score of test is divided by time taken to administer it in order to calculate skill performance score, according to law of quiz. Each player has 3 attempts; the best attempt out of the 3 attempts is taken, player is entitled to use defense from above or below court. Give player a 3 minute break between attempts, grade is not calculated if a legal error occurs in application of skill.

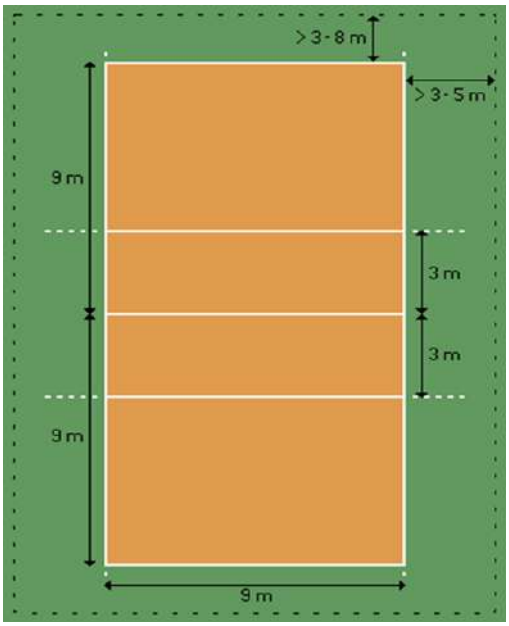

Figure 1. Final form of test for defending field from back and front areas

First pilot study

After experts determined variables and procedures of test through which player's skill in measuring speed and accuracy of defending court could be measured, the researcher conducted pilot study, as it is important to conduct an experiment on a sample of population on which test will be applied to ensure soundness of organization of subject, provided that this experiment is a miniature version of what will be done on day of applying test. (Hassanin, 2001, 169) test was applied to a sample of (2) players (Libero) who were chosen purposively and from outside main sample, representing Al-Thawra Sports Volleyball Club, experiment was conducted on 22/10/2025 at (3) pm, and objective of experiment was as follows: Identifying sample's ability to apply test and understanding performance method. Identifying suitability of equipment and tools used. Identifying time spent applying test. Identifying suitability of certain distances, dimensions, times specified for designed tests of players' responsiveness and interaction with designed test and its suitability to them.

Results of first pilot study revealed following: Estimated time for applying test for a single attempt is approximately 95 seconds to 120 seconds, player feels tired after applying third attempt at test. Give player sufficient rest, estimated at 3 minutes,

between attempts, emphasis is on player connecting and then performing smash or drop ball to designated position in test.

Second pilot study

This experiment was conducted on a sample of (2) players (Libero) chosen purposively from outside main sample, representing (Turkmen Sports) club. This exploratory experiment was conducted on 10/26/2025, results obtained through this experiment are as follows: Understanding ability to accurately measure designed test and how to calculate scores. Training support staff on how to calculate scores and measurement methods for designed test . Organizing workflow and identifying problems and difficulties that the researcher may face during implementation of test, especially those related to administrative and organizational aspects that directly affect test results.

Scientific Foundations of Test

Validity: After reviewing results of pilot studies conducted, and due to inadequacy of face validity in establishing validity of tests, the researcher administered test on 6/11/2025 to (20) players divided into two groups to determine discriminatory validity of test. "Which means extent to which test is able to differentiate between high and low levels in measured trait, or ability to distinguish between different levels". (Al-Fartousi, Al-Midani, 2021, 59) , the upper group included (10) players (Libero). Construction sample was selected as a distinct sample, the lower group (10) players were selected as a non-distinctive sample. The researcher then extracted value of (t) between distinct and non-distinctive groups to arrive at discriminatory validity of test, as shown in Table (3).

Table 3. Values of (t) between the upper and lower groups in accuracy and speed of field defense

Test	Upper Group		Lower group		Calculated (t) value	Sig.
	M.	St.d	M.	St.d		
Performance accuracy	9.30	0.94	6.40	1.17	6.076	0.001
Speed of performance	86.60	6.71	114	5.47	9.99	0.001
Performance level	0.104	0.014	0.058	0.012	7.63	0.001

Results in Table (3) indicate that value of function (Sig.) is less than (0.05), and thus we find statistically significant differences between distinguished group and non-distinguished group, which indicates validity of test used. Reliability: After validity of discrimination was established, the researcher proceeded to take measures to ensure reliability of test-designed application -retest method, since "Validity of test depends on validity and reliability of its results, and without it there is no confidence in those results". (Farhat, 2001, p. 143). The researcher administered test to a sample of (10) players (Libero) in construction team, first administration of test took place on 24/11/2025 and second administration on 18/11/2025 at 2:00 pm in hall of Sulaf Sports Club, with a time interval of (7) days. Reaching correlation coefficient between first and second tests is determined through reliability coefficient results, Table (4) illustrates this:

Table 4. Correlation coefficients between first and second tests

Test name	Correlation coefficient	Sig. level
Performance accuracy	0.89	0.001

Speed of performance	0.87	0.001
Performance level	0.88	0.001

Table (4) shows that significance value is less than (0.05), and this indicates that there is a statistically significant correlation between first application and second application, which indicates that test has a high degree of reliability. Objectivity: Objectivity is defined as extent to which examiner is free from subjective factors, i.e., reduction of bias and preconceived opinions in process of administering test". (Farhat, 2005, 169). To ensure objectivity of test, the researcher reviewed results of several referees. During test, each participant gives their own result independently, and then correlation coefficient of judges' result s is calculated.

Table 5. Correlation coefficient of judges

Test name	Measurement unit	Correlation coefficient	Sig. level
Performance accuracy	Degree	0.97	0.001
Speed of performance	Second	0.95	0.001
Performance level	Degree	0.96	0.001

From results in Table (5), it is clear that significance value is less than (0.05), which indicates that test it possesses a high degree of objectivity. Regarding the selected tests: Validity and reliability coefficients were found for chosen test, suitability of chosen test for sample was confirmed, validity of tools and suitability of registration cards for test were confirmed. Ensuring procedures, conditions, and instructions for testing, as well as appropriate performance sequence and workflow organization. Discovering difficulties that may arise during application and testing process and that may affect the results.

Main Experiment

After confirming validity of test designed to measure speed and accuracy of skill performance of court defense skill for libero in volleyball, the researcher conducted main experiment on standardization sample, which consisted of (20) players (Liberos) representing (15) clubs, application began from 11/25/2025 until 1/14/2026. test was applied separately for each club, and the researcher and assisting team took into account all topics that were confirmed in exploratory experiments and that procedures for applying test were same for all clubs.

Statistical Methods

SPSS was used to calculate arithmetic mean, Standard deviation, Torsion coefficient, Simple correlation coefficient. t-test law for unrelated samples, Standardized score Z -score, Standard grade 6 sigma. Skill level = Accuracy level ÷ Time. (Al-Hadithi, 2013, 231)

RESEARCH RESULTS

Statistical description of test

After calculating scientific coefficients of test used in research and verifying high value and statistical significance of these coefficients, the researcher prepared data related to results of applying test, arithmetic mean, median, standard deviation,

skewness coefficient, standard error, highest score and lowest score were extracted, as shown in Table (6).

Table 6. Arithmetic mean, standard deviation, skewness coefficient, standard error, highest value, and lowest value for test floor defending from front and back areas

Test	Mean	St.d	Mode	Skewness coefficient	Highest degree	Lowest degree
Performance accuracy	7.85	1.81	7	0.46	4	11
Speed of performance	100.30	15.26	88	0.80-	75	121
Performance level	0.0819	0.027	0.066	0.58	0.146	0.033

Standardized scores for the designed test

The researcher prepared a table of standardized scores derived from initial results of backcourt and frontcourt defense test for libero volleyball players, in order to achieve second objective of study and convert those scores into statistically significant standardized scores, standardized score is (t) score, standard Z-score One of the most commonly used standard scores in physical education and sports science research, raw scores an individual records on a test have no inherent meaning; in order for this score to acquire meaning or significance, it must be transformed into a standard. (Bahi et al., 2015, p. 101). Based on results of standardized tests conducted on volleyball players, the researcher was able to prepare standard tables for Libero players, as shown in Table (7).

Table 7. Standardized scores, and 6- Sigma scores for defending field from front and back areas of player performance level (Libero)

Raw Score	Z-Value	6 Sigma	Raw Score	Z-Value	6 Sigma
057	-1.89142	31.09	084	16011	51.60
061	-1.58749	34.13	085	23609	52.36
066	-1.20758	37.92	088	46404	54.64
071	-82767	41.72	089	.54002	55.40
072	-.75168	42.48	089	.54002	55.40
0.075	-.52374	44.76	091	.69198	56.92
078	-29579	47.04	095	99591	59.96
079	-21981	47.80	098	1.22386	62.24
080	-.14382	48.56	104	1.67975	66.80
082	00814	50.08	110	2.13565	71.36

Table 8. Limits of standard levels, standardization sample size, and percentage of defending field from front and back areas test

Level	Grades	Players number	Percentage
Very weak	Less – 0.068	3	15 %
Acceptable	0.069 – 0.079	5	25 %
Middle	0.080 – 0.090	7	35 %
Good	0.091 – 0.101	3	15 %
Very good	0.102 - higher	2	10 %

By presenting levels of test results, we find that players' performance was concentrated at average level, representing 35% of total player performance results,

followed by acceptable level at 25%, and then very weak level and good level, each representing 15%. This indicates that players representing standardization sample largely lack accuracy and speed when performing skill of defending court, which negatively affects results in matches. Defending court is considered one of important defensive skills against powerful spikes in back of court, covering block and feinting shots, and covering team's own attack in front of court, defense is as important as attack for volleyball players. (Taha, 1999, p. 151)

DISCUSSION

The developed test instrument has good statistical characteristics and objectively describes the defensive ability (court defense) of libero players. Based on the descriptive statistics in Table 6, the skewness values for performance accuracy (0.46), performance speed (-0.80), and performance level (0.58) fall within an acceptable range, indicating that the data tend to be normally distributed and can serve as a basis for standardization.

The average accuracy score of 7.85, with a standard deviation of 1.81, indicates considerable variation in ability among players, while the average execution time of 100.30, with a standard deviation of 15.26, indicates variation in speed when performing defensive movements. This variation is important because the libero position demands a combination of reaction speed and precise movement in anticipation of the opponent's attack. Therefore, the descriptive statistics support the conclusion that the developed tests have sufficient discriminatory power to distinguish the defensive levels among players.The preparation of the standard score using Z-score and 6-Sigma score as presented in Table 7, makes a practical contribution to the process of evaluating the ability of libero players. The transformation of raw scores into standard scores allows coaches and evaluators to compare the results of each player more objectively without being influenced by the original unit of measurement. The resulting norms also facilitate the ability classification process so that the development of athletes' performance can be monitored periodically. In sports measurement,the use of standard scores is a recommended procedure because it provides a more meaningful interpretation of test results and increases consistency in decision-making related to player selection, training program preparation, and evaluation of coaching results. Thus, the norm table produced in this study can be used as a practical reference for volleyball coaches in assessing the quality of the defensive ability of libero players more accurately.

The distribution of ability levels in Table 8 shows that most players (35%) are in the middle category,followed by the acceptable category (25%), while the good and very weak categories are 15% each, and only 10% reach the very good category. The distribution pattern indicates that the defensive ability of libero players in the study sample is still at a moderate level and has not reached an optimal level. This condition indicates the need to improve the quality of training that focuses on reaction speed, movement accuracy, positioning, and the ability to read the direction of the opponent's attack. In the modern game of volleyball, defensive effectiveness is a factor that greatly determines the success of the transition from defense to attack, especially when facing hard spikes, tips, and cover situations against the team's own blocks and attacks. Therefore, the results of this study not only produce standardized evaluation instruments, but also provide diagnostic information regarding the actual condition of

the defensive ability of libero players so that they can be the basis for designing a more specific, measurable, and needs-based training program for athletes.

CONCLUSIONS AND RECOMMENDATIONS

Reaching a test to measure speed and accuracy of skill performance of field defense skill for libero player. Volleyball is based on high scientific principles. Developing tables specific to grades and standard levels of test, sample's performance ranged between (Very good, Good, Middle, Acceptable, Very poor) levels. Sample's performance ranged between (Very good, Good, Middle, Acceptable, Very poor) reflecting a clear variation in skill abilities of players (Libero) in skill of defending field.

The test was designed and standardized to be a standard tool for measuring speed and accuracy of skill performance of court defense skill for libero in volleyball, in order to ensure objectivity and accuracy of results. Adopting standard grades and levels in evaluating level of players, with possibility of using these levels as a reference to determine strengths and weaknesses of libero in skill of defending field.

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