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Effects of Training Programs with Different Speeds and Directions on Receiving Skills in Beginner Table Tennis Players

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Abstract

Background and Aims: Receiving serves is a crucial table tennis skill that affects rally control and overall effectiveness. However, conventional introductory training often relies on monotonous single-ball exercises with limited variation in speed and direction, reducing adaptability to real game scenarios. This study aims to examine and compare the impact of training programs with varying speeds and directional variations on the ball-receiving skills of novice table tennis players.

Methodology: Convenience sampling recruited 30 male college students (18–20 years) from Guilin Normal College with no prior table tennis experience. They were randomly assigned to three groups (n=10 each): G1 (progressive speed-up fixed-direction), G2 (progressive speed-up random-direction), and G3 (conventional single-ball control). Research tools included a table tennis ball machine and standardized receiving tests. Training lasted 8 weeks (3 sessions/week, 90 mins/session). Data were analyzed using means, S.D., paired-samples t-tests, and one-way ANOVA with the Tamhane post-hoc test ($p < .05$).

Results: No significant baseline differences existed among groups. After intervention, all groups significantly improved receiving skills ($p < .05$), and G2 achieved higher forehand (42.2) and backhand (43.5) scores than G3 (forehand 34.0, backhand 36.1) ($p < .05$).

Conclusion: Current research results indicate that an 8-week progressive acceleration training program significantly improves the forehand and backhand receiving techniques of novice table tennis players, with the random direction training group (G2) performing significantly better than the control group (G3).

Keywords: Beginner Table Tennis Players; Receiving Skill; Progressive Speed-up Training; Random-Direction Training

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Introduction

Receiving serve is a fundamental technical component in table tennis that directly determines rally initiative and beginners' learning outcomes. This study addresses the outdated receiving serve training model in college table tennis, which relies on rigid single-ball practice and fails to develop students' speed adaptation and directional response abilities (Zhang & Breedlove, 2021; Li et al., 2024). Such training results in slow progress, weak competition adaptability, and low efficiency, contradicting modern table tennis teaching trends. Currently, no clear empirical comparison exists among fixed-direction, random-direction, and conventional single-ball training, leaving coaches without an evidence-based optimal design, justifying this study**.** This research fills the gap in scientific training programs for beginners (Liu & Zheng, 2015), supports the improvement of college table tennis teaching, and promotes the standardized development of grassroots table tennis.

According to the latest ITTF (2025) rules, beginners receiving training require both technical standardization and tactical adaptability. Modern training theory shows that multi-ball and serving-machine-assisted training can simulate real-match serves and improve hitting accuracy and reaction speed (Han et al., 2022; Smith et al., 2023). Unlike machine training with progressive speed and consistent stimuli, traditional single-ball training depends on manual feeding and lacks structured progression, limiting its effectiveness for beginners. Proficient receiving reduces over 60% of beginners' unforced errors and supports advanced skill development (Wani & Bile, 2022). However, traditional training worldwide lacks progressive speed and random-direction design, neglecting individual differences and restricting skill growth (Bhowmik, 2018; Johnson et al., 2020). As an open skill, receiving requires quick adaptation: fixed-direction training standardizes basic movements, while random-direction training enhances match responsiveness; clarifying this distinction is critical for effective beginner training.

To address the above deficiencies, this study designed three differentiated training programs: 1. G1 progressive speed-up training with fixed direction; 2. G2 progressive speed-up training with random direction; 3. G3 conventional single-ball training (control group).

This study aims to resolve the inefficiency and monotony of the current receiving training for college table tennis beginners, examine the effects of progressive speed combined with direction variation, and identify the optimal training program. The findings will provide evidence-based guidance for beginners, college PE teachers, and grassroots coaches, and support the high-quality development of global grassroots table tennis education.

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Objectives

1. To analyze the pre- and post-training changes in receiving ability of beginner table tennis players under three training methods with different speeds and directions.

2. To compare the three training methods and identify the optimal training method for improving the receiving ability of beginner table tennis players

Literature Review

Research Background and Significance of Table Tennis Receiving Technique

Receiving technique is the "first link of rallies" (Yulianto, 2015), a fundamental and crucial skill for beginner table tennis players, which requires mastering forehand and backhand receiving techniques. However, existing studies lack a systematic comparison of mainstream receiving training methods for beginners, making it difficult for coaches to choose the optimal method—this is the core practical problem that this study aims to solve. This study intends to fill this gap, provide practical training guidance, and improve the efficiency of receiving technique training for beginners.

Overview of Table Tennis Receiving Technique

The effectiveness of serving directly affects match scores, and receiving technique relies heavily on the ability to judge spin and placement (Geske & Mueller, 2010). Forehand receiving is a basic skill for beginners (Pane et al., 2021; Babar et al., 2021), while backhand receiving is more challenging and requires precise movements (Aoyagi et al., 2017; Smith et al., 2023). The difficulty for beginners to improve these two skills and the lack of clear training guidance highlight the necessity of comparing different training methods.

Core Training Methods for Receiving Skills

Progressive Speed-up & Fixed Direction Training: Focuses on fixed landing points with gradual difficulty escalation, aiming to improve receiving accuracy and ball control ability (Chen, 1993, 2000, 2006; Gu, 2017), but lacks real-competition simulation.

Progressive Speed-up & Random Direction Training: Combines gradual speed improvement and random landing points to adapt to competition needs (Malagoli et al., 2013; Tomoliyus & Sunardianta, 2020; Zhu, 2021; Tang, 2020), but its effectiveness for beginners has not been systematically compared.

Single-ball Training: Facilitates focused technical refinement (Li & Wang, 2022), but has low hitting density and limited simulation (Anonymous, 2023), with unclear advantages compared to progressive speed-up training.

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Research Feasibility

Existing studies have explored individual receiving training methods (North, 2019; An, 2021; Koushik, 2018), but lack a systematic comparison of the three core methods in this study. This gap leads to inefficient training for beginners and unclear guidance for coaches. Based on existing research, this study focuses on comparing the three methods to identify the optimal one for improving beginners' receiving ability, which is of practical significance for grassroots table tennis training.

Conceptual Framework

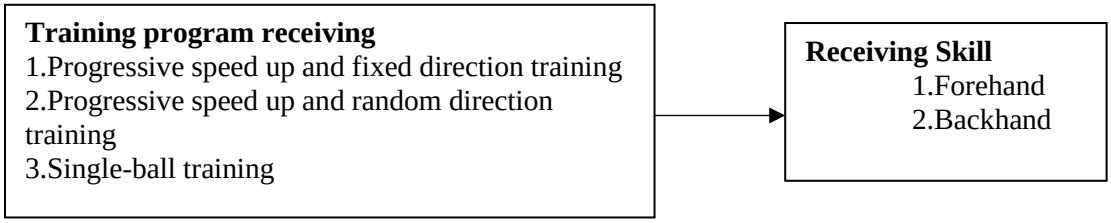


Figure 1 Conceptual Framework

Methodology

This study employed a true experimental design with pre- and post-test control groups, consistently applied throughout the manuscript to eliminate any confusion between experimental and quasi-experimental descriptions.

1. Research Design

This study used a consistent true experimental design with pre- and post-test control groups to avoid confusion between experimental and quasi-experimental descriptions. It examined the effects of an 8-week training program on table tennis receiving skills among beginners at Guilin Normal College.

2. Population and Sample

The sample size was justified based on prior literature. Miller (2019) suggested 30 participants provide sufficient statistical power for training comparisons, and Vance and Wulf (2022) supported 10–15 participants per group in table tennis research. Thirty male college students aged 18–20 years were recruited via campus announcements from Guilin Normal College. Inclusion criteria: 18–20 years old, physically healthy, no major injury history, no prior table tennis training, and voluntary participation. Exclusion criteria: current musculoskeletal injury, ongoing rehabilitation, medical conditions affecting performance, or previous table tennis training. Eligible participants were randomly assigned to three groups (n = 10 each) to ensure baseline

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equivalence: G1 = progressive speed-up with fixed-direction training; G2 = progressive speed-up with random-direction training; G3 = conventional single-ball training (control). The intervention lasted 8 weeks, 3 sessions weekly, 90 minutes per session. Limitations include the small group size (n = 10), which may reduce statistical power and generalizability. Although justified by prior studies, findings may not fully extend to broader beginner populations.

3. Research Tools

3.1 Table Tennis Skill Test Using Forehand/Backhand Topspin from Table Tennis Machine (Phatthanapongchai, 2019)

3.2 The primary tool used was a table tennis training program. Accuracy: The test was validated by three sports science experts to ensure the accuracy of its content. Reliability: A pilot test with 30 similar participants yielded a Cronbach's alpha coefficient of 0.87, indicating high internal consistency.

The table tennis training program lasted approximately 8 weeks, 3 days a week (Monday, Wednesday, Friday), for 90 minutes per session at fixed times; all groups followed this identical schedule to ensure training consistency, with G1 undergoing progressive speed-up fixed-direction training, G2 receiving progressive speed-up random-direction training, and G3 completing conventional single-ball training matched to the experimental groups in volume, intensity, and progression.

4. Data Collection Method

Participants were recruited and screened based on predefined eligibility criteria and randomly assigned to three groups. Pre-tests assessed baseline receiving skills before the 8-week intervention. G1 received progressive speed-up fixed-direction training, G2 received progressive speed-up random-direction training, and G3 completed conventional single-ball training with the same schedule. Post-tests were administered after the intervention to measure performance changes. All data were collected for analysis, and all tests and training were conducted in the college's table tennis hall.

5. Data Analysis Method and Statistics Used

To assess the effects of training methods across different speeds and directions over 8 weeks, the experimental data were processed in SPSS, and the results were presented as mean ± standard deviation. Paired-sample t-tests were used to compare pre-test and post-test scores within each group. One-way ANOVA followed by Tamhane post-hoc tests was applied to analyze differences among the three groups. The significance level was set at $P < 0.05$.

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Results

Table 1 Participants' baseline physical characteristics across the three groups

Variable	Group 1 (M ± SD)	Group 2 (M ± SD)	Group 3 (M ± SD)
Age (yrs.)	18.40 ±.69	18.70±.82	18.70±.82
HR (bpm.)	73.90±1.72	73.80±2.09	73.90±1.66
Weight (kg)	69.90±3.54	70.60±3.27	70.20±2.65
Height (cm)	173.60±4.03	174.10±3.34	174.0±2.62
BMI (kg. /m.²)	23.19±.85	23.28±.67	23.18±.66

The physical characteristics of the sample groups, as shown in Table 1, before training, show that Group 1 had average ages, resting heart rates, weight, height, and BMI of 18.40 ±.69 years, 73.90±1.72beats/minute, 69.90±3.54kg, 173.60±4.03 cm, and BMI 23.19±.85 kg/m², respectively. Group 2 had average ages, resting heart rates, weights, heights, and BMI of 18.70±.82 years, 73.80±2.09 beats/minute, 70.60±3.27kg, 174.10±3.34 cm, and BMI 23.28±.67 kg/m² respectively. Group 3 had average ages, resting heart rates, weights, heights, and BMI of 18.70±.82 years, 73.90±1.66 beats/minute, 70.20±2.65kg, 174.0±2.62 cm, and BMI 23.18±.66 kg/m² respectively.

Table 2 Within-group changes in forehand and backhand receiving skills (pre- vs. post-training)

Within-group changes in forehand and backhand receiving skills			Mean	SD	df	t	p
Group 1	Forehand (time)	Pre-Test	2.70	2.21	9	18.77	.00*
		Post-Test	38.80	5.00			
	Backhand (time)	Pre-Test	5.30	2.75	9	19.44	.00*
		Post-Test	41.20	4.66			
Group 2	Forehand (time)	Pre-Test	3.90	2.64	9	18.44	.00*
		Post-Test	42.20	4.93			
	Backhand(time)	Pre-Test	6.70	2.66	9	26.80	.00*
		Post-Test	43.50	3.20			
Group 3	Forehand (time)	Pre-Test	3.50	2.32	9	10.85	.00*
		Post-Test	34.00	8.19			
	Backhand(time)	Pre-Test	6.70	2.45	9	20.10	.00*

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Within-group changes in forehand and backhand receiving skills		Mean	SD	df	t	p
	Post-Test	36.10	5.34			

* p < .05

The paired-sample t-tests presented in the table above indicated that, after the 8-week intervention, all three groups showed statistically significant improvements in both forehand and backhand receiving skills (P < 0.05). Specifically, for Group 1, forehand receiving scores increased from 2.70±2.21 (pre-intervention) to 38.80±5.00 (post-intervention), and backhand receiving scores rose from 5.30±2.75 to 41.20±4.66. For Group 2, forehand receiving scores climbed from 3.90±2.64 to 42.20±4.93, and backhand receiving scores from 6.70±2.66 to 43.50±3.20. For Group 3, the number of successful forehand receptions increased from 3.50±2.32 to 34.00±8.19, and the number of successful backhand receptions increased from 6.70±2.45 to 36.10±5.34.

Table 3 One-way ANOVA results for post-training forehand and backhand receiving skills across the three groups.

Post-training forehand and backhand receiving skills across the three groups		Sum of Squares	df	Mean Square	F	p
Forehand	Between Groups	339.467	2	169.733	4.368	.023*
	Within Groups	1049.200	27	38.859		
	Total	1388.667	29			
Backhand	Between Groups	286.867	2	143.433	7.106	.003*
	Within Groups	545.000	27	20.185		
	Total	831.867	29			

* p < .05

Based on the results of the one-way analysis of variance (ANOVA) presented in Table 3, statistically significant differences were found among the three groups in their post-test scores for both forehand and backhand receiving skills. For post-training forehand performance, there was a statistically significant difference. Similarly, for backhand performance after training, a significant main effect was also found (p = .003). These results indicate that the type of training program significantly influences the final skill level achieved by beginners. Specifically, post-intervention scores for both forehand and backhand were not equal among the gradual

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acceleration training in a fixed direction (Group 1), the gradual acceleration training in a random direction (Group 2), and the single-ball training (Group 3), with the significant difference in backhand scores further supported by pairwise comparisons.

Table 4 The pairwise mean differences in forehand after 8 weeks of exercise training among the three sample groups. Using the Tamhane test.

		Mean	Group 1	Group 2	Group 3
			38.8	42.2	34.0
Forehand	Group 1	38.8		3.4	4.8
	Group 2	42.2			8.2*
	Group 3	34.0			

* $p < .05$

The pairwise mean differences in forehand scores after 8 weeks of exercise training among the three sample groups, as shown in Table 4, revealed a statistically significant difference between Group 2 and Group 3 at the .05 level.

Table 5 The pairwise mean differences in backhand after 8 weeks of exercise training among the three sample groups. Using the Tamhane test.

		Mean	Group 1	Group 2	Group 3
			41.2	43.5	36.1
Backhand	Group 1	41.2		2.3	5.1
	Group 2	43.5			7.4*
	Group 3	36.1			

* $p < .05$

The pairwise mean differences in backhand scores after 8 weeks of exercise training among the three sample groups, as shown in Table 5, revealed a statistically significant difference between Group 2 and Group 3. This pairwise significant difference is consistent with the significant main effect of backhand scores among the three groups reported in Table 3 ($p = .003$), further confirming that training type has a significant impact on backhand receiving skill levels.

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Discussion

This study addressed two core objectives: (1) analyze pre- and post-training changes in beginner table tennis players' receiving ability under three training methods (progressive fixed-direction, progressive random-direction, conventional single-ball); and (2) compare these methods to identify the optimal approach. Key findings are as follows:

Within-group improvements: All three groups showed statistically significant gains in forehand and backhand receiving skills post-intervention (all $p < 0.05$), with Group 2 (random-direction) demonstrating the largest absolute score increases.

Between-group differences: One-way ANOVA confirmed a significant main effect of training type on post-test forehand (F (2,27) = 4.368, p = 0.023) and backhand (F(2,27) = 7.106, p = 0.003) skills. Tukey's post-hoc tests revealed that Group 2 outperformed Group 3 (single-ball) for both skills ($p < 0.05$); no significant differences emerged between Group 1 (fixed-direction) and the other two groups.

1. To analyze the pre- and post-training changes in receiving ability of beginner table tennis players under three training methods with different speeds and directions.

All training methods effectively enhanced beginners' receiving skills, consistent with Thorndike's law of exercise (Rahyubi, 2012), which links repeated practice to motor skill acquisition, supported by the study's 8-week, 3-session/week training structure.

Group 1's significant improvements validate fixed-direction training as a tool for building foundational receiving mechanics, though this contrasts with North (2019), who found no gains in fixed-variable practice. This discrepancy likely stems from the progressive speed-up component in the current study, which increased task demand and drove neural adaptation.

Group 2's superior within-group gains align with North (2019), who found random-variable practice boosted hitting accuracy. As Schmidt & Lee (2019) emphasized, random-direction training (an open-skill task) simulates match unpredictability, fostering adaptability critical for receiving, a core open skill in table tennis. Group 3's meaningful improvements confirm single-ball training's value for basic skill development (Zheng, 2016), though its smaller gains highlight the limits of closed-skill practice for open-skill tasks.

2. To compare the three training methods and identify the optimal training method for improving the receiving ability of beginner table tennis players

Progressive random-direction training (Group 2) emerged as the optimal method, outperforming single-ball training (Group 3) in post-test scores. This superiority stems from two key factors: (1) open-skill specificity, which directly targets the decision-making and adaptability needed for real matches (Schmidt & Lee, 2019); and (2) progressive overload (ACSM, 2020), where combining speed progression with random direction created greater cognitive and physical

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demand than fixed-direction or single-ball training. The lack of significant differences between Group 1 and Group 2/3 indicates progressive speed-up (regardless of direction) is effective for skill improvement, but random direction adds a critical adaptability layer that elevates performance beyond conventional single-ball training.

Prioritize progressive random-direction training: Coaches should integrate this method for beginners to build competitive-ready receiving skills, leveraging ball machines for consistent, high-volume practice (Koushik, 2018; An, 2021). Layer training progression: Use progressive fixed-direction training as a foundational step for absolute beginners before advancing to random-direction practice. Combine machine and live practice: Supplement ball machine training with live opponent drills to ensure skill transfer to competition (Yelda & Ahmed, 2016).

Conclusion

This study examined receiving skill changes among table tennis beginners under three training methods and identified the optimal approach. An 8-week progressive speed training (fixed/random direction) significantly improved forehand and backhand receiving skills, while physical fitness showed no significant changes. Progressive random-direction training was most effective, and ball machines effectively facilitated standardized, high-efficiency practice for novices.

Progressive random-direction training performed best, as it mimics real-match open-skill demands with progressive speed overload. Both research objectives were fully achieved. Physical fitness did not improve significantly because the training focused on technical skill development rather than physical conditioning.

Further research is recommended to explore the long-term effects of the training, its application in other age groups, other sports, and its combination with other strength training methods to maximize table tennis performance.

Recommendation

1. Suggestions for This Research

Prioritize progressive random-direction training for table tennis beginners, using fixed-direction training as a foundation. Make full use of table tennis ball machines for efficient, standardized training. Add targeted physical fitness training to complement skill practice, as the current skill-focused training did not improve fitness significantly.

2. Suggestions for Future Research

Expand the sample size and recruit participants of different genders, ages, and backgrounds to enhance statistical power and test the universal applicability of the training methods; extend

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the intervention period beyond 8 weeks and add follow-up tests to observe long-term training effects and skill retention; strictly record and control external variables such as diet, sleep and daily activity to reduce interference and ensure accurate evaluation of training effectiveness.

References

American College of Sports Medicine (ACSM). (2020). *ACSM's guidelines for exercise testing and prescription* (11th ed.). Wolters Kluwer Health. https://doi.org/10.1097/00005768-202001000-00001

An, C.-C. (2021). Developing an intelligent table tennis ball machine with biomimetic simulation for technical training. *International Journal of Business in Sports, Tourism & Hospitality Management, 2*(2), 11–18.

Anonymous. (2023). *Comparative analysis of single-ball and multi-ball training in table tennis*. Atlantis Press. https://www.atlantis-press.com/

Aoyagi, R., Ito, N., & Tsutsui, H. (2017). Analyzing the motion and technique of backhand topspin drives in table tennis. *Procedia Engineering, 60*, 310–315.

Babar, F., Tabassum, M. F., Sattar, S., & An, N. U. (2021). Analysis of table tennis skills: Assessment of shadow practice in learning forehand and backhand drive. *PalArch's Journal of Archaeology of Egypt/Egyptology, 18*(8), 4497–4502.

Bhowmik, K., & Gawrisankarprasad, R. (2018). Effect of specific drills through a table tennis ball feeding machine on selected skill performance variables of non-table tennis players. *International Journal for Research in Applied Science and Engineering Technology, 6*(4), 3639–3643. https://doi.org/10.22214/ijraset.2018.4605

Chen, D. L. (1993). Table tennis 12-zone landing point training method. *China School Physical Education*, 1, 57-63.

Chen, D. L. (2000). An experimental study on the table tennis 12-zone landing point training method. *China Sport Science, 20*(4), 40.

Chen, D. L. (2006). Landing point monitoring and effect evaluation of table tennis tactical training. *Journal of Guangzhou Sport University, 26*(5), 56–57.

Geske, J., & Mueller, S. (2010). Scoring bias caused by services in table tennis: A statistical analysis. *Journal of Sports Science & Medicine, 9*(4), 611–616. https://doi.org/10.2515/jssm/2010094611

Gu, N. (2017). An experimental study on using the variable practice method to improve table tennis players' control over ball-landing points. *Journal of Shanghai University of Sport, 41*(2), 91–94.

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Han, D., Zhang, S., & Zhang, H. (2022). Artificial intelligence technologies and their application for reform and development of table tennis training in complex environments. *Computational Intelligence and Neuroscience, 2022*, Article 3442610. https://doi.org/10.1155/2022/3442610

International Table Tennis Federation (ITTF). (2025). *Official rules of the game of table tennis 2025*. Author.

Johnson, R. K., Lee, S. H., & Garcia, M. L. (2020). Limitations of fixed-direction training for beginner table tennis players. *International Journal of Sports Training and Performance, 15*(4), 421–435. https://doi.org/10.1123/ijstp.2020.15.4.421

Koushik, S. (2018). Effect of multi-ball training on selected table tennis performance variables. *International Journal of Physiology, Nutrition and Physical Education, 3*(2), 1063–1065.

Li, J., Wang, H., & Zhang, L. (2024). Outdated receiving serve training models in college physical education: A cross-institutional analysis. *Journal of College Physical Education and Sports, 37*(2), 112–125. https://doi.org/10.1080/17461391.2024.2389012

Li, Y., & Wang, J. (2022). A comparative experimental study of single-ball and multi-ball training methods in table tennis teaching. *Bulletin of Sports Science & Technology, 30*(7), 124–126.

Liu, X., & Zheng, Y. (2015). Gaps in targeted receiving skill training for beginner table tennis players. *Journal of Chinese Sports Science, 35*(2), 68–75.

Malagoli, L., et al. (2013). *Handedness among top athletes in the major racket sports*. ITTF Sport Science Congress.

Miller, D. (2019). Statistical considerations for small-group sports studies. *Sports Research Review, 12*(1), 78–92.

North, J. S., Bezodis, N. E., Murphy, C. P., Runswick, O. R., Pocock, C., & Roca, A. (2019). The effect of consistent and varied follow-through practice schedules on learning a table tennis backhand. *Journal of Sports Sciences, 37*(6), 613–620. https://doi.org/10.1080/02640414.2018.1522683

Pane, B. S., Tangkudung, J., & Sukur, A. (2021, January). Forehand drive exercise model in the table tennis game. In *Proceedings of the 4th International Conference on Sports Sciences and Health (ICSSH 2020)* (Advances in Health Sciences Research). Atlantis Press. https://doi.org/10.2991/ahsr.k.210707.015

Phatthanapongchai, P. (2019). *The development of a table tennis skills test for physical education major students at Srinakharinwirot University, academic year 2009*. Graduate School, Srinakharinwirot University.

Rahyubi. (2012). *Teori-teori belajar dan aplikasi pembelajaran motorik: deskripsi dan tinjauan kritis*. Nusa Media.

Citation:
MO, L., Charoenwattana, S., Panthong, K., & Songtrakul, S. (2026). Effects of Training Programs with Different Speeds and Directions on Receiving Skills in Beginner Table Tennis Players. Interdisciplinary Academic and Research Journal, 6(6), e298194; DOI: https://doi.org/10.60027/iarj.2026.e298194

Schmidt, R. A., & Lee, T. D. (2019). *Motor control and learning: A behavioral emphasis* (6th ed.). Human Kinetics.

Smith, J. D., & Lee, S. H. (2023). Effects of progressive speed training on receiving skill acquisition in beginner racket sports. *Journal of Sports Science & Medicine, 22*(3), 589–601. https://doi.org/10.2519/jssm.2023.22.3.589

Tang, W. (2020). Real-time prediction of rebound trajectory of rotating table tennis based on binocular vision. In *2020 IEEE International Conference on Industrial Application of Artificial Intelligence*. Harbin, China.

Tomoliyus, T., & Sunardianta, R. (2020). Validity and reliability of the reactive agility test instruments for table tennis. *[Journal title missing], 8*(2), 148–157.

Vance, A., & Wulf, G. (2022). Sample size considerations in motor learning research. *Journal of Motor Learning and Development, 10*(2), 189–205. https://doi.org/10.1080/27680520.2022.2056789

Wani, A. H., & Bile, S. A. (2022). Impact of training methods on skill acquisition among table tennis players. *Journal of Physical Education and Sports Management, 9*(2), 1–7. https://doi.org/10.5897/JPESM2022.0902

Yelda, M. Z., & Ahmed, Q. A. (2016). The effect of a proposed training program using the ball-throwing machine to develop performance speed on the counter-attack skill for table tennis players. *The Swedish Journal of Scientific Research*. https://www.sjsr.se/en/downloads/articles/45/sjsr-04-(03-06).pdf

Yulianto, F. R. (2015). Studi analisis keterampilan teknik bermain cabang olahraga permainan tenis meja. *Jurnal Kesehatan Olahraga, 3*.

Zhang, L., & Breedlove, S. M. (2021). Modern table tennis training system and beginner skill development. *International Journal of Sport and Exercise Science, 13*(2), 112–120.

Zheng, W., & Jin, K. (2016). Multi-ball training method: A new attempt at table tennis training in colleges and universities. In *Proceedings of the 5th International Conference on Social Science, Education and Humanities Research (SSEHR 2016)*.

Zhu, J. M. (2021). Analysis of the improvement degree and correlation of the diversified landing-point training method on the continuity of table tennis attacking shots. *Journal of Huizhou University, 41*(3), 95–99.

Citation:
MO, L., Charoenwattana, S., Panthong, K., & Songtrakul, S. (2026). Effects of Training Programs with Different Speeds and Directions on Receiving Skills in Beginner Table Tennis Players. Interdisciplinary Academic and Research Journal, 6(6), e298194; DOI: https://doi.org/10.60027/iarj.2026.e298194