



## Research Article

ICFFL Goa Conference|2025

**Biomechanical Analysis of Standing Long Jump of Junior National Football Girls with the Implementation of General Warming Up and Ramp Warm-Up**Ms. Ningthoujam Jeny<sup>1</sup>, Dr. Satish Kumar<sup>2</sup>, Dr. Sapam Sanatombi Devi<sup>3</sup> & Ms. Oinam Wangoleima Chanu<sup>4</sup><sup>1</sup>Football Coach, Department of Physical Education, National Sports University, Manipur-India<sup>2</sup>Assistant Professor, Department of Physical Education & Director of Sports, The ICFAI University, Tripura-India<sup>3</sup>Assistant Professor, Department of Physical Education, National Sports University, Manipur-India<sup>4</sup>Taekwondo Coach, Department of Physical Education, National Sports University, Manipur-India**Article History**

Received: 01.07.2025

Accepted: 20.08.2025

Published: 25.09.2025

**Citation**

Jeny, N., Kumar, S., Devi, S. S., Chanu, O. W. (2025). Biomechanical Analysis of Standing Long Jump of Junior National Football Girls with the Implementation of General Warming Up and Ramp Warm-Up. Goa Conference 2025 Fit for Life: Empowering Youth Through Physical Education, Sports and Traditional Sports. *Indiana Journal of Agriculture and Life Sciences*, 163-167. Indiana Publications.

**Abstract:** The study investigates the biomechanical analysis of the standing long jump (SLJ) among junior national female football players, explicitly comparing the effects of general warming up (GWP) and RAMP warm-up techniques. A total of 20 participants, aged 13 to 18 from Chhattisgarh, India, were selected for this analysis using a Repeated measures design. The focus was on evaluating the sagittal plane movements related to the peak flexion of the hip joint angle (HJA) and knee joint angle (KJA) during the SLJ. Data was collected using Kinovea software to analyze the joint angles after each warm-up method. The statistical analysis employed Pearson product-moment correlation to assess relationships between the variables, with a significance level set at  $p < 0.05$ . The findings revealed a strong negative correlation (-0.707) between HJA and GWP, indicating that as one variable increases, the other decreases, which is statistically significant with a p-value of 0.000. In contrast, the correlation between KJA and GWP was weak (-0.028), with a non-significant p-value of 0.907. When examining RAMP warm-up effects, a moderate negative correlation (-0.643) was found between HJA and RAMP warm-up, significant at  $p = 0.002$ . However, the KJA and RAMP warm-up relationship was weak (-0.227) and not statistically significant ( $p = 0.337$ ). Overall, this study highlights essential biomechanical differences in SLJ performance influenced by different warm-up methods among junior female football players, suggesting that specific warm-up strategies affect joint angles and potentially impact jumping performance. Further research could explore these dynamics in greater detail to optimize training protocols for athletes.

**Keywords:** General warming up, RAMP warming up, Kinematics, Kinovea software.

Copyright © 2025 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0).

**INTRODUCTION**

General warming-up can be achieved through walking, running, jumping and some other physical exercises of flexibility and agility. It works as a comprehensive preparation of body organs, muscles and joints but it is not sufficient to qualify a player to participate in games or hard sections of training and performance. (Alanazi, 2016)

The RAMP warm-up system was designed to address all the previous considerations. Its structure maximises performance in the short term, but additionally it provides a sequence by which each activity optimises subsequent activity in a time and energy efficient manner. (Ian Jeffreys, 2017)

The competition in all fields of sports and games has developed to such a high degree, that no coach or player can afford to neglect the application of scientific principles that can give him an added advantage in the high level of competition. This approach definitely eliminates the chance factor that in hit-or-miss method. Besides providing a definite and scientific procedure for teaching and analysing

techniques in order to obtain the most efficient performance. It is interesting to note that the principles of mechanics apply to the human machine just as they apply to all of the machines. That is to say that man is a machine. However, the difference between human and machine do not change the fundamental principles. (Reddy, 2015)

Marijana Hraski *et al.* (2015) conducted a study on comparison of standing long jump technique performed by subjects from different age groups and the study determine kinematic parameters relevant for the proficient performance of standing long jump (SLJ) test in boys and adolescents. The results showed the existence of specific relationship between selected kinematic parameters that significantly affected the execution of standing long jump test in each age group.

**STATEMENT OF THE PROBLEM**

The purpose of the study was to find out the Biomechanical analysis of standing long jump of junior national football girls with the implementation of general warming up and RAMP warm up.

## METHODOLOGY

To achieve the purpose of the study, twenty (N=20) junior national football girls were selected from Chhattisgarh state, India. The age of these subjects ranged from 13 to 18 years. The selected subjects were analyzed in two different conditions, one was after general warming up and second one was after RAMP warming up in two different days, each player performed 3 attempts and the best performance was taken, as well as the sagittal plane movements of peak flexion of knee joint angle (KJA) and the peak flexion of hip joint angle (HJA).

### Testing Procedure

To do the video analysis of the standing long jump, investigator used one YI Action Cameras (SONY IMX206 high-definition (HD) H264/ MJPEG video engine and a 700-MHz ARM11 applications processor), one tripods for camera, and reflective markers of marking knee joint and hip joint, shoulder joint, and ankle joint, the camera was fixed at the height of one meter with a distance of 5metres away from the initial point of measurement to avoid the perspective error.

### Statistical Analysis

The collected data were analyzed through Person correlation and t-test for Repeated measures design. The obtained data were subjected to statistical treatment using correlation for reliability of the data. In all cases 0.05 level of significance was fixed to test the confidence level.

## RESULTS AND DISCUSSION

**Table 1 Showing the Descriptive Statistics of HJA and GWP**

	Descriptive Statistics		
	Mean	Std. Deviation	N
HJA	93.9500	23.63867	20
GWP	1.6845	0.22521	20

Table 1 demonstrated the descriptive statistics for two variables, HJA and GWP, based on a sample size of 20 for each. The mean value of HJA was 93.95, with a standard deviation of 23.64, indicating a considerable spread of values around the mean. In contrast, the mean value of GWP was 1.6845, with a lower standard deviation of 0.2252, suggesting less variability in the data.

**Table 2 Showing the Pearson product-moment correlation of HJA and GWP**

		Correlations	
		HJA	GWP
HJA	Pearson Correlation	1	-.707**
	Sig. (2-tailed)		0.000
	N	20	20
GWP	Pearson Correlation	-.707**	1
	Sig. (2-tailed)	0.000	
	N	20	20

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 2 demonstrated the correlation between HJA and GWP using Pearson’s correlation coefficient. The results indicate a strong negative correlation of -0.707, which is statistically significant at the 0.01 level (p = 0.000). This suggests that as HJA increases, GWP tends to decrease, and vice versa. The sample size for both variables is 20 (N = 20). The significant p-value confirms that the observed relationship is unlikely due to chance, indicating a meaningful inverse association between the two variables.

**Table 3 Showing the Descriptive Statistics of KJA and GWP**

	Descriptive Statistics		
	Mean	Std. Deviation	N
KJA	119.7500	11.84938	20
GWP	1.6845	0.22521	20

Table 3 demonstrated the descriptive statistics for the variables KJA and GWP, based on a sample size of 20 for each. The mean value of **KJA** is **119.75**, with a standard deviation of **11.85**, indicating a moderate spread of values around the mean. In contrast, **GWP** has a mean of **1.6845** and a standard deviation of **0.2252**, suggesting relatively low variability.

**Table 4 Showing the Pearson product-moment correlation of KJA and GWP**

		Correlations	
		KJA	GWP
KJA	Pearson Correlation	1	-0.028
	Sig. (2-tailed)		0.907
	N	20	20
GWP	Pearson Correlation	-0.028	1
	Sig. (2-tailed)	0.907	
	N	20	20

Table 4 demonstrates the correlation between KJA and GWP using Pearson’s correlation coefficient. The correlation value of -0.028 indicates a very weak negative relationship between the two variables. Additionally, the p-value (0.907) is much greater than 0.05, suggesting that the correlation is not statistically significant. This means there is no meaningful association between KJA and GWP in the given sample of 20 observations, implying that changes in one variable do not predict changes in the other.

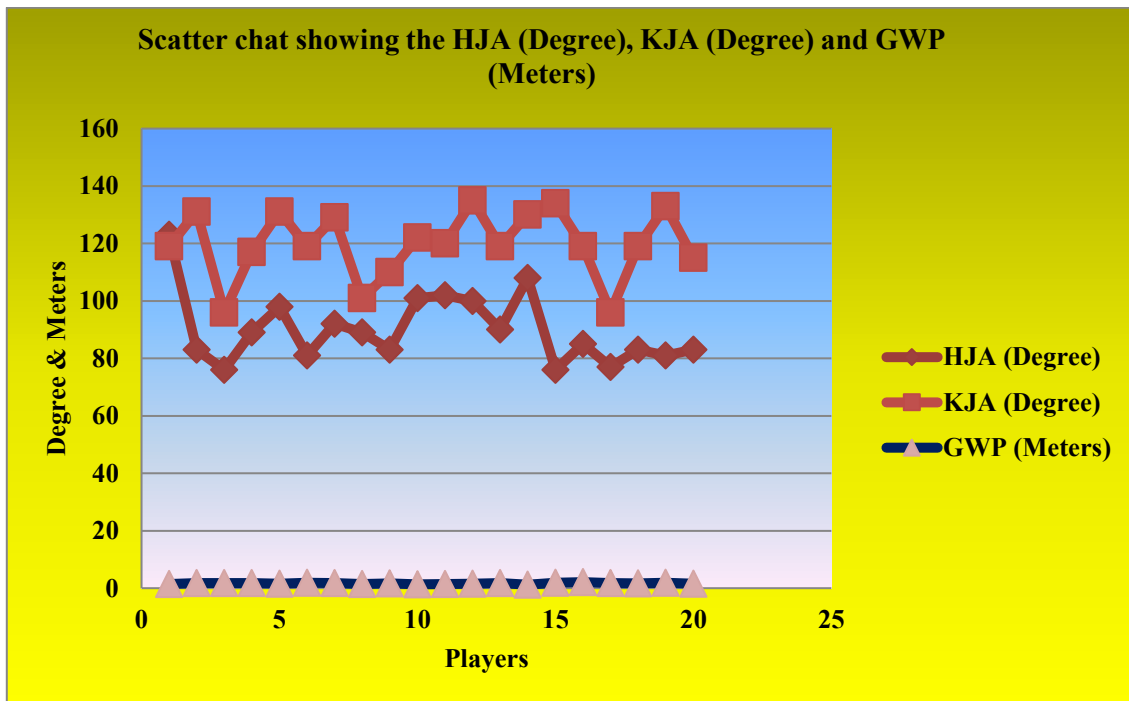


Figure 1: Showing the Scatter chat of the HJA (Degree), KJA (Degree) and GWP (Meters)

Table 5: Showing the Descriptive Statistics of HJA1 and RAMPWP

Descriptive Statistics			
	Mean	Std. Deviation	N
HJA1	75.6000	12.50852	20
RAMPWP	1.9535	0.26524	20

Table 5 demonstrates the descriptive statistics for HJA1 and RAMPWP based on a sample size of 20. The mean value for HJA1 is 75.6000 with a standard deviation of 12.50852, indicating the average value and the spread of data around the mean. Similarly, RAMPWP has a mean of 1.9535 and a standard deviation of 0.26524, showing relatively low variability in its values.

Table 6: Showing the Pearson product-moment correlation of HJA1 and RAMPWP

Correlations			
		HJA1	RAMPWP
HJA1	Pearson Correlation	1	-.643**
	Sig. (2-tailed)		0.002
	N	20	20
RAMPWP	Pearson Correlation	-.643**	1
	Sig. (2-tailed)	0.002	
	N	20	20

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 6 demonstrates the correlation table that presents the relationship between HJA1 and RAMPWP using Pearson’s correlation coefficient. The correlation value is -0.643, indicating a moderate to strong negative correlation between the two variables. This suggests that as HJA1 increases, RAMPWP tends to decrease, and

vice versa. The p-value (0.002) is less than 0.01, signifying that the correlation is statistically significant at the 0.01 level. This means there is strong evidence to support the existence of this negative relationship in the given sample (N = 20).

Table 7 Showing the Descriptive Statistics of KJA1 and RAMPWP

Descriptive Statistics			
	Mean	Std. Deviation	N
KJA1	108.9000	10.68644	20
RAMPWP	1.9535	0.26524	20

Table 7 demonstrated the descriptive statistics table provides a summary of the variables KJA1 and

RAMPWP based on a sample size of 20. The mean value for KJA1 is 108.90 with a standard deviation of 10.69,

indicating the average value and the extent of variation in the data. Similarly, RAMPWP has a mean of 1.9535

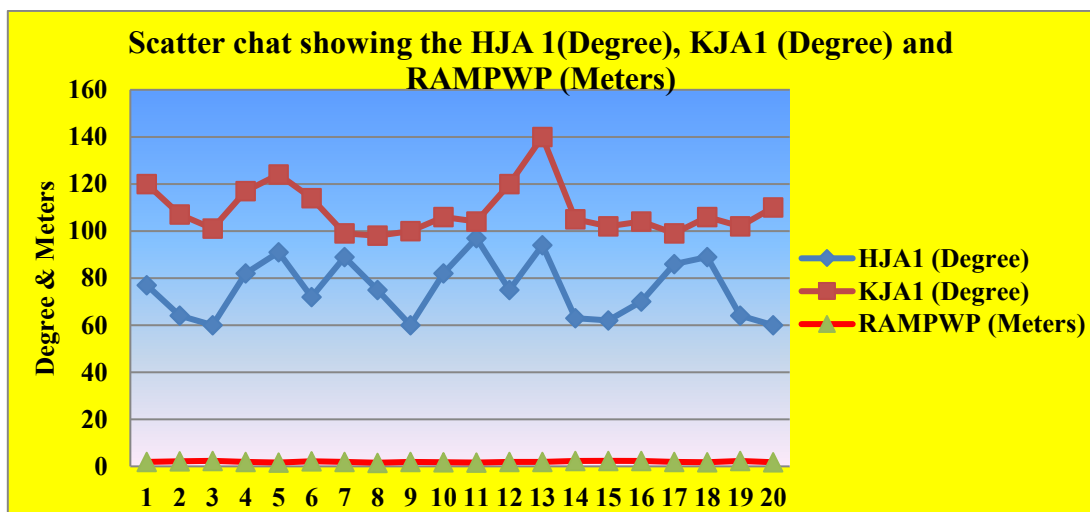
with a standard deviation of 0.26524, showing a smaller spread in values.

**Table 8: Showing the Pearson product-moment correlation of KJA1 and RAMPWP**

		KJA1	RAMPWP
KJA1	Pearson Correlation	1	-0.227
	Sig. (2-tailed)		0.337
	N	20	20
RAMPWP	Pearson Correlation	-0.227	1
	Sig. (2-tailed)	0.337	
	N	20	20

Table 8 demonstrated the correlation table presents the Pearson correlation between KJA1 and RAMPWP based on a sample size of 20. The Pearson correlation coefficient is -0.227, indicating a weak negative correlation between the two variables. The p-value (Sig.

2-tailed) is 0.337, which is greater than 0.05, suggesting that the correlation is not statistically significant. This means that there is no strong evidence of a meaningful linear relationship between KJA1 and RAMPWP in this dataset.



**Figure 2:** Showing the Scatter chat of the HJA1 (Degree), KJA1 (Degree) and RAMPWP (Meters)

## CONCLUSSIONS

The analysis of descriptive statistics and Pearson correlations reveals key insights into the relationships between different variables. A strong negative correlation ( $r = -0.707$ ,  $p = 0.000$ ) was found between HJA and GWP, indicating that as HJA increases, GWP significantly decreases. Similarly, a moderate to strong negative correlation ( $r = -0.643$ ,  $p = 0.002$ ) was observed between HJA1 and RAMPWP, suggesting that higher HJA1 values are associated with lower RAMPWP values. In contrast, the correlation between KJA and GWP was extremely weak ( $r = -0.028$ ,  $p = 0.907$ ), and the relationship between KJA1 and RAMPWP was also weak and statistically insignificant ( $r = -0.227$ ,  $p = 0.337$ ). These results indicate that while HJA and HJA1 exhibit significant inverse relationships with GWP and RAMPWP, KJA and KJA1 do not show meaningful associations with these variables. This suggests that HJA and HJA1 may have a stronger influence on the respective dependent variables compared to KJA and KJA1. However, further research

with larger sample sizes and additional factors may be necessary to confirm and expand upon these findings.

## REFERENCES

1. Alanazi, H. M. (2016). Role of warming-up in promoting athletes’ health and skill. *International Journal of Scientific and Research Publications*, 6(1), 158.
2. Biscarini, A., Panichi, R., Dieni, C. V., & Contemori, S. (2021). Effects of voluntary quadriceps–hamstring cocontraction on tibiofemoral force during isometric knee extension and knee flexion exercises with constant external resistance. *Journal of Applied Biomechanics*, 37(6), 565–572.
3. Farrow, A. C., & Palmer, T. B. (2021). Age-related differences in hip flexion maximal and rapid strength and rectus femoris muscle size and composition. *Journal of Applied Biomechanics*, 37(4), 311–319.
4. Gruber, A. H., Zhang, S., Pan, J., & Li, L. (2021). Leg and joint stiffness adaptations to minimalist and

- maximalist running shoes. *Journal of Applied Biomechanics*, 37(5), 408–414.
5. **Hraski, M., Hraski, Ž., & Prskalo, I.** (2015). Comparison of standing long jump technique performed by subjects from different age groups. *Baltic Journal of Sport & Health Sciences*, 3(98), 2–12.
  6. **Jeffreys, I.** (2017). RAMP warm-ups: More than simply short-term preparation. *ResearchGate*, 44, 20.
  7. **Kumar, S., & Singh, A. K.** (2023). 2D kinematical analysis of upper extremity of obese during walking with implementation of fitness training. *Journal of Clinical Otorhinolaryngology, Head, and Neck Surgery*, 27(2), 2287–2293.
  8. **Kumar, S., & Singh, A. K.** (2023). Biomechanical analysis of walking style of obese with implementation of fitness training. *Journal of Clinical Otorhinolaryngology, Head, and Neck Surgery*, 27(2), 2279–2286.
  9. **Kumar, S., & Singh, A. K.** (2022). The effects of fitness training on the kinematical variables of obese people during running. *Nagfani Journal*, 12(41), 72–77.
  10. **Reddy, C. P.** (2015). *Scientific principles of biomechanics*. Friends Publication.
  11. **Unver, B., Selici, K., Akbas, E., & Erdem, E. U.** (2021). Foot posture, muscle strength, range of motion, and plantar sensation in overweight and obese. *Journal of Applied Biomechanics*, 37(2), 87–94.