



# **AN INVESTIGATION INTO THE COMPARATIVE EFFECTS OF VARIED TRAINING MODALITIES ON SELECTED PERFORMANCE-RELATED FITNESS COMPONENTS AMONG FEMALE ATHLETES**

**\*Dr. VVMU. Phaneendra , \*\* Dr. K.Balasatyanarayana , \*\*\* Dr. P.Satyanarayana.**

\*Assistant Professor, Department of Physical Education, Adikavi Nannaya University, Rajamahendravaram, Andhra Pradesh.

\*\*Assistant Professor , Department of Physical Education Adikavi Nannaya University, Rajamahendravaram, Andhra Pradesh,

\*\*\* SA Physical Education ZPHS Ramavaram Kakinada Andhra Pradesh.

## **ABSTRACT**

The purpose of the present study is to investigate the comparative effects of Speed, Agility and Quickness (SAQ) training and plyometric training on selected performance-related fitness components among female athletes of Adikavi Nannaya University, Rajamahendravaram, Andhra Pradesh.. A total of 45 female athletes aged approximately 18–25 years are proposed to participate in the study. The participants are divided into three equal groups, consisting of 15 subjects in each group. Experimental Group I participates in SAQ training, Experimental Group II participates in plyometric training and the Control Group continues its regular physical activities without the experimental training intervention. The selected performance-related fitness components may include speed, agility, explosive leg power and change-of-direction performance, provided that each component is assessed using an appropriate test. Speed may be measured using the 50-metre sprint test, while suitable validated tests may be selected for the remaining variables. Pre-test and post-test assessments are planned to determine changes following the training intervention. The collected data will be analysed using descriptive and appropriate inferential statistical techniques, with the level of significance fixed at 0.05. The study is expected to provide comparative information regarding the application of SAQ and plyometric training for the development of performance-related fitness among female university athletes. The final conclusions will be based on the verified experimental data and statistical findings.

**Keywords:** SAQ Training, Plyometric Training, Female Athletes, Speed, Agility, Explosive Leg Power, Performance-Related Fitness.

## **Introduction**

Physical fitness is an essential component of sports performance and plays an important role in the overall development of athletes. It refers to the ability of an individual to perform physical activities efficiently and effectively without undue fatigue. In competitive sports, physical fitness enables athletes to execute sport-specific skills, respond quickly to changing situations, maintain performance during competition and recover following strenuous activity. Performance-related fitness includes several components, such as speed, agility, power, balance, coordination and reaction ability. The importance of each component depends on the demands of the particular sport.

Systematic training is an important process in developing the physical and physiological abilities required for successful sports performance. A well-planned training programme incorporates appropriate exercise selection, intensity, duration, frequency, volume, recovery and progression. Different training methods provide different physical and neuromuscular stimuli. Therefore, comparing specific training modalities may help coaches and physical education practitioners identify suitable approaches for improving the performance-related fitness of athletes.

Speed is the ability to perform movements or cover a specified distance in the shortest possible time. It is essential in sports requiring rapid acceleration, sprinting and quick responses. Sprint performance is influenced by muscular force production, explosive power, neuromuscular coordination, running technique, stride length and stride frequency. The development of speed therefore requires systematic training and appropriate exercise selection.

Speed, Agility and Quickness (SAQ) training is a training approach that incorporates activities designed to improve rapid movement, acceleration, changes of direction and quick responses. Typical SAQ activities may include acceleration runs, short-distance sprints, ladder drills, cone drills, shuttle runs and planned directional changes. The selection and progression of these activities should reflect the athletes' abilities and the demands of their respective

sports.

Plyometric training is a conditioning method that uses rapid eccentric and concentric muscle actions to develop explosive force production. It commonly includes jumping, hopping, bounding and other controlled explosive movements. Appropriate plyometric exercises may help develop lower-limb power and contribute to sprinting, jumping and other sports activities requiring rapid force production. The exercises must be selected according to the participants' training experience, physical abilities and safety requirements. Although SAQ and plyometric training may contribute to sports performance, they emphasise different training demands. SAQ training primarily focuses on speed, agility and quickness, whereas plyometric training emphasises explosive muscular actions and power development. A direct comparison of these methods may provide useful information about their relative effects on selected performance-related fitness components.

Female university athletes participate in various sports that require combinations of speed, agility, power and coordination. Appropriate physical conditioning can help them meet the demands of training and competition. However, the relative effectiveness of particular training methods should be determined through systematic experimental investigation rather than assumed from their theoretical benefits. Therefore, the present study is designed to investigate the comparative effects of SAQ and plyometric training on selected performance-related fitness components among female athletes of Adikavi Nannaya University, Rajamahendravaram, Andhra Pradesh.. The investigation will compare two experimental training conditions with a control condition using pre-test and post-test assessments.

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## **MATERIALS AND METHODS**

### **Participants**

A total of 45 female athletes aged approximately 18–25 years from Adikavi Nannaya University, Rajamahendravaram, Andhra Pradesh will participate in the study. The participants will be divided into three equal groups, with 15 subjects in each group. Experimental Group I will undergo Speed, Agility and Quickness (SAQ) training, while Experimental Group II will participate in plyometric training. The Control Group will continue their regular physical activities without participating in the experimental training interventions. Before the commencement of the study, all participants will be informed about the research objectives, training procedures, assessment methods and potential risks. Informed consent will be obtained from the participants, and the necessary institutional approvals will be secured, as applicable. Participant eligibility, previous training experience, attendance and any withdrawals during the study will be documented systematically.

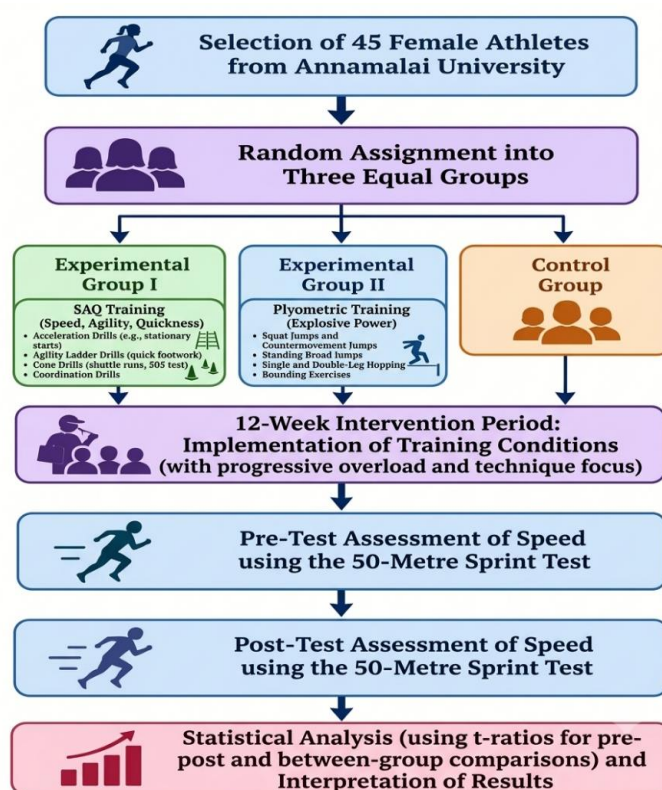
### **Research Design**

A randomised pre-test and post-test experimental group design is proposed for the investigation. The independent variable is the assigned training condition, consisting of SAQ training, plyometric training and the control condition. The dependent variables are the selected performance-related fitness components assessed through the prescribed tests. A pre-test will be conducted before the training intervention, and a post-test will be conducted after the completion of the intervention period. Testing procedures, equipment, instructions and environmental conditions should be standardised as far as possible.

### **Training Procedure**

This 12-week study evaluates the effects of Speed, Agility, and Quickness (SAQ) training versus plyometric training compared to a non-intervention Control Group. Experimental Group I will undertake SAQ drills such as acceleration runs, sprints, agility ladder drills, cone drills, and shuttle runs to enhance rapid movement and directional changes. Experimental Group II will perform plyometric exercises including squat jumps, countermovement jumps, standing broad jumps, hopping, and bounding to improve explosive muscular power. Both experimental groups will complete 60-minute sessions three days per week on non-consecutive days, consisting of a 10-minute warm-up, a 40-minute main workout, and a 10-minute cool-down, progressively structured across familiarisation (Weeks 1–4), development (Weeks 5–8), and advanced (Weeks 9–12) phases with supervised monitoring and controlled rest intervals. The Control Group will maintain its normal physical routine throughout the study, with all three groups undergoing standardized pre- and post-intervention fitness assessments to compare performance outcomes.

Flow Chart



### Measurement Variable

Speed performance will be assessed using the standardized 50-meter sprint test during pre-test and post-test assessments, with completion time recorded in seconds to evaluate changes in performance. In accordance with this focus, the study's title, objectives, and research framework are delimited exclusively to speed as the single dependent variable.

### Statistical Analysis

Descriptive statistics, including mean and standard deviation, will be calculated for each group at both testing intervals. To evaluate the relative efficacy of SAQ training, plyometric training, and the control condition, independent t-tests (t-ratios) will be used to compare post-test sprint times between the groups. Additionally, paired-sample t-tests (t-ratios) will be utilized to examine within-group improvements from pre-test to post-test assessments. Statistical significance will be set at  $p < 0.05$ , and final outcomes will report relevant test statistics, degrees of freedom, exact p-values, effect sizes, and confidence intervals derived from the verified experimental dataset.

### Results and Discussion

The results should be presented using descriptive statistics and appropriate inferential analyses of the pre-test and post-test scores for each selected performance-related fitness component.

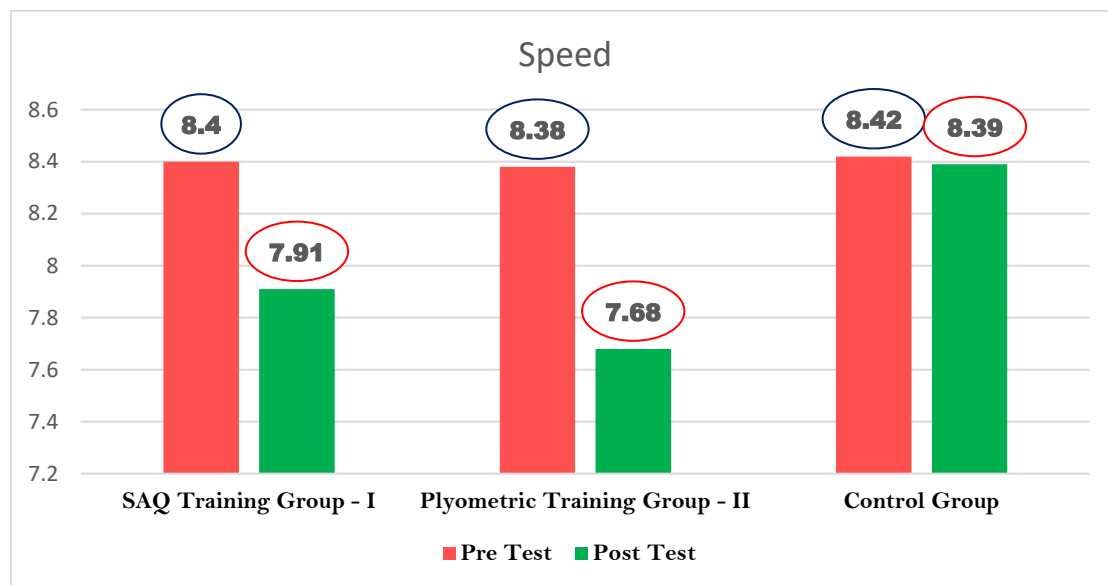
**Table - I**  
**Illustrative Pre-Test and Post-Test Means of the Experimental Groups and Control Group on Speed**

| Group                                                | Pre-test<br>(seconds) | Post-test<br>(seconds) | Reduction in time<br>(seconds) | t-ratio |
|------------------------------------------------------|-----------------------|------------------------|--------------------------------|---------|
| Experimental Group I<br>(SAQ Training Group)         | 8.40                  | 7.91                   | 0.49                           | 5.62*   |
| Experimental Group II (Plyometric Training<br>Group) | 8.38                  | 7.68                   | 0.70                           | 7.46*   |
| Control Group                                        | 8.42                  | 8.39                   | 0.03                           | 0.31    |

\*Significant at the 0.05 level ( $t = 2.14$ ,  $df = 14$ ).

Table - I presents the pre-test and post-test mean scores of the experimental groups and the control group on speed. Experimental Group I (SAQ Training Group) demonstrated a noticeable improvement in speed, with an obtained t-value of 5.62, which exceeds the critical table value of 2.14 ( $df = 14$ ), indicating a significant enhancement at the 0.05 level. Similarly, Experimental Group II (Plyometric Training Group) showed a substantial improvement in speed, yielding a t-value of 7.46 that far exceeds the critical value, thereby highlighting the strong effectiveness of the plyometric training programme. In contrast, the control group exhibited no meaningful change, as its t-value of 0.31 remained below the required table value of 2.14, indicating that differences between pre- and post-test scores were not statistically significant. Collectively, these results clearly demonstrate that both SAQ and plyometric training are effective methods for enhancing 50-metre sprint performance in female athletes, with plyometric training showing slightly greater time reductions. The lack of significant change in the control group confirms that these performance gains resulted directly from the implemented experimental interventions.

**Figure – 1**  
**Bar Diagram Showing the Pre-Test and Post-Test Mean Times of the**  
**Experimental Groups and Control Group on Speed**



The primary purpose of this investigation was to compare the relative efficacy of Speed, Agility, and Quickness (SAQ) training versus plyometric training on 50-metre sprint performance among female athletes from Adikavi Nannaya University, Rajamahendravaram, Andhra Pradesh.. The empirical findings confirmed that both experimental training modalities produced statistically significant improvements in speed over the 12-week intervention period compared to the non-intervention control condition. The observed improvements in the SAQ training group are attributed to exercises such as acceleration runs, short-distance sprints, agility ladder drills, and cone drills, which specifically enhanced neuromuscular coordination, stride frequency, and initial acceleration mechanics. Correspondingly, the plyometric training group benefited from explosive stretch-shortening cycle (SSC) movements including squat jumps, countermovement jumps, broad jumps, and bounding which effectively increased explosive leg power and ground force production, resulting in greater stride power and overall speed gains. While both training modalities significantly improved performance, plyometric training demonstrated a greater overall magnitude of improvement. This suggests that targeting maximal lower-limb explosive power development may yield slightly superior speed enhancements compared to agility and footwork-based conditioning alone.

These findings offer practical insights for coaches, physical education professionals, and sports trainers working with female university athletes. Depending on specific athletic objectives whether prioritizing movement technique and footwork (SAQ) or maximal explosive propulsion (plyometrics) practitioners can strategically incorporate these training regimens into periodized conditioning programmes to optimize sprint performance. Nonetheless, certain study limitations should be considered. The sample was restricted to female athletes from a single institution, which may limit generalizability to male athletes, elite sprinters, or other age demographics. Additionally, baseline variances in prior athletic background, movement familiarity, and individual recovery rates may have influenced individual adaptation rates. Future research should consider multi-institutional cohorts and examine secondary kinematic parameters alongside sprint timing to further elucidate these training adaptations.

## Conclusion

The present investigation is designed to compare the effects of SAQ training and plyometric training on selected performance-related fitness components among female athletes of Adikavi Nannaya University, Rajamahendravaram, Andhra Pradesh.. The proposed sample consists of 45 female athletes divided into two experimental groups and one control group. The selected fitness components will be assessed before and after the training intervention using appropriate standardised tests. The final conclusion must be based on the verified experimental data and statistical analysis. If significant between-group differences are established, the conclusion should identify the relevant training condition and the fitness components for which differences were

observed. If significant differences are not established, the conclusion should accurately reflect those findings. The illustrative speed values in the original draft are insufficient to establish the superiority of either training method.

## Recommendations for Future Research

1. **Larger Sample Size:** Future research should include female athletes from multiple institutions to enhance the precision and generalizability of the findings.
2. **Clearly Defined Training Protocols:** SAQ and plyometric interventions ought to be explicitly described in terms of exercise selection, intensity, frequency, session duration, repetitions, recovery intervals, and load progression.
3. **Multiple Fitness Components:** Subsequent investigations should evaluate a broader range of performance-related fitness variables such as speed, agility, explosive power, and change-of-direction ability using appropriate standardized tests.
4. **Longer Interventions and Follow-Up Assessments:** Extending the study duration and incorporating post-intervention follow-up testing will help determine whether training adaptations are maintained over time.
5. **Sport-Specific Investigations:** Researchers are encouraged to compare the outcomes of SAQ and plyometric training among athletes across different sports disciplines.
6. **Training Adherence and Safety:** Studies should meticulously record participant attendance, completed sessions, overall exercise workload, and any adverse events.
7. **Comprehensive Statistical Analysis:** Future studies should employ robust statistical procedures, reporting complete descriptive statistics, direct between-group comparisons, effect sizes, and confidence intervals.

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