



Predicting the skill of the high spike from position 6 based on the thinking style of volleyball players aged 16-18 years

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DOI:

[https://doi.org/10.37359/JOPE.V38\(3\)2026.2620](https://doi.org/10.37359/JOPE.V38(3)2026.2620)

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Article history: Received 7/ September/2026; Accepted 17/September/2026; Available online 28/ September/2026

Abstract

The research aimed to identify the relationship between thinking style and the high smash skill from position (6) and to identify the percentage of contribution of thinking style to the performance of this skill as well as to construct an equation to predict the level of performance of the high smash skill from position (6) in terms of thinking style among volleyball players aged (15-16) years. The researcher adopted the descriptive approach with the method of correlational and predictive studies to suit the nature of the research and its objectives. The research sample include of (30) volleyball players aged (15-16) years and they were chosen purposively. To collect the data the researcher used the thinking style scale and the high smash skill test from position (6) after make sure that availability of the scientific conditions for the two instruments in terms of validity, reliability and objectivity. The pilot experiment was carried out on 1/15/2026 on a sample consisting of (6) players from the Industry Club while the main experiment was carried out during the two days of 2/12-13/2026 where the first day was allocated to implementing the high smash skill test from position (6) and the second day to applying the thinking style scale. The data were statistically processed utilizing the SPSS statistical software and suitable statistical methods were used, including the arithmetic mean, standard deviation, skewness coefficient, Pearson correlation coefficient, simple linear regression, coefficient of determination t-test and F-test. The results demonstrated a statistically significant positive correlation between thinking style and the high smash skill from position (6). It also presented that thinking style contributes (58.4%) to explaining the variation in the level of performance of this skill. A linear regression equation was built to predict the level of performance of the high smash skill from position (6) in terms of thinking style. The researcher concluded that the thinking style is one of the important variables related to the level of performance of the high smashing skill from position (6) and that it can be relied upon in predicting the level of skill performance of volleyball players aged (15-16) years. The researcher recommended utilizing the prediction equation in sports evaluation and selection

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Journal of Physical Education

Volume 38 – Issue (3) – 2026 Open Access

P-ISSN: 2073-6452 , E-ISSN: 2707-5729

<https://jcope.uobaghdad.edu.iq>



processes and paying attention to improving the thinking style through training programs and conducting similar studies on other skills and several age groups.

Keywords: Smashing, Thinking style, Volleyball players.



Introduction

Volleyball is a team sport that has witnessed significant development in recent years due to scientific advancements in sports training, measurement and evaluation and sports psychology. Achieving athletic success in volleyball relies on the integration of several physical, technical, tactical, and psychological aspects. Offensive skills, particularly the spike, have become important in determining match outcomes. The high spike from position 6 is a modern offensive technique that demands high technical, physical and mental capabilities, enabling the player to make the right decisions and execute the performance efficiently under varying competitive conditions.

Researchers and specialists have paid increasing attention to studying the psychological factors affecting skill performance, most notably thinking styles which play an important role in information processing, decision-making, and adapting to changing situations during play. Given the differences in thinking styles among players, this may be reflected in their performance of various offensive skills. Hence, the need arose to study the possibility of predicting the performance level of the high spike from position (6) according to the thinking style of volleyball players aged (16-18) years. This would contribute to providing scientific indicators to assist coaches in selection, guidance, training and enhancing athletic performance. (Habib, 2003, p. 58).

Volleyball has witnessed significant development in its physical, technical, tactical and psychological aspects. Achieving success now depends on the integration of all these aspects. Offensive skills, especially the high spike from position (6) are among the fundamental skills that directly contribute to deciding match results. This skill demands a high level of physical abilities, motor coordination, perception, and quick decision-making in addition to the player possessing appropriate thinking style that helps him choose the optimal movement solution during performance. (Mufti, 2001, p. 45).

The researcher's field observations through his work and monitoring of age group teams indicate a clear disparity in the level of performance of players in this skill, despite their similarity in age, training experience and physical preparation which indicates the existence of other factors that may affect the quality of performance, most notably the thinking style which is one of the cognitive variables that have the impact on information processing and decision-making during competitive situations.

Although many studies have focused on the physical and skill factors affecting skill performance studies that have addressed the relationship between thinking style and the ability to predict the performance level of the high spike skill from position (6) among volleyball players aged (16-18) years are still limited which leaves a knowledge gap in this field and limits the possibility of benefiting from thinking styles in selection, training and evaluation processes.

Research objectives

1. To explain the relationship between the high smashing skill from position (6) and the thinking style of volleyball players aged (16-18) years.
2. Identifying the percentage of contribution of thinking style to the performance of the high smashing skill from position (6) among volleyball players aged (16-18) years.
3. Forecasting the performance level of the high smashing skill from position (6) in terms of the thinking style of volleyball players aged (16-18) years.

Research hypotheses:

1. There is a statistically significant correlation between thinking style and high smashing skill from position (6) among volleyball players aged (16-18) years.
2. The thinking style facilitates statistically significantly to explaining the variation in the performance level of the high smashing skill from position (6) among volleyball players aged (16-18) years.
3. The performance level of the high-pressure spike from position (6) can be predicted according to the thinking style of volleyball players aged (16-18) years.

Method and tools:

The researcher implemented the descriptive approach using correlational and predictive studies, as it is suitable for the nature of the research problem and its objectives. This approach aims to reveal the nature of the connotation between thinking style and the performance level of the high spike skill from position (6) as well as to determine the percentage contribution of thinking style to skill performance and to construct an equation to predict the skill performance level among volleyball players aged (15-16) years. (Al-Zaghoul & Al-Zaghoul, 2010, p. 77). The research population was defined as players from the Talent Center affiliated with the Ministry of Youth and Sports/Specialized Schools in Baghdad numbering 40 players. The sample was selected purposively and consisted of high spike players who are proficient in the spike skill from position 6, aged 15-16 years, numbering 30 players, representing 75% of the population. Homogeneity variables were applied to the studied research sample as shown in Table (1).

Table 1. Homology Table for the Research Sample

Variable	Unit of Measurement	Arithmetic Mean	Standard Deviation	Crookedness Coefficient
Chronological Age	Year	15.58	0.49	0.21
Training Age	Year	3.42	0.91	-0.18
Height	Cm	178.64	6.12	0.37
Weight	Kg	69.85	5.87	-0.26

The table shows the homogeneity of the research sample in the variables of chronological age, training age, height and weight as the values of the skewness coefficient ranged between (-0.26) and (0.37) which are within the acceptable range (± 1) which indicates that the distribution of the sample is normal and that the sample is homogeneous in these variables which allows for carrying out the statistical treatments specific to the research.

Data collection methods:

The researcher used a number of scientific methods to collect the data necessary to reach the research objectives which were as follows:

1. Observation: The researcher depends on direct scientific observation while following the training units and matches of the research sample as well as reviewing scientific sources and previous studies connected to the research variables in order to identify the research obstacles and choose its tools and procedures.
- 2- Thinking Style Scale: The researcher adopted a thinking style scale appropriate for the age group (15-16) years old in order to identify the thinking style of the research sample members and use its findings in studying the relationship and predicting skill performance.
- 3- Testing and Measurement: The researcher used the high smashing skill test from Center (6) in order to measure the level of skill performance among the members of the research sample and to acquire the data necessary to achieve the study objectives.

Devices and auxiliary tools

The researcher used a number of devices and equipment to assist in carrying out the research procedures, namely:

1. A personal computer (laptop).
2. Thinking style scale forms.
3. Forms for recording the results of the high smashing test from Center (6).
4. Legal volleyballs.
5. A regulation volleyball court equipped with a regulation net.
6. A measuring tape to identify performance zones.
7. Whistle.
8. Office supplies (paper and pens).
9. A video camera or smartphone to document the tests when needed.

Field research procedures:

To reach the research objectives and answer its hypotheses, the researcher followed a set of organized field procedures. The research variables were identified appropriate measurement tools were selected and then they were applied to the members of the research sample according to well-studied scientific steps to make sure that accurate data could be relied upon in statistical analysis and reaching results.

Identifying approved tests and measures:

The researcher identified two research variables: the high smash skill from position (6) as the dependent variable and the thinking style as the independent variable. To select appropriate tests and measures for these two variables the researcher conducted a comprehensive survey of scientific sources, references and current studies related to the research topic. This survey resulted in the adoption of the high smash skill test from position (6) to measure the skill performance level as well as the adoption of the thinking style scale to measure the thinking style of the research sample. To ensure the validity of the test and scale and their suitability for achieving the research objectives the researcher prepared a questionnaire and presented it to a group of (5) experts and specialists in the field of motor learning, measurement, evaluation, sports training and volleyball to give their opinions on the validity of the two tools and their suitability for the research sample. They were adopted after obtaining a suitable percentage of agreement from the experts.

The Qatari crushing multiplication test (Hassanein and Abdel Moneim, 1997, page 206)

- Purpose of the test: To measure the accuracy of the diagonal smashing
- Equipment: 3 volleyballs, a volleyball court and a set of exercises one of which is placed in the corner of the court so that its inner corners are 5 cm away from the side and end line.
- Performance specifications: The player performs the smash from position 4 with the coach passing from position 3 using the strong pass to the diagonal. The player performs 15 smash attempts on the back mat then 15 attempts on the main mat. Correct attempts are counted for every 30 attempts. The dimensions of the mat are 1.5 meters long and 1 meter wide from its edge and are 5 cm away from the side line. The dimensions of the back striped area are 1.5 meters long and 1 meter wide and the front striped area is 2 meters long and 2 meters wide.
- Registration:
 - (4) points for each correct slam where the ball lands on the mat.
 - (3) We meet you for every four correct smashes in which the ball falls into the striped area.
 - (2) points for each correct slam where the ball lands in zone A or B.
 - (1) point for each correct slam where the ball lands in Zone C.

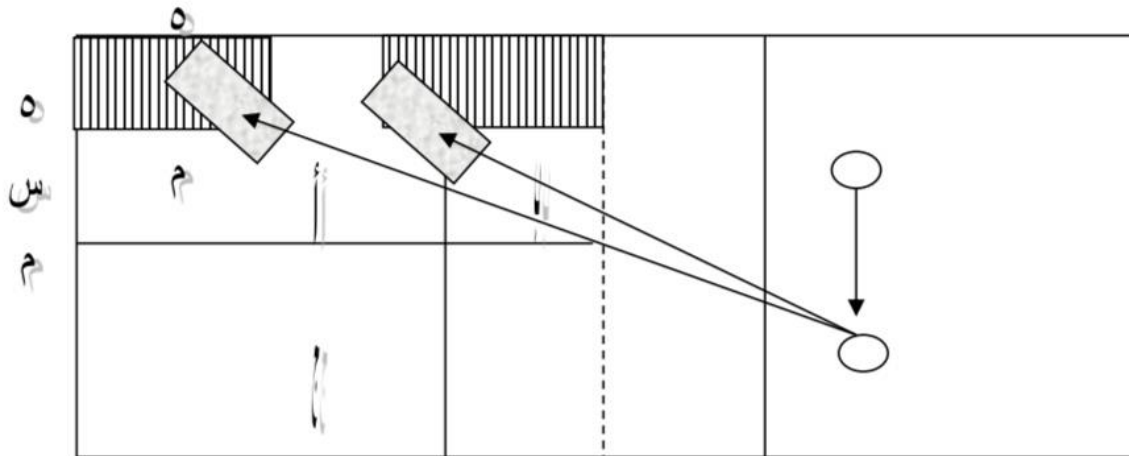


Figure1. shows the spike test in volleyball.

The accuracy test of the diagonal smashing performance demonstrates
Description of the Flexible Thinking Test (Eidan, 2019)

The flexible thinking scale consists of (30) and the decision method of answering from several alternatives. There is one alternative that is correct and another that is incorrect and the answer alternatives are (1, 0) the correct alternative and the incorrect alternative respectively.

Exploratory experiment

The researcher conducted the exploratory experiment on 1/15/2026 on a sample of (6) players from the Industry Club in the age group (15-16) years old, and they were chosen randomly from outside the main research sample, and the experiment lasted two days.

The first day was dedicated to applying the high smashing skill test from center (6), while the second day was dedicated to applying the thinking style scale, with the aim of ensuring the suitability of the application procedures and the safety of the execution of the tests before starting the main experiment.

The pilot study aimed to achieve the following:

1. Ensure the validity of the skills test and the thinking style scale for application to the sample members.
2. Ensure that the test and scale instructions are clear and that the players understand them.
3. Determine the time demand to administer each test and measure.
4. Identifying the obstacles and difficulties that researchers may face while conducting the tests and working to address them.
5. Ensuring the efficiency of the support team and the mechanism for distributing tasks among them.
6. Ensure the validity of the devices, tools and data registration forms.

The results of the pilot study showed the success of all field procedures, as the organization of the tests was sound, the instructions were clear, the players responded well, and the time allotted for applying both the high smashing skill test from center (6) and the thinking style scale was appropriate, in addition to confirming the validity of the results recording forms and the tools

and devices used which encouraged the researchers to proceed with implementing the main experiment according to the specified procedures.

Scientific procedures for tests and measurements used in research

First: Honesty.

The researcher adopted content validity to verify the validity of the research tools. The high smashing skill test from Center (6) and the thinking style scale were presented to a group of experts and specialists in the fields of sports training, measurement and evaluation, motor learning and volleyball numbering (5) experts with the goal of verifying the validity of the two tools in measuring the variables for which they were developed.

After collecting the experts' forms and analyzing them statistically using the chi-square test the results presented that the experts agreed on the validity of the test and the scale as the calculated chi-square value was greater than its tabulated value at a significance level of (0.05) which indicates that they have content validity as shown in Table (2).

Table2. It shows the content validity results of the tests and measures used in the research.

Variable	Agree	Disagree	Calculated value of (t)	tabulated value (t)	Significance
Thinking Style Scale	5	0	5.00	3.84	Significant
High Smash Test from Center (6)	5	0	5.00	3.84	Significant

Second: Reliability:

To ensure the reliability of the research instruments the researcher applied the test-retest method. The Thinking Style Scale and the High Smash Test from Center (6) were administered to a pilot sample and then re-administered to the same sample after (10) days. After calculating Pearson's correlation coefficient between the results of the two administrations the reliability coefficients were found to be high suggesting the stability of the measurement instruments and their reliability in collecting research data.

Third: Objectivity:

The objectivity of the High Smash Test from Center (6) was verified by using specialized judges to evaluate the players' performance. The correlation coefficient between the judges' scores was then calculated and the results demonstrate a high and statistically significant correlation, confirming the test's high degree of objectivity.



As for the Thinking Style Scale, objectivity calculations are unnecessary because it depends on the responses of the sample members according to standardized instructions and a fixed scoring key.

Table 3. shows the reliability and objectivity coefficients for the tests and scales used in the research.

Variable	Reliability Coefficient	Statistical Significance	Objectivity Coefficient	Statistical Significance
Thinking Style Scale	0.86	0.000	—	—
High Smash Test from Center (6)	0.89	0.000	0.815	0.003

Main experience:

The main experiment was carried out over two days corresponding to 2/12-2/2026. The first day, 2/12/2026 was dedicated to applying the high smashing skill test from center (6) while the second day, 2/13/2026 was dedicated to applying the thinking style scale. The tests were carried out under uniform conditions for all members of the sample taking into account the provision of the necessary tools and devices the standardization of test instructions and direct supervision by the researcher and the assisting work team to ensure obtaining accurate and objective data that fulfills the research objectives.

Statistical methods:

The researcher used the Statistical Package for the Social Sciences (SPSS) program to process the research data and extract the results and implemented the following statistical methods:

The arithmetic mean, standard deviation, skewness coefficient, Pearson correlation coefficient, independent samples t-test when needed, simple linear regression coefficient, coefficient of determination (R^2) contribution ratio.

Results:

Deriving the equation for predicting the high smash skill from center (6) in terms of thinking style

Finding the correlation between thinking style and high smashing skill from the center

Table 4. It shows the correlation coefficients between thinking style and high smashing skill from center (6).

Variables	Correlation coefficient (r)	Nature of the relationship	Calculated value of (t)	tabulated value (t)	Significance
The high smashing skill from position (6) x thinking style	0.764	Simple positive	30.428	2.011	Significant

Table (4) shows that the correlation coefficient between thinking style and the high spike skill from position (6) was (0.764) indicating a relatively strong positive correlation. The calculated t-value was (30.428) which is greater than the critical t-value of (2.011) at a significance level of (0.05) demonstrating a significant correlation between the two variables. This findings suggests that the improvement of thinking style among volleyball players aged (16–18) years is associated with improved performance in the high spike skill from position (6) thus supporting the possibility of utilizing thinking style to predict the performance level of this skill.

Table 5. shows the correlation coefficient and the percentage contribution of the thinking style in predicting the high smashing skill from center (6) are shown.

dependent variable	Correlation coefficient (R)	Nature of the relationship	Contribution ratio (R ²)
The high smashing skill from position (6)	0.764	positive correlation	0.584 (58.4%)

Table (5) shows that the value of the correlation coefficient between thinking style and the high smashing skill from position (6) reached (0.764) which is a positive correlation demonstrating a good relationship between the two variables. The contribution rate reached (0.584) which is equivalent to 58.4% of the variance in the level of performance of the high smashing skill from position (6) that can be explained by the thinking style while the remaining percentage of 41.6% is ascribed to other variables not addressed by the research or to random error. This result confirms the possibility of depending on the thinking style as an explanatory variable in predicting the level of performance of the high smashing skill from position (6).

Table 6. shows The Analysis of variance (ANOVA) of regression to predict the skill of the high spike from the center (6) in relation to the thinking style of volleyball players aged (16–18) years

(Sig.)	value	F (Mean Square)	(df)	(Sum of Squares)	The model
0.000	39.312	2299.351	1	2299.351	Inside the squares
		58.595	28	1640.649	Outside the squares
			29	3940.000	Total

At a significance level of 0.05 and two DF (1, 28)

Table (6) shows the results of the regression analysis of variance for predicting the high spike skill from position (6) according to the thinking style of volleyball players aged (16–18) years.

The results showed that the coefficient of determination (R^2) was (0.584) which means that the thinking style explains (58.4%) of the variance in the performance level of the high spike skill while the remaining percentage of (41.6%) is attributed to other variables not addressed by the study model such as physical and skill abilities, training experience and psychological factors.

The results also demonstrated that the calculated F-value was 39.312 which is greater than the tabulated F-value of 4.20 at 1 and 28 degrees of freedom and a significance level of 0.05. Moreover the statistical significance level was 0.000 which is less than 0.05. These results indicate that the regression model has a high degree of statistical significance and that the relationship between thinking style and high smashing skill is not random but rather a real and reliable relationship for predicting performance.

Table 7. shows the Summary of the regression model for predicting the high spike skill from position (6) in terms of the thinking style of volleyball players aged (16–18) years

Multiple correlation coefficient (R)	Coefficient of determination (R^2)	Adjusted coefficient of determination (Adjusted R^2)	(Std. Error of the Estimate)
0.764	0.584	0.569	7.655

The results showed that the value of the coefficient of determination (R^2) was (0.584) which means that the thinking style explains (58.4%) of the variance in the level of performance of the high smashing skill while the remaining percentage of (41.6%) is attributed to other variables not addressed by the study model such as physical and skill abilities, training experience and psychological factors.

These results indicate that the regression model has a good degree of efficiency in explaining the relationship between the two research variables and can be relied upon to develop an equation to predict the performance level of the high smash skill from position (6) among volleyball players aged (15-16) years.

This result reflects the significant of the mental processes the player employs during performance. The high smash needs quick perception of the game's flow, analysis of the opponent's positions choosing the optimal timing for the jump and determining the direction and power of the shot in relation to the positioning of the block and backcourt defense. Therefore possessing a suitable thinking style contributes to enhancing the quality of decision-making which directly impacts the efficiency of skill execution.

This finding connects with modern trends in sports training science which emphasize that skill performance depends not only on physical and technical preparation but also on mental and cognitive capacities that enable athletes to process information quickly and make sound decisions in a timely manner. It also confirms that integrating cognitive and psychological aspects into training programs contributes to raising the level of skill performance and improving performance prediction in team sports consisting volleyball. Based on the results of the statistical analysis the regression equation is as follows:

$$Y^{\wedge}=5.481+0.201(X)\hat{Y}=5.481+0.201(X)Y^{\wedge}=5.481+0.201(X)$$

- $Y^{\wedge}\hat{Y}$ = Expected score in the high smashing skill from position (6).
- XXX = The player's score on the thinking style scale.
- 5.4815.4815.481 = Constant.
- 0.2010.2010.201 = Regression coefficient.

Discussion:

The results of Tables (3, 4, 5, 6) demonstrated a statistically significant positive correlation between thinking style and the high smashing skill from position (6). The results also showed that thinking style contributes a good percentage to explaining the variation in the level of performance of this skill as well as the possibility of building a regression equation to predict skill performance in terms of thinking style.

The researcher considers that this result is due to the fact that performing the high smash from position (6) does not depend only on physical and technical abilities but also demands incorporated mental processes that include quickly perceiving the situation analyzing the ball's trajectory, choosing the suitable timing for jumping and determining the direction and power of the shot in accordance with the opponent's position. Therefore the player who possesses a more efficient thinking style is more able to make the right decision and execute the skill performance with a high degree of accuracy and effectiveness. (Martel, 2014, p. 49).

The high smash from position (6) is also one of the most complex offensive skills as it requires a high degree of coordination between sensory perception and movement in addition to the ability to process information received from the surrounding environment in a short time. The thinking style plays a vital role in organizing these processes which helps the player to choose the appropriate movement solution according to the requirements of the competitive situation. (McGown, Fronske, & Moser, 2001, p. 66)

The research results indicate that the high level of thinking among players is reflected positively on the quality of skill performance as the player becomes more able to predict the ball's trajectory, choose the appropriate angle of attack and change the direction of the strike based on the positioning of the blocking wall or defensive players which have the impact on the effectiveness of the smash and the possibility of scoring points.

The regression results also confirm that thinking style is an important variable that can be relied upon in predicting the performance level of the high smash skill from position (6) as it contributed significantly to explaining the variation in skill performance. This indicates that developing thinking styles in players should be an crucial part of training programs by designing training situations that require speed of thinking decision-making, and problem-solving and linking skill training to the mental processes that accompany performance during competition (Williams & Hodges, 2004, p. 120).

The researcher believes that modern volleyball training is no longer limited to developing physical and skill abilities but has become dependent on integrating cognitive and mental aspects with motor performance, due to the impact of this on raising performance



efficiency and improving the quality of execution of offensive skills particularly the high smashing skill from position (6) which requires speed of thinking and accuracy in decision-making and execution at the same time.

Conclusions:

In light of the research objectives and hypotheses, and after presenting, analyzing and discussing the results the researcher achieved the following conclusions:

1. A linear regression equation was developed to predict the performance level of the high smashing skill from position (6) in terms of the thinking style of volleyball players aged (15-16) years.
2. There is a statistically significant positive correlation between thinking style and the performance level of the high smashing skill from position (6).
3. The thinking style contributes significantly to explaining the variation in the performance level of the high smashing skill from position (6) which verifies its importance as one of the variables affecting skill performance.
4. The thinking style can be depended upon as a scientific indicator in predicting the performance level of the high smashing skill from position (6) among volleyball players in this age group.
5. The high level of thinking among players is reflected positively on the efficiency of executing the high smashing skill from position (6) by enhancing the speed of decision-making and the accuracy of choosing skillful solutions during performance.

Recommendations:

In light of the research findings, the researcher recommends the following:

1. Adopting the prediction equation extracted in the research when evaluating and choosing players, especially in the age groups (15-16) years.
2. Giving attention to developing the thinking style of volleyball players by including cognitive exercises and training situations that require speed of thinking and decision-making within the training units.
3. Conducting periodic assessments of the thinking style and high smashing skill level from position (6) and using their results in monitoring the development of players.
4. Employing research findings in preparing training programs that combine the development of mental and skill aspects in a way that facilitates to increase the level of offensive performance of players.
5. Conduct same studies on other offensive and defensive skills and on several age groups and competitive levels to verify the possibility of using the thinking method to predict different aspects of performance in volleyball.



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