



# International Journal of Physical Education, Sports and Health

P-ISSN: 2394-1685  
E-ISSN: 2394-1693  
Impact Factor (R,JIF): 5.93  
IJPESH 2025; 12(5): 661-665  
© 2025 IJPESH  
<https://www.kheljournal.com>  
Received: 25-07-2025  
Accepted: 27-08-2025

**Savitha V**  
PhD Scholar, School of Physical  
Education and Sports Sciences,  
Mahatma Gandhi University,  
Kottayam, Kerala, India

**Dr. Binu George Varghese**  
Research Supervisor, School of  
Physical Education and Sports  
Sciences, Mahatma Gandhi  
University, Kottayam, Kerala,  
India

**Dr. Ajesh C R**  
Assistant Professor, Department  
of Physical Education, E.K.N.M.  
Government College, Elerihattu,  
Kasaragod, Kerala, India

**Corresponding Author:**  
**Savitha V**  
PhD Scholar, School of Physical  
Education and Sports Sciences,  
Mahatma Gandhi University,  
Kottayam, Kerala, India

## Approach kinematics of the jump shot in handball among national level handball players

**Savitha V, Binu George Varghese and Ajesh CR**

**DOI:** <https://doi.org/10.22271/kheljournal.2025.v12.i5j.4043>

### Abstract

The purpose of the present research was to investigate the nature and characteristics of selected kinematical parameters of approach phase of jump shot in handball. Assessment of kinematic parameters in jump shot can throw light into the technical perfection and training parameters of handball players. The preliminary objective was to assess characteristics of selected biomechanical parameters of the approach phase of jump shot in handball using national level handball players from Kerala, India. For the purpose of the study 30 male national level handball players were randomly selected, who were having a training and playing experience in handball not less than 5 years. The selected subjects represented either Kerala state or any university from Kerala in national level competitions. The total subjects were further classified in three groups with 10 numbers in each based on the age group in the game handball, called as Sub Junior, Junior and Senior. Jump shot technique in handball is a scoring method used by players during the game. Considering the technical importance in it, which can describe the efficiency and accuracy of the technique, the researcher made an attempt to analyse the approach kinematics during Jump Shot in handball using Kinovea Motion Analysis Software. The Jump Shot trials were recorded using videography and assessed using the software. The data capturing was made in predetermined frame width, which ensure no hindering factors were influencing the natural performance of the player while performing the technique. For the present research Approach Distance, Approach Velocity, Lowest Height of CG at Last Stride and Duration of Last Stride were selected as the dependent factors. Approach Distance was the distance taken by the player from the point of stance to the point of take-off. Approach Velocity was calculated by dividing the displacement during approach run with the time taken to complete the same. Lowest Height of the CG during Last Stride was the measure of perpendicular distance from the point of CG of the player to the ground. Duration of the Last Stride was the time taken by the player to complete the last step of approach during performing the jump shot. The captured videos of players performing the technique were opened in the software and using various tools in the software the data were obtained after calibration of the video. The data obtained were analysed using MANOVA, ANOVA and LSD Post Hoc Test. Descriptive statistics were calculated to obtain the demographic characteristics of the data. The results showed that there was significant difference in Approach Distance, Approach Velocity and Lowest Height of CG during Last Stride among the three National Level Male Handball Players from Kerala. The research also concluded that there was no significant difference in Duration of Last Stride during the approach phase of Jump Shot in Handball.

**Keywords:** Jump shot, approach phase, kinematic analysis

### Introduction

The nature and characteristics of the game handball demands high level of physical fitness as well as mastery of the techniques in the game which can influence the performance of the player at any level. As the said parameters and the performance of the game is directly proportional to the systematic training experience and technical knowledge. In handball the efficiency of the technique and its economy in performance is a vibrant factor in defining the consistency of a player in executing different techniques and during the game. Jump shot in handball is a scoring technique used by the players to score a goal. It involves a kinetically linked movements of different body parts, that demands a continuity in movement from the start to the end of the execution of the skill. The technique starts with an approach run followed by takeoff and throw of the ball and landing ground.

The peculiarity of the technique and the demand of the game need to be satisfied while performing the same during the game. The player has to accomplish the same a number of times without making much difference with the recommended model of the technique, even though the individual modifications and adaptations of the techniques varies player to player. The fulfilment of biomechanical principles in very crucial factor in successful performance of the technique, as the player is intended to get the attempt on the goal become a successful one. Violation of the principles can either lead to an unsuccessful attempt at the goal or an uneconomic movement pattern, which will hinder the natural performance of the player.

The approach phase of jump shot on handball starts from the stance with the ball and the player runs forward with a maximum of three steps, which is the stipulated maximum steps by the rules of the game. The approach phase of the technique is a vital contributing phase of the technique as the horizontal velocity developed during the phase is important in successful completion of the technique. The phase is intended to generate maximum horizontal velocity that will be effectively used to generate maximum vertical velocity at the time of takeoff, which will help the players to raise their center of gravity to a maximum height. There for, what a player does during the approach phase becomes decisive factor in the successful execution of the technique as well as the scoring chances of the player. The kinematic parameters during the approach phase are the potential contributors in an economically efficient movement pattern. There for the researcher had made an attempt to investigate the kinematic characteristics of the approach phase of jump shot in handball. The purpose of the present research was to investigate the nature and characteristics of selected kinematic parameters of the approach phase of the jump shot in handball. Assessment of kinematic parameters in jump shots can shed light on the technical perfection and training parameters of handball players. With the preset research the researchers intended to describe the nature and magnitude of selected

kinematic variables in the approach phase of jump shot in handball and to know the differences in kinematic variables in the approach phase of jump shot among handball players concerning the age group.

### Methodology

For the purpose of the study 30 male national level handball players were randomly selected, who were having a training and playing experience in handball not less than 5 years. The selected subjects represented either Kerala state or any university from Kerala in national level competitions. The total subjects were further classified in three groups with 10 numbers in each based on the age group in the game handball, called as Sub Junior, Junior and Senior. The study was delimited to back court players and the jump shot performed against a defensive wall by the players in front of the goal area. For the present research work four kinematic variables – Approach Distance, Approach Velocity, Lowest Height of the CG at Last Stride and Duration of Last Stride - were selected as the dependent variables. Approach Distance was the distance taken by the player from the point of stance to the point of take-off. Approach Velocity was calculated by dividing the displacement during approach run with the time taken to complete the same. Lowest Height of the CG during Last Stride was the measure of perpendicular distance from the point of CG of the player to the ground. During of the Last Stride was the time taken by the player to complete the last step of approach during performing the jump shot. The back court players performing the jump shot technique were captured using videography and assessed using Kinovea Motion Analysis Software. The data pertaining to the selected kinematic variables were obtained from the using the tools and techniques in the Kinovea Motion Analysis Software. The data collected were assessed using MANOVA, ANOVA and LSD Post Hoc Test. Descriptive statistics were calculated to obtain the demographic characteristics of the data.

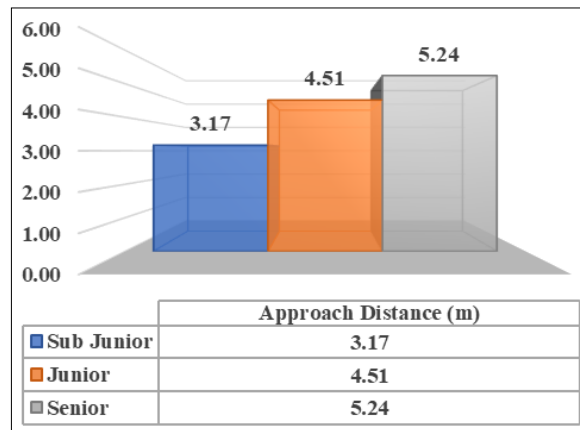
### Results of the Study

**Table 1:** Analysis of Kinematic Variables in the Approach Phase of Jump Shot among National Level Male Handball Players

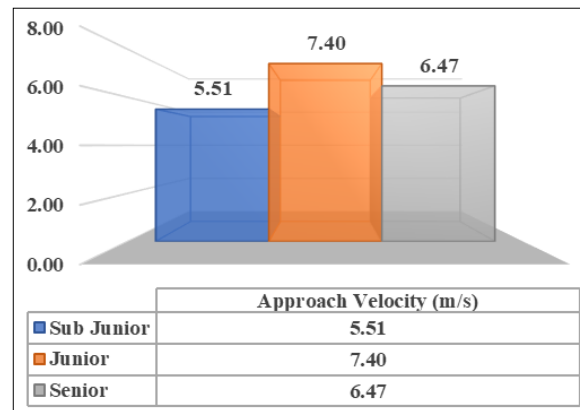
Variable	Group	Mean	Std. Deviation	N
Approach Distance (m)	Sub Junior	3.17	0.08	10
	Junior	4.51	0.29	10
	Senior	5.24	0.28	10
	Total	4.31	0.90	30
Approach Velocity (m/s)	Sub Junior	5.51	0.33	10
	Junior	7.40	1.01	10
	Senior	6.47	0.31	10
	Total	6.46	1.00	30
Lowest Height of the CG at Last Stride (m)	Sub Junior	0.72	0.06	10
	Junior	0.82	0.06	10
	Senior	0.91	0.07	10
	Total	0.82	0.10	30
Duration of Last Stride (s)	Sub Junior	0.1710	0.02	10
	Junior	0.1660	0.01	10
	Senior	0.1720	0.01	10
	Total	0.17	0.01	30

Table 1 illustrates the demographic characteristics of the selected dependent variables across three different groups. Senior male national level handball players were found with highest mean value for approach distance, lowest height of CG and duration of last stride while the highest mean value for the approach velocity was found with junior category. The

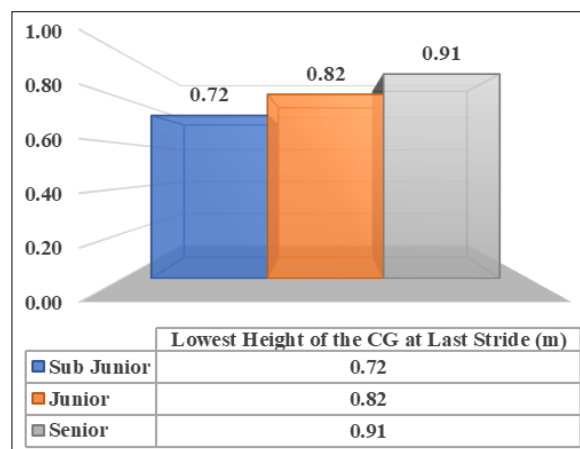
results indicated that the senior players use a longer approach while performing the jump shot technique, which is comparatively lesser in junior and sub-junior category. The approach velocity was found to be highest with the junior players followed by senior and sub junior players.



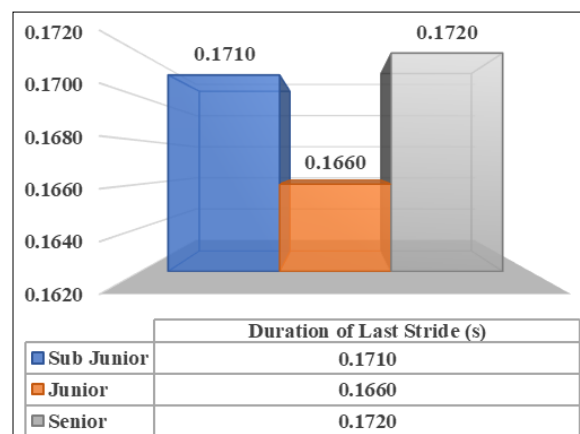
**Fig 1:** Estimated marginal means of approach distance among different groups of national-level male handball players.



**Fig 2:** Estimated marginal means of approach velocity among different groups of national-level male handball players.



**Fig 3:** Estimated marginal means of lowest height of CG at last stride among different groups of national-level male handball players.



**Fig 4:** Estimated marginal means of duration of last stride among different groups of national-level male handball players.

**Table 2:** MANOVA of all dependent variables of Jump Shot among National Level Male Handball Players.

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	1.508	19.153	8.000	50.000	.000	.754
Wilks' lambda	.027	30.418 <sup>a</sup>	8.000	48.000	.000	.835
Hotelling's trace	16.128	46.367	8.000	46.000	.000	.890
Roy's largest root	14.795	92.470 <sup>b</sup>	4.000	25.000	.000	.937

Multivariate Analysis of Variance was used to analyze the effect of the independent variable 'Group' on all dependent variables in different categories. From the table it is evident that the test statistics confirm significant difference among the three groups (sub junior, junior and senior) in relation to all

selected dependent variable of the present research. The tested F score of Wilks' lambda ( $F = 30.418$ ,  $p=0.000$ ) confirm that the three different groups differ significantly in selected dependent variables, which indicated further statistical tests to confirm exact difference between the groups.

**Table 3:** Univariate ANOVA on Effect of Group with Kinematic Variables in the Approach Phase of Jump Shot among National Level Male Handball Players

Dependent Variable	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Approach Distance	22.063	2	11.032	195.759	.000	.935
Approach Velocity	17.977	2	8.988	22.119	.000	.621
Lowest Height of the CG at Last Stride	.169	2	.085	22.957	.000	.630
Duration of Last Stride	.000	2	.000	.595	.559	.042

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Computed using alpha =.05

The ANOVA results presented in the table indicates that among the selected kinematic variables in the approach phase of jump shot approach distance ( $F= 195.759$ ,  $p = 0.000$ ), approach velocity ( $F= 22.119$ ,  $p= 0.000$ ), lowest height of CG at last stride ( $F= 22.957$ ,  $p=0.000$ ) differ significantly in relation to the selected independent variable group (Sub

junior, junior and senior). The pair wise comparison and the post hoc test (LSD) carried out on the following dependent variables (Approach Distance, Approach Velocity and Lowest Height of CG at Last Stride) showed significant difference in relation to the three different groups are presented below.

**Table 4:** Pairwise Comparison of Groups of significant Kinematic variables in the Approach Phase of Jump Shot among National Level Male Handball Players on Group (LSD).

Dependent Variable	Group		Mean Difference (I-J)	Std. Error	Sig.
Approach Distance	Sub Junior (3.17 m)	Junior	-1.340*	0.106	.000
		Senior	-2.071*	0.106	.000
	Junior (4.51 m)	Sub Junior	1.340*	0.106	.000
		Senior	-.731*	0.106	.000
	Senior (5.24 m)	Sub Junior	2.071*	0.106	.000
		Junior	.731*	0.106	.000
Approach Velocity	Sub Junior (5.51 m/s)	Junior	-1.896*	0.285	.000
		Senior	-.968*	0.285	.002
	Junior (7.40 m/s)	Sub Junior	1.896*	0.285	.000
		Senior	.928*	0.285	.003
	Senior (6.47 m/s)	Sub Junior	.968*	0.285	.002
		Junior	-.928*	0.285	.003
Lowest Height of the CG at Last Stride	Sub Junior (0.72 m)	Junior	-.094*	0.027	.002
		Senior	-.184*	0.027	.000
	Junior (0.82 m)	Sub Junior	.094*	0.027	.002
		Senior	-.090*	0.027	.003
	Senior (0.91 m)	Sub Junior	.184*	0.027	.000
		Junior	.090*	0.027	.003

The pair wise comparison on the dependent variables found with difference among three groups of players assessed for significant mean difference across the groups. From table 4, it is evident that all the three groups differ significantly with the dependent variables approach distance, approach velocity and lowest height of CG at last stride.

### Discussion of Findings

The present research work examined the difference in kinematic parameters of approach phase of jump shot in handball and found that the players in three different age groups (Sub-Junior, Junior and Senior) differ in their approach pattern while performing the technique. This may be

due to their physical and motor characteristics differences across the age group. It was found that the senior group had highest mean value for approach distance, lowest height of CG and Duration of Last Stride, which suggest that the senior male national level handball players take more distance to approach and lower the CG to a minimum height and takes more time to complete the approach while performing the technique in comparison with the Sub-Junior and Junior national level male handball players. The pair wise comparison of mean difference reported that the Sub- Junior, Junior and Senior national level male handball players differ significantly in terms of approach distance, approach, approach velocity and lowest height of CG at last stride. Pori,

Bon and Sibila (2003) <sup>[1]</sup> provided a validated model with parameters that corresponded directly with the present research work, emphasizing CG lowering and stride length As discriminators between experience levels. Ohnjec *et al.* (2010) <sup>[2]</sup> also highlighted age-based differences in approach mechanics, particularly in CG elevation and stride metrics among younger versus older athletes.

### Conclusion

The study concluded that there was significant difference in Approach Distance, Approach Velocity and Lowest Height of CG during Last Stride among the three groups of National Level Male Handball Players. The research also concluded that there was no significant difference in Duration of Last Stride during the approach phase of Jump Shot in Handball.

### References

1. Šibila M, Pori P, Bon M. Basic kinematic differences between two types of jump shot techniques in handball. Univ Palackianae Olomucensis Gymnica. 2003;33(1):19-26.
2. Ohnjec K, Antekolović L, Gruić I. Comparison of kinematic parameters of jump shot performance by female handball players of different ages. Acta Kinesiologica. 2010;4(2):33-40.