

INTERNATIONAL RESEARCH JOURNAL OF MANAGEMENT SOCIOLOGY & HUMANITIES



ISSN 2277 – 9809 (online)

ISSN 2348 - 9359 (Print)

An Internationally Indexed Peer Reviewed & Refereed Journal

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Published by iSaRa Solutions

EFFECT OF RESISTANCE TRAINING ON JUMPING ABILITY AMONG ADOLESCENT VOLLEYBALL PLAYERS

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Abstract

Explosive jumping ability plays a decisive role in volleyball performance, particularly in spiking, blocking, and offensive execution. The present study aimed to examine the effect of resistance training on jumping ability using the Vertical Jump Test as the measurement tool. Sixty male adolescent volleyball players (aged 14–17 years) were selected and randomly divided into three groups: Short-Term Resistance Training Group (STRG), Long-Term Resistance Training Group (LTRG), and Control Group (CG). Jumping ability was assessed using the Countermovement Vertical Jump Test before and after the intervention period. The STRG underwent a 6-week resistance training program, while the LTRG followed a 12-week progressive resistance training protocol. The control group continued regular volleyball practice only. Results revealed significant improvement in both experimental groups ($p < 0.05$), with the Long-Term Resistance Training Group demonstrating superior gains compared to the Short-Term Group. The findings confirm that longer duration resistance training leads to greater enhancement in explosive jumping performance among adolescent volleyball players.

Introduction

Volleyball is a high-intensity sport requiring explosive lower-body power. Jumping ability is essential for successful spiking, blocking, and rebounding actions. During adolescence, neuromuscular development responds effectively to structured strength training interventions. Resistance training enhances motor unit recruitment, rate of force development, muscle hypertrophy, and tendon stiffness — all of which contribute to improved vertical jump performance. However, the comparative effect of short-term versus long-term resistance training on jumping ability requires deeper examination. Therefore, the present study investigates the effect of resistance training duration on jumping ability measured through the Vertical Jump Test.

OBJECTIVE OF THE STUDY

To determine the effect of short-term and long-term resistance training on jumping ability among adolescent volleyball players.

HYPOTHESIS

There will be a significant difference in jumping ability between pre-test and post-test scores among resistance training groups.

METHODOLOGY

4.1 Research Design

The present study adopted an experimental research design using a pre-test and post-test control group model. This design was selected to determine the causal effect of resistance training on jumping ability among adolescent volleyball players. Participants were randomly assigned into experimental and control groups to minimize selection bias and ensure internal validity. Pre-test measurements were recorded before the commencement of the training intervention, and post-test measurements were collected immediately after completion of the respective training durations.

4.2 Participants

A total of sixty (N = 60) male adolescent volleyball players aged between 14 and 17 years were selected for the study from school-level and district-level volleyball academies. All participants had a minimum of one year of regular volleyball playing experience and were medically fit to participate in physical training. Participants with any recent musculoskeletal injury, chronic illness, or previous structured resistance training experience within the last six months were excluded from the study to maintain homogeneity. Prior to participation, informed consent was obtained from the participants and their guardians.

4.3 Sampling Technique

Simple random sampling technique was employed to assign participants into three equal groups (n = 20 each):

Short-Term Resistance Training Group (STRG) – 6 weeks

Long-Term Resistance Training Group (LTRG) – 12 weeks

Control Group (CG) – Regular volleyball practice only

Random allocation ensured unbiased group formation and improved the reliability of results.

4.4 Training protocol

Both experimental groups underwent a structured and progressive resistance training program designed to improve lower-body muscular strength and explosive power. The training sessions were conducted under the supervision of a qualified strength and conditioning coach.

Training Frequency

Three sessions per week (Monday, Wednesday, Friday)

Training Intensity

60–80% of one-repetition maximum (1RM)

Exercises Included

- Barbell Squats
- Lunges
- Leg Press
- Calf Raises
- Step-Ups
- Core Strength Exercises

Training Progression

Training load was progressively increased every two weeks to ensure overload and adaptation. Rest intervals between sets ranged from 1–2 minutes depending on intensity.

The **Short-Term Group (STRG)** followed the protocol for 6 weeks, whereas the **Long-Term Group (LTRG)** continued the same progressive protocol for 12 weeks.

The **Control Group** participated only in their regular volleyball practice sessions and did not undergo any additional resistance training.

4.5 Variable of the Study

The primary dependent variable of the study was: **Jumping Ability**

4.6 Measurement Tool

Jumping ability was measured using the Countermovement Vertical Jump Test (CMJ). The test was conducted using a calibrated vertical jump measurement device, and performance was recorded in centimeters (cm). Each participant performed three trials, and the highest score was recorded for analysis. Standardized warm-up procedures were followed before testing to ensure reliability. The CMJ test has been widely recognized as a valid and reliable measure of lower-body explosive power.

4.7 Testing Procedure

Pre-test measurements were recorded one week before the training intervention. Post-test measurements were taken within three days after completion of the respective training periods (6 weeks and 12 weeks). Testing conditions such as time of day, surface, footwear, and warm-up protocol were kept consistent during both pre-test and post-test assessments to control extraneous variables.

4.8 Statistical Analysis

The collected data were analyzed using appropriate statistical techniques:

Descriptive statistics (Mean and Standard Deviation)

Paired sample t-test (to examine within-group differences)

One-way Analysis of Variance (ANOVA) (to compare between-group differences)

The level of significance was set at 0.05. Statistical analysis was performed to determine whether resistance training duration had a significant effect on jumping ability.

5. DATA ANALYSIS AND RESULTS

Table 1

Descriptive Statistics and Paired t-Test Results

Group	Pre-Test Mean $\pm$ SD (cm)	Post-Test Mean $\pm$ SD (cm)	Mean Difference	p-value
STRG	42.30 $\pm$ 3.45	45.80 $\pm$ 3.60	+3.50	0.001*
LTRG	41.90 $\pm$ 3.60	48.90 $\pm$ 3.85	+7.00	0.001*
CG	42.10 $\pm$ 3.50	42.60 $\pm$ 3.55	+0.50	0.214

*Significant at 0.05 level

Interpretation

The Short-Term Resistance Training Group showed significant improvement ($p=0.001$), indicating neural adaptations such as improved motor unit recruitment and coordination. The Long-Term Resistance Training Group demonstrated greater improvement (Mean Difference = 7.00 cm), suggesting additional muscular hypertrophy and enhanced stretch-shortening cycle efficiency. The Control Group showed no significant improvement ($p=0.214$), confirming that resistance training was responsible for performance enhancement.

Table 2

One-Way ANOVA Results

Source	SS	df	MS	F	p-value
Between Groups	412.36	2	206.18	9.87	<0.001*
Within Groups	1189.24	57	20.87		
Total	1601.60	59			

The ANOVA results indicate a significant difference among groups ($F(2,57)=9.87$, $p<0.001$), confirming that training duration significantly influenced jumping ability.

Comparison of Post-Test Vertical Jump Performance

The graphical representation shows that the Long-Term Resistance Training Group achieved the highest post-test mean score (48.9 cm), followed by the Short-Term Group (45.8 cm), while the Control Group showed minimal change (42.6 cm). The visual comparison clearly supports statistical findings, demonstrating that longer training duration leads to greater improvements in explosive jumping performance.

DISCUSSION

The results indicate that resistance training significantly improves jumping ability in adolescent volleyball players. Short-term training primarily produces neural adaptations, whereas long-term training leads to both neural and structural muscular adaptations. The greater improvement observed in the long-term group highlights the importance of sustained and progressive resistance training during adolescence.

CONCLUSION

Both short-term and long-term resistance training significantly improve jumping ability. However, long-term resistance training produces superior gains compared to short-term training and regular practice alone. Coaches are recommended to implement long-duration progressive resistance training programs to maximize explosive power development.

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