

Impact of Resistance Training on Agility among Female Volleyball Players

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ABSTRACT

The current experimental research study investigated the impact of resistance training on agility of female volleyball players. Total 40 female volleyball players were selected purposively from Government College for Women Township Lahore (GCWT) and University of the Punjab aged between 18-24 years. The participants followed 8-week resistance training program four days a week, following volleyball practice, and they gradually increased the intensity of the training from 60% to 80% of 1RM. The standardized T-test agility protocol was used to evaluate agility performance before and after the intervention. The data was analyzed descriptively, normality test (shapiro Wilk) and paired sample t-test. Both pre-test agility ($W = .972$, $p = .384$) and post-test agility ($W = .979$, $p = .612$) scores were normally distributed as evidenced by the results. There was a significant improvement in the mean agility score from 19.09 seconds pre-test to 17.71 seconds post-test, suggesting an improvement in agility performance after the training intervention. Additionally, the paired sample t-test showed that the difference between the pre-test and post-test scores was statistically significant, $t(39) = 34.91$, $p < .001$. The results indicate that resistance training has a significant effect on agility in volleyball players, which may be attributed to the improvement of lower body strength, coordination, balance and neuromuscular efficiency. Thus, resistance training can be recommended as an effective approach to enhance agility and overall athletic performance of female volleyball players.

Keywords: Agility, resistance training, volleyball, Female athletes, physical performance, Illinois Agility Test

INTRODUCTION

Volleyball is a fast and dynamic sport that requires quick movements, rapid jumps, changes of direction, and continuous coordination. Female volleyball players must constantly react to teammates, opponents, and ball movement during gameplay. Among the various physical fitness components, agility is considered one of the most important because it enables athletes to accelerate, decelerate, maintain balance, and quickly change direction during actions such as spiking, blocking, and defensive transitions (Silva et al., 2023). Therefore, agility training has become an essential part of volleyball conditioning programs.

Agility includes both change-of-direction (COD) speed and reactive agility. COD agility refers to planned movement changes, while reactive agility involves responding to external stimuli such as opponent actions or ball movement. According to Warren B. Young and Jeremy M. Sheppard (2006), improving COD ability alone may not fully improve reactive agility because decision-making and perceptual skills are also involved. As a result, volleyball training programs should focus on both physical and cognitive agility development.

Resistance training is widely recognized as an effective method for improving athletic performance and agility. Increased lower-body strength enhances movement speed, balance, and directional control. Studies have shown that resistance training improves muscular strength, neuromuscular coordination, tendon stiffness, and force production, all of which are important for agility performance (Keoliya et al., 2024). Similarly, plyometric training improves explosive power, reactive strength, jumping ability, and COD performance through rapid eccentric and concentric muscle actions (Sylvester et al., 2024). Recent research also suggests that combining resistance and plyometric training may provide greater improvements in agility and explosive performance among female volleyball players (Kavuran et al., 2025).

Despite growing evidence, several gaps remain in the literature. Most previous studies have focused on male or mixed-gender athletes, making it difficult to generalize findings specifically to female volleyball players. Additionally, studies have reported inconsistent findings regarding the effects of resistance training on agility, possibly due to differences in training duration, intensity, exercise selection, and testing procedures (Sylvester et al., 2024). Other factors such as training surfaces and environmental conditions may also influence agility development (Yu et al., 2025).

Resistance and plyometric training have been shown to improve countermovement jump performance, balance, movement efficiency, and agility in volleyball players (Ramírez-Campillo et al., 2021). However, questions still remain regarding the ideal timing of resistance training in relation to regular volleyball practice sessions. Some studies report performance improvements when resistance training is performed after practice, while others suggest that fatigue may affect training quality (Masel & Maciejczyk, 2024; Deng et al., 2025).

Standardized tests such as the T-test and Illinois Agility Test are commonly used to assess agility performance in volleyball players because they are reliable and valid measures of COD ability (Kaya et al., 2022). Therefore, the present study aims to examine the effect of an 8-week resistance training program performed after regular volleyball practice on the agility of female collegiate volleyball players. The findings may provide useful guidance for coaches, trainers, and physical educators in improving agility and athletic performance among female volleyball players.

METHOD

Research Design

The experiment was carried out during eight weeks, which was split into two sections Pre-test and Post-test measurements, in which 40 volleyball female players participated.

Participants

This study employed an experimental research design to examine the effect of resistance training on agility among 40 female volleyball players aged 18–24 years from Government College for Women Township Lahore and University of the Punjab. Participants completed a pre-test using the Illinois Agility Test (IAT) followed by an 8-week resistance training program conducted four times weekly after volleyball practice. The program included strength, plyometric, and agility exercises with progressive intensity. After the intervention, a post-test was conducted using the IAT. Data were analyzed through descriptive statistics and paired sample t-test to determine the effect of resistance training on agility performance.

Instruments and Measures

For the present study, the following instruments and measures were used to evaluate the effect of resistance training on agility in female volleyball players.

Illinois Agility Test (IAT)

The Illinois Agility Test (IAT) was used to measure agility performance among female volleyball players. Participants completed a 10 m × 5 m cone course involving sprinting and direction changes, while completion time was recorded using a digital stopwatch. The test was conducted before and after the 8-week resistance training program to assess agility improvement.

Resistance Training Equipment

The intervention program used equipment such as barbells, dumbbells, resistance bands, medicine balls, agility cones, and plyometric boxes to improve lower-body strength, power, and agility performance.

Digital Stopwatch

A digital stopwatch was used to accurately record the completion time of the Illinois Agility Test. A time was taken in seconds to measure the agility performance during pre-test and post-test measurement to have a precise measurement of agility performance.

Anthropometric Measures

Basic anthropometric data such as age and body weight of participants was taken prior to the intervention. The body weight was taken using a standard weighing machine (kg) and the age was obtained from the participant's records.

Training Protocol

The study implemented an 8-week resistance training program conducted four times weekly after volleyball practice. The program included lower-body resistance, plyometric, and agility exercises with progressive intensity from 60% to 80% 1RM.

Resistance Training Intervention

The study involved 40 female volleyball players aged 18–24 years from Government College for Women Township Lahore and University of the Punjab. Participants completed an 8-week resistance training program conducted four times weekly after volleyball practice sessions. The program included lower-body strength, plyometric, and agility exercises with progressive intensity from 60% to 80% 1RM. Each session lasted 45–60 minutes and all training sessions were supervised to ensure safety, consistency, and proper exercise technique.

Procedure and Ethical Considerations

The study was conducted among female volleyball players aged 18–24 years from Government College for Women Township Lahore and University of the Punjab. Participants were selected according to inclusion and exclusion criteria, and only healthy athletes actively involved in volleyball training were included.

Informed consent was obtained before data collection, while confidentiality and participant safety were maintained throughout the study.

Statistical Analysis

The data were analyzed using IBM SPSS Statistics. Descriptive statistics including mean, standard deviation, frequencies, and percentages were used to summarize participant characteristics and agility scores. Data normality was assessed through the Shapiro-Wilk test, and since the data were normally distributed, a paired samples t-test was applied to compare pre-test and post-test agility scores and determine the effect of the resistance training program.

RESULTS

This part of the research presents the findings of the study in four sections: (i) the demographic characteristics of the sample, (ii) Descriptive Statistics of Study Variables, (iii) Comparison of Pre and Post Test Agility Scores and (iv) Paired Samples T Test Results for Agility (Pre vs Post)

Demographic Characteristics of Participants

Table 1

Demographic Characteristics of Participants (N = 40)

Variable	Category	Frequency (f)	Percentage (%)
Age Group (Years)	18–19	5	12.5
	20–21	21	52.5
	22–24	14	35.0
Weight (kg)	40–49	12	30.0
	50–59	16	40.0
	60–69	10	25.0
	70–79	2	5.0
Institution	Government College for Women Township Lahore (GCWT)	20	50.0
	University of the Punjab	20	50.0
Playing Experience (Years)	< 1 year	4	10.0
	1–2 years	22	55.0

	3–4 years	12	30.0
	5+ years	2	5.0

Note. N = Total number of participants; f = Frequency.

The demographic information of the participants showed that most of the female volleyball players were in the age range of 20-21 years (52.5%). The participants were distributed in the following way: 40.0% had a body weight between 50 and 59 kg. The distribution of participants was equal, 50% were from Government College for Women Township Lahore (GCWT) and 50% were from the University of the Punjab. In terms of playing experience, most participants (55.0%) had 1–2 years of volleyball playing experience.

Descriptive Statistics of Study Variables

Table 2

Descriptive Statistics of Study Variables (N = 40)

Variable	Mean	Std. Deviation
Age (years)	20.83	1.65
Baseline weight (kg) 54.28	8.74	
Pre-test agility (sec)	19.09	0.65
Pos- test agility (sec)	17.71	0.64

The table 2 provides information regarding the descriptive statistics (mean and standard deviations) for the key study variables (N = 40). Specifically, the mean age of the respondents was equal to 20.83 (SD = 1.65), meaning that the majority of the participants were young and almost the same age (there is no substantial variability in age). As for the weight, it is equal to 54.28 kg (SD = 8.74), which demonstrates moderate variance between the weights of the participants. Regarding the performance, it is obvious that the mean pre-test agility time is lower than post-test one 19.09 vs. 17.71 seconds. The difference in time means that there is an improvement in agility due to resistance training. Moreover, SD values are very low, which suggests consistency in performance.

Comparison of Pre and Post Test Agility Scores

Table 3

Comparison of Pre and Post Test Agility Scores

Test type	Mean (sec)	Std. Deviation
Pre-test	19.09	0.65
Post- test	17.71	0.64

As shown Table 3, there is a decrease in participants' agility time between pre-test and post-test. The mean pre-test agility time was 19.09 seconds (SD = 0.65). After training, the post-test time was 17.71 seconds (SD = 0.64). This result indicates that participants' agility test time reduced significantly after training. The two standard deviations obtained are also very close. Thus, this finding suggests consistency in the level of deviation in participants' agility scores between the two tests. Hence, it implies that there is improvement in the performance of participants' agility after training.

Paired Samples T Test Results for Agility (Pre vs Post)

Table 4

Paired Samples T Test Results for Agility (Pre vs Post)

Variable	Mean difference Std. deviation	t value	df	p value
Pre&post-test agility	1.38	0.25	39	34.91 < .001

Table 4 paired samples t-test results, it shows a significant difference between pre-test and post-test participants' agility scores. The mean difference in pre-test and post-test agility scores was 1.38 seconds (SD = 0.25). This result reveals that participants improved their agility test time by 1.38 seconds. The results of the t-test revealed a highly significant difference at 39 df; $t(39) = 34.91$, $p < .001$.

DISCUSSION

The present study aimed to examine the effect of resistance training on agility among female volleyball players. Statistical analyses included the Shapiro–Wilk normality test, descriptive statistics, demographic analysis, and paired sample *t*-test. The findings revealed that both pre-test ($W = .972$, $p = .384$) and post-test ($W = .979$, $p = .612$) agility scores were normally distributed, supporting the use of parametric analysis (Field, 2018). Descriptive results showed a significant improvement in agility performance following the 8-week resistance training program, as the mean agility score improved from 19.09 seconds in the pre-test to 17.71 seconds in the post-test. The paired sample *t*-test further demonstrated a statistically significant difference between pre- and post-test scores, $t(39) = 34.91$, $p < .001$, indicating that resistance training had a strong positive effect on agility performance. These improvements may be attributed to enhanced lower-body muscular strength, neuromuscular coordination, balance, and movement efficiency developed through structured resistance exercises (Haff & Triplett, 2016; Suchomel et al., 2019). The findings are consistent with previous studies reporting positive effects of resistance and plyometric training on agility, movement speed, and change-of-direction performance in female volleyball players (Ramírez-Campillo et al., 2021; Sylvester et al., 2024; Keoliya et al., 2024). Unlike earlier studies that combined multiple training methods, the current research specifically isolated resistance training as the primary intervention, providing clearer evidence of its effectiveness in improving agility among female volleyball players. Despite limitations such as small sample size and short intervention duration, the study concludes that resistance training is an effective strategy for enhancing agility and overall athletic performance in female volleyball players.

Implications for Practice in Pakistani Higher Education

The findings of the study indicate that resistance training significantly improves agility among female volleyball players and has important implications for higher education institutions in Pakistan.

Incorporating structured resistance training into university sports programs can enhance athletes' agility, strength, coordination, and overall performance. The study also emphasizes the need for better coaching support, conditioning facilities, and gender-inclusive sports development to promote the long-term athletic growth of female students.

LIMITATIONS

The study has several limitations that should be considered while interpreting the findings. The small sample size and short intervention duration may limit the generalizability of the results to a larger population of female volleyball players in Pakistan. Additionally, the study focused only on agility, while other important performance variables such as vertical jump, speed, endurance, coordination, and injury prevention were not examined.

CONCLUSION

The study results demonstrate that the 8-week resistance training program IAT leads to better agility performance in female volleyball players. The post-test results show that agility test time reduction indicates better speed and coordination and quick directional movement abilities. The research produced statistically significant outcomes which demonstrate that resistance training helps athletes improve their physical performance with special emphasis on agility development which is essential for volleyball competition. The study results show that training programs help athletes who have only basic to intermediate skills in their respective sports. The study demonstrates that structured resistance training should be included in sports practice because it leads to significant athletic performance improvements. Resistance training should be regarded as a crucial training element for female volleyball players.

Conflict of Interest

The author declares no conflict of interest.

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