Original Article

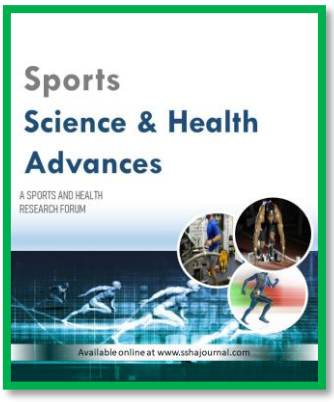
Speed Enhancement Through Combined Plyometric and Skill Training: An 8-Week Study on Beginner Fencers

Usha Rani[1], Ankit[2]*

[1]Professor and Dean Faculty of Education & Chairperson, Department of Physical Education, Kurukshetra University Kurukshetra, India

[2]Ph.D. Scholar, Department of Physical Education, Kurukshetra University, Kurukshetra, India

***Correspondence**: ankit000gujjar@gmail.com



Peer-Reviewed
Refereed
Indexed

How to cite: Rani, U., Ankit. (2025). Speed Enhancement Through Combined Plyometric and Skill Training: An 8-Week Study on Beginner Fencers. *Sports Science & Health Advances*. 3(1), 487-492. https://doi.org/10.60081/SSHA.3.1(Spl).2025.487-492

Received: 16-05-2025
Published: 10-07-2025

Abstract

This study investigates the impact of an 8-week plyometric-weight training and fencing-specific skill training program on the speed of beginner fencers aged 10–19 years from Karnal District, Haryana. Sixty beginner fencers were purposively selected and randomly divided into two equal groups: an experimental group (n=30) receiving the integrated training program, and a control group (n=30) undergoing standard fencing training. The 50-Meter Dash Run Test from the AAHPER Youth Physical Fitness Test (1976) was used to assess speed before and after the intervention. Descriptive statistics revealed a significant improvement in post-test speed scores for the experimental group (M=7.08, SD=0.26) compared to the control group (M=7.71, SD=0.29). ANCOVA results demonstrated a statistically significant difference between the groups ($F=137.42$, $p<0.001$), with post hoc analysis indicating a mean difference of -0.63 seconds ($p<0.001$) favoring the experimental group. The results confirm that a combined plyometric-weight and skill-specific training regimen is effective in improving speed performance among beginner fencers. This research underlines the importance of targeted physical conditioning programs for youth athlete development.

Keywords: Plyometric training, Fencing drills, 50-Meter Dash, Speed development, Beginner fencers, AAHPER, ANCOVA

Introduction

Speed is one of the most vital bio-motor abilities required for success in fencing. While fencing is often perceived as a technical and tactical sport, the physical aspect particularly speed—plays a decisive role in determining performance outcomes. Fencing movements are characterized by sudden bursts of acceleration, rapid lunges, explosive retreats, and quick directional changes. These actions require the athlete to generate maximal force in the shortest possible time, emphasizing the critical importance of sprint speed and reaction timing (Young et al., 2015).

Recent advancements in sports science have further underscored the influence of internal and external factors on physical performance. Studies have explored the implications of muscle architecture on speed and power output, highlighting how fascicle length, pennation angle, and muscle thickness influence sprint and lunge performance (Khare et al., 2023; Kumar, 2022; Kumar, 2023a; Kumar & Jhajharia, 2020).

These physiological parameters play a critical role in talent identification and individualized training design (Kumar, 2023b; Kumar, 2023c). Furthermore, athlete readiness and performance are affected by factors such as sleep deprivation (Gautam & Kumar, 2018; Kumar, 2018), immunity (Kumar & Jhajharia, 2018), mental toughness during crises like the COVID-19 pandemic (Jadaun et al., 2021), and holistic approaches like yoga (Jain et al., 2023; Aakash et al., 2023). Understanding and integrating such multidimensional aspects can enhance the effectiveness of training interventions. Also, discriminant models based on aerobic and muscle fiber characteristics have been used for player classification and performance prediction (Kumar et al., 2021; Kumar & Jhajharia, 2022; Nandal & Kumar, 2024), indicating a paradigm shift toward precision training in sports.

In this context, speed refers not only to linear sprinting ability but also to the capacity to move efficiently, explosively, and under control across short distances. The initial acceleration, stride frequency, neuromuscular activation, and power output of the lower limbs all contribute to short-distance sprint performance. Therefore, enhancing speed in beginner fencers can lay a solid physical foundation that supports future skill refinement and tactical decision-making under pressure. The 50-Meter Dash Run Test from the AAHPER Youth Physical Fitness Test (1976) is widely recognized as a reliable and valid tool for measuring speed in children and adolescents. This test is simple, time-efficient, and sensitive to improvements in short-distance sprinting ability, making it highly suitable for beginner populations.

Plyometric training has been widely acknowledged for its role in enhancing explosive power, speed, and reactive strength. This type of training involves the stretch-shortening cycle of muscles and enables athletes to produce greater force more rapidly. When coupled with light resistance (weight) training and sport-specific drills, such as fencing footwork and sprint-like transitions, the potential for improving sprint performance increases (Markovic, 2007; Chu, 1998). Despite the growing recognition of plyometric and strength training in sports conditioning programs, limited research has specifically targeted beginner fencers. Most previous studies either focused on elite athletes or examined agility and power variables, leaving a gap in literature pertaining to speed development in fencing beginners. The current study aims to fill this gap by assessing the impact of a combined plyometric-weight and fencing-specific training regimen on 50-meter sprint speed.

Through a scientifically designed training intervention, the study not only measures the physical outcome but also contributes to evidence-based practice for fencing coaches and conditioning specialists. By targeting speed development early in an athlete's career, it is possible to influence long-term athletic potential positively.

Objective

To assess the effectiveness of an eight-week plyometric-weight and fencing-specific skill training program on the speed of beginner fencers.

Hypothesis

There will be a significant difference in speed between the experimental and control groups after the intervention, in favor of the experimental group.

Delimitations

- The study was limited to 60 beginner fencers aged 10–19 years.
- Participants were selected from Karnal District, Haryana.
- Speed was measured using the 50-Meter Dash Test.
- The intervention lasted 8 weeks with 3 sessions per week.
- ANCOVA was used to control pre-test variability.

Training Protocol

Duration and Frequency

- **Total Duration:** 8 weeks
- **Frequency:** 3 sessions per week

- **Session Length:** 60–75 minutes
- **Recovery:** Non-consecutive days (e.g., Mon-Wed-Fri)

Table 1 Training Phases

Phase	Weeks	Focus Area	Intensity	Volume
Phase I	1–2	Basic plyometrics, sprint mechanics	50–60% effort	2–3 sets × 8–10 reps
Phase II	3–5	Moderate plyometrics, sprint drills	60–75% effort	3–4 sets × 10–12 reps
Phase III	6–8	High-impact drills, complex sprint sequences	75–90% effort	4 sets × 12–15 reps

Plyometric and Weight Training Components

- Warm-Up: Dynamic mobility, jogging, sprint drills

Main Plyometric Drills:

- Standing long jumps
- Bounding drills
- Tuck jumps
- Depth jumps

Weight Training

- Bodyweight squats
- Lunges
- Calf raises
- Resistance bands and light dumbbells

Cool-Down: Static stretching and relaxation

Fencing-Specific Speed Drills

- Explosive lunge and retreat drills
- Speed ladder footwork
- Partner mirroring sprints
- Start-stop sprints mimicking attack/defense transitions

Fencing-Specific Speed Drills

- Explosive lunge and retreat drills
- Speed ladder footwork
- Partner mirroring sprints
- Start-stop sprints mimicking attack/defense transitions

Control Group

The control group maintained their usual fencing practice, which involved technical drills, general conditioning, and footwork exercises, without additional plyometric or sprint-focused training.

Results

Table 1: Descriptive Statistics of Pre- and Post-Test Scores

Group	N	Pre-Test Mean (sec)	SD	Post-Test Mean (sec)	SD
Experimental	30	7.76	0.27	7.08	0.26
Control	30	7.75	0.28	7.71	0.29

Table and Fig 1 displays the mean and standard deviation scores of the 50-Meter Dash for both the experimental and control groups. The pre-test means were almost identical—7.76 seconds for the experimental group and 7.75 seconds for the control group—indicating a balanced baseline. After the 8-week intervention, the experimental group improved significantly, recording a mean post-test time of 7.08 seconds, an average improvement of 0.68 seconds. In contrast, the control group showed a negligible improvement, reducing their average time to only 7.71 seconds. This result suggests that the specific intervention

(plyometric-weight and skill training) had a substantial impact on sprinting speed, while routine fencing and conventional training alone did not produce notable improvements.

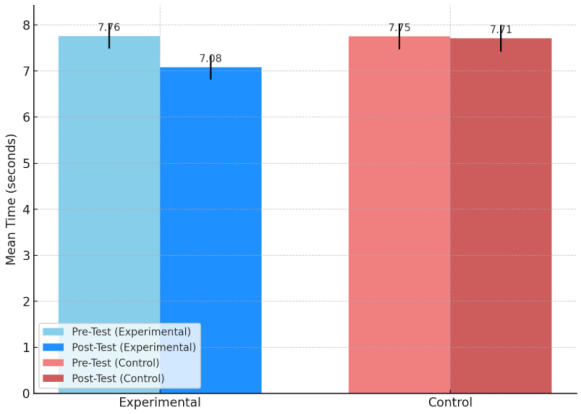


Figure 1 Bar graph Statistics of Pre-Test and Post-Test Speed Scores

Table 2: ANCOVA Summary Table for Adjusted Post-Test Scores

Source	SS	df	MS	F	Sig.
Between Groups	5.02	1	5.02	137.42	0.000
Within Groups	2.08	57	0.036		
Total	7.10	58			

Table 2 presents the ANCOVA results to compare the adjusted post-test means of the two groups while controlling for any pre-existing differences. The F-value of 137.42 and a p-value of <0.001 indicate that the difference between the groups is statistically significant. The very high F-ratio suggests that the variance between the groups is far greater than within the groups, and that this difference is unlikely to be due to chance. Hence, the null hypothesis is rejected, and it is concluded that the experimental intervention significantly influenced speed performance.

Table 3 Post Hoc Comparison Between Groups

Comparison	Mean Difference	Std. Error	Sig.	95% CI Lower	Upper
Experimental vs Control	-0.63	0.05	0.000	-0.74	-0.52

Discussion

The study revealed a significant improvement in the speed performance of beginner fencers in the experimental group, validating the effectiveness of plyometric-weight training combined with fencing-specific skill drills. The mean sprint time decreased from 7.76 seconds to 7.08 seconds in the experimental group, while the control group's performance remained virtually unchanged (7.75 to 7.71 seconds). The ANCOVA results confirmed this difference ($F = 137.42$, $p < 0.001$), and the post hoc mean difference of -0.63 seconds further validated the intervention's impact.

These results are supported by several studies. Markovic (2007) emphasized that plyometric training enhances neuromuscular efficiency, resulting in faster force generation and shorter ground contact times. Similarly, Thomas et al. (2009) reported significant improvements in sprinting performance among youth soccer players using a combined plyometric and resistance training model, highlighting the synergistic effect of such programs.

Miller et al. (2006) also found that a six-week plyometric regimen improved agility and speed in collegiate athletes. These findings resonate with the current study, where a similar training strategy improved short-distance sprinting in beginner fencers. Contrarily, Faigenbaum et al. (2005) reported only modest improvements in speed when using

plyometric training alone among children, suggesting that without integration of sport-specific drills or resistance components, improvements might be limited. This underscores the strength of the present study, where fencing-specific drills were included, ensuring greater transfer to actual sport performance. Moreover, Myer et al. (2005) and Ford et al. (2011) stressed the importance of age-appropriate, progressive overload and skill-specific adaptations in youth conditioning. The phased training structure in this study with increasing intensity and complexity likely facilitated safer and more effective gains in speed.

Conclusion

This study confirmed that an 8-week integrated program of plyometric-weight and fencing-specific skill training significantly improves 50-meter sprint speed in beginner fencers. The experimental group showed a statistically and practically meaningful improvement of 0.68 seconds, while the control group's change was negligible. These results were strongly supported by ANCOVA and post hoc analyses. The findings advocate for incorporating structured, age-appropriate physical conditioning programs in grassroots-level fencing. Coaches and sports educators are encouraged to adopt similar evidence-based models to maximize performance potential in young athletes. Future research could include long-term follow-up, gender-based comparisons, or a broader geographic sample to further validate and expand the applicability of these results.

Conflict of Interest: No Conflict of Interest Declared among authors

References

AAHPER. (1976). AAHPER Youth Fitness Test Manual. Washington, D.C.: American Alliance for Health, Physical Education, and Recreation.

Aakash, Sisodia, A., Kumar, A., & Jain, I. (2023). Patanjali's Ashtanga Yoga: A bibliometric analysis of its impact on health and well-being. Journal for ReAttach Therapy and Developmental Diversities, 6(1), 1003–1013.

Chu, D. A. (1998). Jumping into Plyometrics (2nd ed.). Human Kinetics.

Faigenbaum, A. D., Bellucci, M., Bernieri, A., Bakker, B., & Hoorens, K. (2005). Acute effects of different warm-up protocols on fitness performance in children. Journal of Strength and Conditioning Research, 19(2), 376–381.

Ford, P. R., et al. (2011). The long-term athlete development model: Physiological evidence and application. Journal of Sports Sciences, 29(4), 389–402.

Gautam, R. K., & Kumar, A. (2018). Effects of deprivation of sleep on the catching accuracy in cricket. International Journal of Physiology, Nutrition and Physical Education, 3(2), 14–16.

Jadaun, R., Kumar, D. A., Singh, D., & Sisodia, D. A. (2021). A comparative study of Covid-19 pandemic on mental toughness of national level players of selected team games. Natural Volatiles & Essential Oils, 8(6), 6583–6587.

Jain, I., Sisodia, A., Kumar, A., & Aakash. (2023). Yoga as a viable non-pharmacological approach for primary dysmenorrhea: An in-depth review and meta-analysis. Journal for ReAttach Therapy and Developmental Diversities, 6(1), 1014–1025.

Khare, S., Reddy, T. O., Kumar, A., & Sisodia, A. (2023). Muscle architecture and sports performance. International Journal of Physiology, Nutrition and Physical Education, 4(2), 254–257.

Kumar, A. (2018). Effect of deprivation of sleep on handball shooting accuracy. International Journal of Physiology, Nutrition and Physical Education, 3(1), 2075–2077.

Kumar, A. (2022). Relationship between quadriceps muscle fiber architecture and lunges performance. International Journal of Physiology, Nutrition and Physical Education, 7(2), 347–351.

Kumar, A. (2023a). Muscle architecture: A new dimension of talent identification – A mini review. International Journal of Applied Research, 9(1), 142–146.

Kumar, A. (2023b). Muscle fiber type estimation through muscle architectural properties. Unpublished manuscript or pending source information.

Kumar, A. (2023c). Non-invasive estimation of muscle fiber type using ultrasonography. International Journal of Physical Education, Sports and Health, 10(1), 89–95.

Kumar, A., & Jhajharia, B. (2018). Effect of morning exercise on immunity. International Journal of Physiology, Nutrition and Physical Education, 3(1), 1987–1989.

Kumar, A., & Jhajharia, B. (2020). Lunges performance predicted by multiple linear regression model with muscle architectural parameters. Turkish Online Journal of Qualitative Inquiry, 11(4), 2510–2517.

Kumar, A., & Jhajharia, B. (2022). A comparative study of white muscle and red muscle fiber architectural parameters. Asian Pacific Journal of Health Sciences, 9(3), 46–49.

Kumar, A., Khare, S., & Sisodia, D. A. (2021). An aerobic capacity variable-based discriminant model for the classification of handball players. Natural Volatiles & Essential Oils, 8(6), 6544–6548.

Markovic, G. (2007). Does plyometric training improve vertical jump height? A meta-analytical review. British Journal of Sports Medicine, 41(6), 349–355.

Miller, M. G., et al. (2006). The effects of a 6-week plyometric training program on agility. Journal of Sports Science and Medicine, 5(3), 459–465.

Myer, G. D., et al. (2005). The effects of plyometric versus dynamic stabilization and balance training on lower extremity biomechanics. American Journal of Sports Medicine, 34(3), 445–455.

Nandal, A., & Kumar, A. (2024). A comparative analysis of lower limb explosive strength between judo and Kho-Kho players. Journal of Sports Science and Nutrition, 5(1), 25–26.

Thomas, K., French, D., & Hayes, P. R. (2009). The effect of two plyometric training techniques on muscular power and agility in youth soccer players. Journal of Strength and Conditioning Research, 23(1), 332–335.

Young, W. B., Dawson, B., & Henry, G. J. (2015). Agility and change-of-direction speed are independent skills. International Journal of Sports Science & Coaching, 10(1), 159–169.