



Research Article

ICFFL Goa Conference|2025

Stroke Distribution and Footwork Agility: A critical Analysis of India's elite female Table Tennis Player in International Tournament

Rahul Kumar¹, Raushan Kumar¹, Akshay Tyagi¹, Vikho Avoinii Pao¹, Dr. Harish Kumar Tiwari²,¹Netaji Subhas National Institute of sports Patiala, Punjab, India²Deputy Director Sports, Nagaland University, Lumani Nagaland, India

Article History

Received: 01.07.2025

Accepted: 20.08.2025

Published: 25.09.2025

Citation

Kumar, R., Kumar, R., Tyagi, A., Pao, V. A., Tiwari, H. K. (2025). Stroke Distribution and Footwork Agility: A critical Analysis of India's elite female Table Tennis Player in International Tournament. Goa Conference 2025 Fit for Life: Empowering Youth Through Physical Education, Sports and Traditional Sports. *Indiana Journal of Agriculture and Life Sciences*, 191-195. Indiana Publications.

Abstract: The study aims to find out the strokes and footwork used by the elite Female Indian athlete at international competition. Only Singles match format was taken into consideration. In order to evaluate the selected KPIs, Dartfish Pro S 2024 Switzerland software was used. A total of 10 International matches were taken into consideration and only Indian player's performance were analyzed. Where Stroke and Footwork were considered as KPIs. The match video clips were extracted from secondary source (ITTFWORLD YouTube Channel), matches were tagged on slow motion and frame by frame using Dartfish Pro S 2024 Switzerland. Successively all the data collected are exported to Microsoft Excel for analyzing and data visualization. A total of 10 matches 41 sets were played. Overall, 2024 strokes were used in which 1371 backhand and 653 forehand strokes were used and under that 1177 Defensive and 847 Offensive strokes were used. The result of the study reveals that elite Indian Female athletes in international competition adopt to more defensive playing style as defensive stroke percentage is higher when compare to offensive stroke percentage (58% Defensive, 42% offensive). Amongst the Defensive stroke, 16.69% were Block, 1.87% were Chop, 39.37% were Push, and 0.197% were Lob and amongst the Offensive stroke, 5.7% were Flick, 15.85% were Topspin, 2.07% were Topspin counter topspin, 13.38% were Drive and 4.74% were Smash. In terms Footwork, 31.75% were one step, 26.68% were slide step, 30% were stroke without step, 3.03% were pivot step, 8.1% were jumping step, and 0.149% were crossover step. Further, the result of the study revealed that elite Indian Female athlete uses 68% of the time backhand stroke and 32% of the time forehand stroke indicating that their Backhand stroke is more dominant.

Keywords: Table tennis, performance analysis, tactical analysis, Footwork, Stroke, Dartfish Pro S.

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

As one of the most popular racket sports in the world, table tennis has always attracted much attention. With the increasingly strong competition of table tennis in international events, the technical requirements for table tennis players are getting higher and higher. Table tennis is a competitive sport carried out on a small playing area, which requires players to run continuously over a small range during a match. Players need to complete a series of instantaneous explosive actions and change directions quickly and frequently in the process of continuous movement to achieve the purpose of hitting the ball effectively (Francisco, Teresa & Vargas, 2005; Mansec, Dorel & Jubeau, 2018). Footwork is a necessary factor influencing the performance of table tennis players. Players perform large amounts of active running to ensure that they can reach the most suitable hitting position prior to playing the next stroke (Malagoli Lanzoni, Di Michele & Merni, 2007); this positive behavior can provide sufficient preparation time for playing the next stroke. There is a strong link between stroke, type of footwork, and different types of strokes that may be combined with specific types of footwork (Malagoli Lanzoni, Di Michele & Merni, 2014). Therefore, footwork is not only the basis but also one of the key points of table tennis training. The chasse step and one step are the basic footwork patterns that combine with forehand and backhand strokes in table tennis (Lam

et al., 2018; Fuchs et al., 2018; McAfee, 2009; Zhang, Zhou & Yang, 2018). In addition, proficient mastery of footwork can bring advantages to energy transfer in the power chain of lower extremities. Therefore, the study of biomechanics in table tennis footwork is an interesting field for athletes and scientists.

Human action recognition in sports video analysis has become a critical issue in computer vision and deep learning. This field is crucial for recognizing specific athletic actions, facilitating performance analysis, creating highlight videos, and assisting coaches. Table tennis is one of the most popular sports in the world. There are over 300 million table tennis participants worldwide, making it stand out in the list of the highest participation sports, as is reported by the International Sports Federation (ISF). Good motion patterns are essential for table tennis players to achieve good performance. Trainees in professional teams, for example, are instructed to repeat prescribed movement hundreds of times to construct stable motion patterns and develop so-called dynamic stereotype (Pavlov, 1927) for selected techniques. Good motion patterns can help the players keep continuity of hitting, improve overall appearance, and further strengthen, energize and revitalize the body. On the other hand, bad motion patterns may prevent further skill improvement because

of interference between old and new learning, which is known as negative transfer (Singley, 1989).

Need Analysis

As table tennis is technical game whereas to find the Indian female elite athlete’s footwork agility and variation of stroke are having vital role in the game.

- To find this statement we need to analyze the pattern of footwork and stroke distribution.
- To find the dominating strokes and pattern of footwork used more.

METHODS

A total of 10 International matches were taken into consideration and only Indian player’s performance were analyzed. Where Stroke and Footwork were considered as KPIs. The match video clips were extracted from secondary source (ITTFWORLD YouTube Channel), matches were tagged on slow motion and frame by frame using Dartfish Pro S 2024 Switzerland. Successively all the data collected and are exported to Microsoft Excel for analyzing and data visualization.

RESULT & FINDINGS

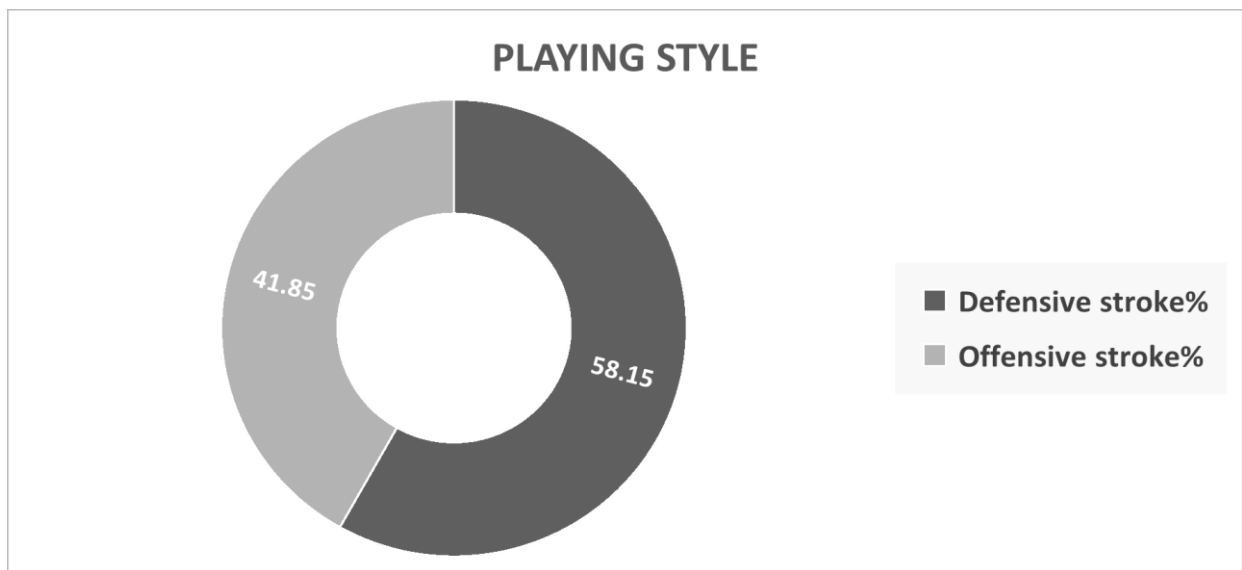


Figure 1: Playing style

This chart shows that percentage of Defensive stroke and Offensive stroke (58%, 41.85%)

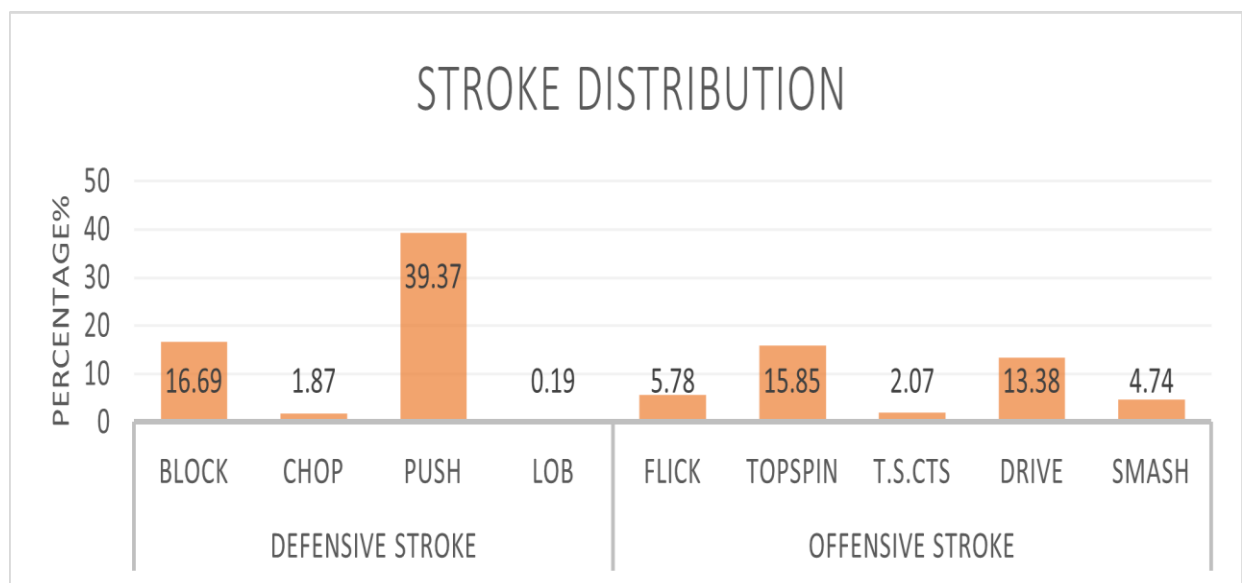


Figure 2: Stroke Distribution

This graph shows variation of stroke defensive stroke (Block:16.69, Chop: 1.87, Push: 39.37, Lob: 0.19) and Offensive stroke (Flick: 5.78, Topspin: 15.85, Topspin counter Topspin: 2.07, Drive: 13.38, Smash: 4.74).

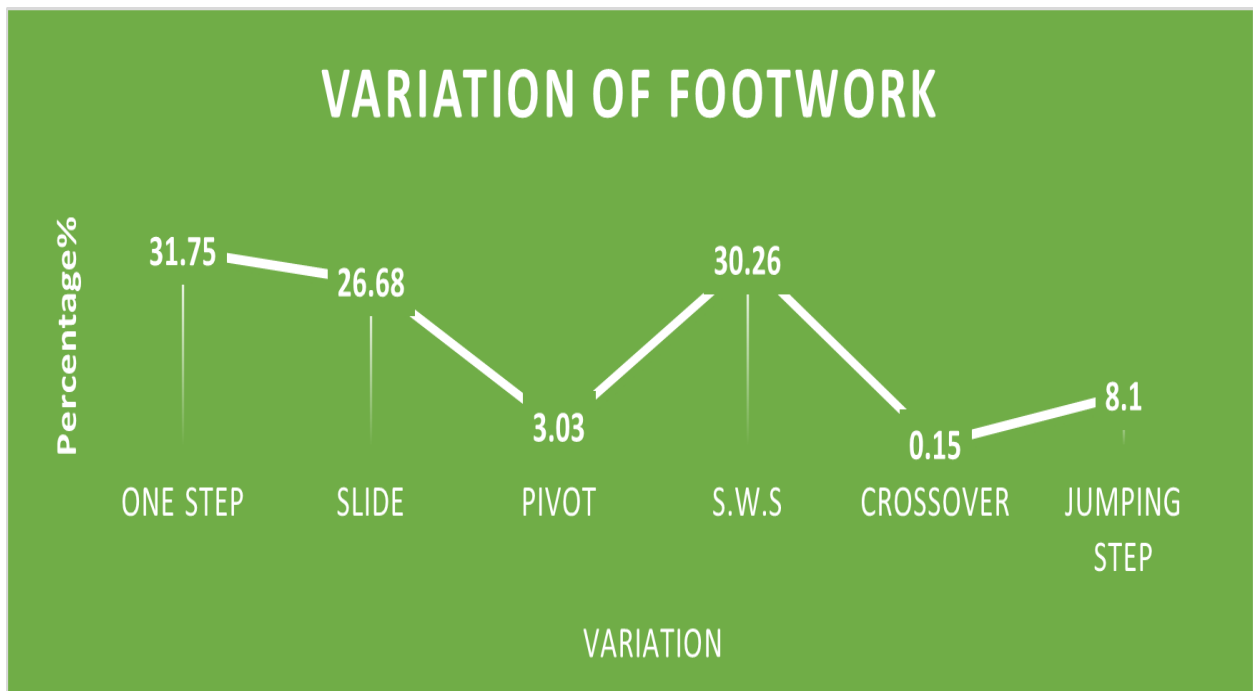


Figure 3: Variation of Footwork

This graph shows footwork used more in the game (One step: 31.75, Slide: 26:68, Pivot:3:03, Stroke without step: 30.26, Crossover:0.15, Jumping step: 8.1)

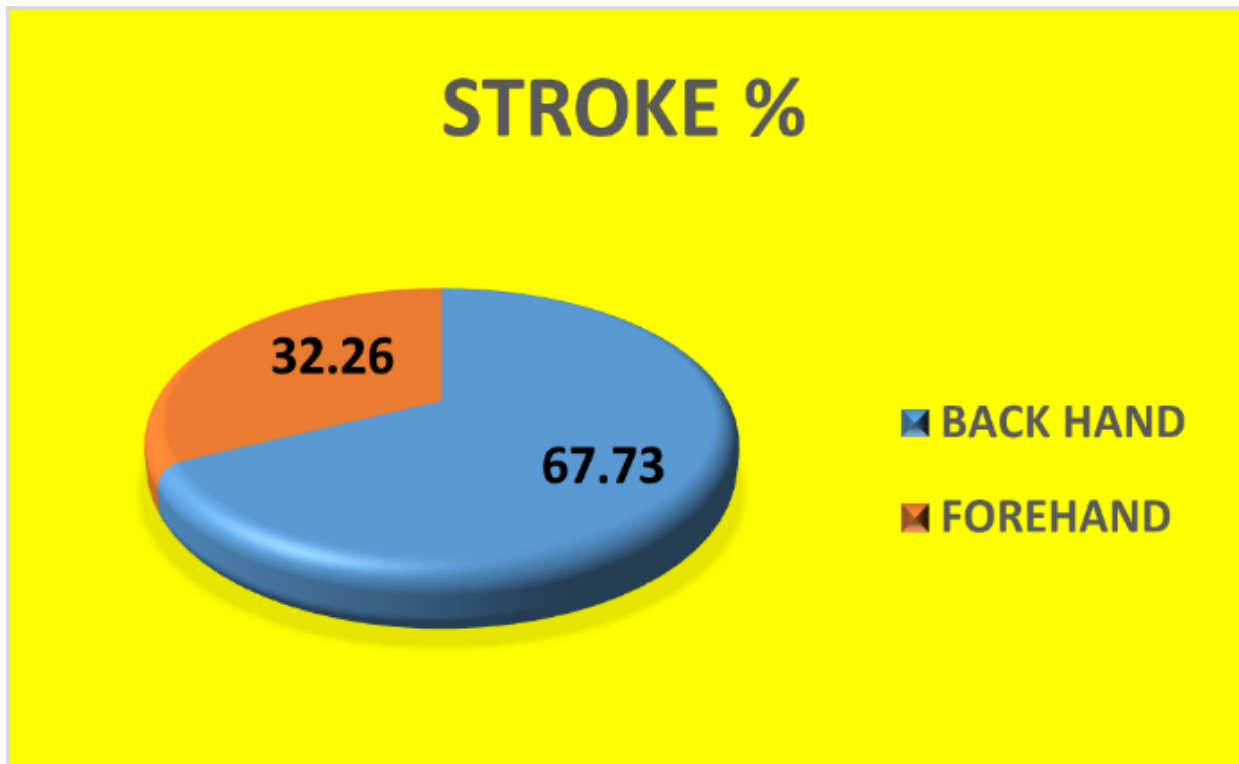


Figure 4: Stroke Percentage

This chart shows the athlete's dominating stroke (Backhand: 67.73, Forehand: 32.26)

DISCUSSION

Table 1: Stroke distribution and footwork variation

	SKILL	TOTAL PERCENTAGE
FOOTWORK	BACK HAND	67.73
	FOREHAND	32.26
	BLOCK	16.69
	CHOP	1.87
	PUSH	39.37
	LOB	0.19
	FLICK	5.78
	TOPSPIN	15.85
	T.S.CTS	2.07
	DRIVE	13.38
	SMASH	4.74
	ONE STEP	31.75
	SLIDE	26.68
	PIVOT	3.03
	STROKE	30.26
	WITHOUT STEP	
	CROSSOVER	0.15
JUMPING STEP	8.1	

The result shows that elite female athlete used 67.73% backhand stroke and 32.26% forehand stroke. During game athlete adopted more defensive strokes as 16.69% were Block, 1.87% were Chop, 39.37% were Push, and 0.197% were Lob and amongst the Offensive stroke, 5.7% were Flick, 15.85% were Topspin, 2.07% were Topspin counter topspin, 13.38% were Drive and 4.74% were Smash. In terms Footwork, 31.75% were one step, 26.68% were slide step, 30% were stroke without step, 3.03% were pivot step, 8.1% were jumping step, and 0.149% were crossover step.

CONCLUSION

Notational analysis has been widely used in several racket sports, and is receiving some interest also in table tennis. Therefore, it's important to share a standard classification of most relevant indicators in order to create reference model for this sport. From methodological perspective, for a complete analysis of performance, we should note that the importance of analyzing both technical components of table tennis shots, namely the strokes and footwork, and in particular their interaction. This study has an applied interest for performance analysts, coaches and athletes, providing reference models useful to improve the technical/tactical training and the physical conditioning in the elite female athlete players. Further perspectives include the analysis of the playing style in further categories of athletes, such as junior, cadets, etc., and even in groups of players with specific play characteristics, such as left-handed athletes or defensive players.

REFERENCES

- Dong, K., & Yan, W. Q. (2024). Player performance analysis in table tennis through human action

recognition. *Computers*, 13(12), 332. <https://doi.org/10.3390/computers13120332>

- Castellar, C., Pradas, F., Carrasco, L., La Torre, A. D., & González-Jurado, J. A. (2019). Analysis of reaction time and lateral displacements in national level table tennis players: Are they predictive of sport performance? *International Journal of Performance Analysis in Sport*, 19(4), 467–477. <https://doi.org/10.1080/24748668.2019.1621673>
- Zhang, Z. (2017). *Biomechanical analysis and model development applied to table tennis forehand strokes* (Doctoral thesis, Nanyang Technological University, Singapore).
- Lanzoni, I. M., Katsikadelis, M., Straub, G., & Djokić, Z. (2020). Footwork technique used in elite table tennis matches. *International Journal of Table Tennis Sciences*, 12, 45–53. (If page numbers or publisher missing, add when known.)
- He, Y., Sun, D., Yang, X., Fekete, G., Baker, J. S., & Gu, Y. (2021). Lower limb kinetic comparisons between the chasse step and one step footwork during stroke play in table tennis. *PeerJ*, 9, e12481. <https://doi.org/10.7717/peerj.12481>
- Hughes, M. (1998). The application of notational analysis to racket sports. In T. Reilly, M. D. Hughes, A. Lees, & I. Maynard (Eds.), *Science and racket sports II* (pp. 211–220). London: E. & F. N. Spon.
- Hughes, M., & Bartlett, R. (2002). The use of performance indicators in performance analysis. *Journal of Sports Sciences*, 20(10), 739–754. <https://doi.org/10.1080/026404102320675602>
- Krippendorff, K. (2004). *Content analysis: An introduction to its methodology* (2nd ed.). Thousand Oaks, CA: Sage.
- Malagoli Lanzoni, I., Di Michele, R., & Merni, F. (2012). Reliability of selected performance

- indicators in table tennis. *International Journal of Table Tennis Sciences*, 7, 62–65.
10. Malagoli Lanzoni, I., Di Michele, R., & Merni, F. (2013a). Distribution of stroke and footwork types in top-level men's and women's table tennis. In D. M. Peters & P. O'Donoghue (Eds.), *Performance analysis of sport IX* (pp. 168–173). Routledge: Taylor & Francis.
 11. Malagoli Lanzoni, I., Di Michele, R., & Merni, F. (2013b). Technical and tactical performance of top class senior, junior and cadet table tennis players. *International Journal of Table Tennis Sciences*, 8, 78–83.
 12. Malagoli Lanzoni, I., Di Michele, R., & Merni, F. (2014). A notational analysis of shot characteristics in top-level table tennis players. *European Journal of Sport Science*, 14(4), 309–317. <https://doi.org/10.1080/17461391.2013.819382>
 13. Malagoli Lanzoni, I., & Lobietti, R. (2009). A pilot study to compare footwork techniques used in table tennis. In A. Hökelmann & M. Brummund (Eds.), *Proceedings of the World Congress of Performance Analysis of Sport VIII* (pp. 58–62). Magdeburg: Otto-von-Guericke Universität Magdeburg.
 14. Tepper, G. (2003). *ITTF level 1 coaching manual*. Lausanne: International Table Tennis Federation.
 15. Molodzoff, P. (2008). *Advanced coaching manual*. Lausanne: International Table Tennis Federation.