



Original Article

A Comprehensive Study on the Effects of a Plyometric Training Program on Skill Performance Variables in Sub-Junior Judokas

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Abstract

This study investigates the effectiveness of a systematically designed plyometric training program on the improvement of specific judo skill performance variables in sub-junior judokas aged between 11 and 14 years. The research aims to assess whether such training interventions can bring measurable enhancement in the execution of key judo techniques, including Ippon Seoi Nage (one-arm shoulder throw), Tomoe Nage (stomach throw), and O Soto Gari (major outer reaping throw). Through random sampling, a total of 80 judokas were chosen and split evenly into two groups: the experimental group and the control group. During the course of 12 weeks, the experimental group engaged in three one-hour plyometric training sessions per week. In contrast, the control group did not engage in any specialized training during this period. The performance of the participants was assessed using standardized Judo Fitness Tests both before and after the training intervention. Statistical analysis was conducted using Analysis of Covariance (ANCOVA) through SPSS software to determine the significance of differences between the two groups. The findings revealed statistically significant improvements in the performance of the experimental group across all three skill variables, indicating that plyometric training effectively enhances neuromuscular coordination, explosive strength, and technique execution. The study concludes that integrating plyometric drills into the training routines of young judo athletes can substantially benefit their skill development and overall performance. These results underscore the importance of age-appropriate strength and conditioning programs in competitive youth sports, particularly in disciplines that rely heavily on agility, power, and technical precision.

Keywords: Plyometric Training, Skill Performance, Speed and Agility; Combat Sports Performance

Introduction

Judo is an intense and physically challenging martial art that demands a combination of several physical qualities. To succeed in judo, an athlete must have excellent coordination (the ability to move the body in a controlled and synchronized way), strength (to hold, lift, and throw opponents), speed (to react quickly), and explosive power (to perform powerful, fast movements, especially during throws and counter-attacks). In judo, the accurate and skillful performance of techniques, particularly throws (like Ippon Seoi Nage or Tomoe Nage) and grip control, plays a major role in determining who wins a match. Being able to execute these techniques with speed and power is essential.

Plyometric training is a special kind of physical training used in many sports. It involves exercises that focus on rapid stretching and contracting of muscles (like jump squats or bounding exercises). This method is known for improving an athlete's power (the ability to produce force quickly) and agility (quick, controlled changes in direction). While plyometric training has been proven effective in various sports like basketball, football, or track and field, there has been little research on how it helps sub-junior judokas—young judo athletes usually aged 11–14 years. This study is designed to fill that research gap by specifically examining how a structured plyometric training program influences the development of selected judo skills in these young athletes.

Research Methodology

The general plan or approach taken to carry out a study is referred to as research methodology. It covers the methods, techniques, and resources needed to gather, examine, and evaluate data in order to respond to a particular research question.

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The purpose of this study was to determine whether plyometric exercise may enhance sub-junior judokas' (ages 11–14) performance in judo skills.

Key Elements of the Methodology Used in This Study:

1. Type of Study:

- The researcher used an experimental design, which means the study was conducted in a controlled way to observe the effects of plyometric training.
- This method is used when the goal is to compare the results of two or more groups to see what effect a treatment or intervention has.

2. Participants:

- 80 sub-junior judokas were selected randomly.
- They were divided into two equal groups:
 - Experimental Group (40 judokas) – received the plyometric training.
 - Control Group (40 judokas) – did not receive any special training.

3. Duration of the Training:

- The plyometric training program was conducted over 12 weeks.
- Training sessions were held 3 days a week, 1 hour each day.

4. Exercises in the Training Program:

The experimental group performed various plyometric exercises, such as:

- Jumping Jacks
 - Burpees
 - Box Jumps
 - Plyo Push-ups
 - Skipping
 - Tuck Jumps
- These exercises help develop explosive power, speed, and coordination.

5. Phases of the Study:

- **Pre-test Phase:** Skill levels of all participants were measured before training started.
- **Training Phase:** Only the experimental group followed the plyometric training plan.
- **Post-test Phase:** Skill levels were again tested in both groups after 12 weeks.

6. Variables Tested:

- The study focused on three judo techniques:

- Ippon Seoi Nage
- Tomoe Nage
- O Soto Gari

These were the dependent variables—the outcomes that were measured.

- The independent variable was the plyometric training program itself.

7. Tools for Measurement:

- Standard Judo Fitness Tests were used to measure the performance of each technique.
- These tests recorded how well each participant performed the selected judo throws.

8. Data Analysis Method:

- The researcher used ANCOVA (Analysis of Covariance) for statistical analysis.
- This method helps compare the results between the two groups while accounting for initial skill levels.
- The analysis was done using SPSS software, and significance was considered at $p < 0.05$.

Study Procedure

Phase I: Pre-Test

Pre-tests were conducted using Judo Fitness Tests to measure each participant's baseline skills. Subjects were oriented regarding test protocols and ensured to be medically fit.

Measurement Tools:

- Throwing Performance for Ippon Seoi Nage
- Throwing Performance for Tomoe Nage
- Throwing Performance for O Soto Gari

Phase II: Training Phase

The experimental group followed a 12-week plyometric program, training three days per week for one hour per session.

Warm-up (10 mins):

Included general and specific warm-up routines to prevent injuries.

Main Plyometric Session (40 mins):

Exercises were performed in a circuit with gradual increments in duration and repetitions every 4 weeks.

Cool-down (10 mins):

Included light jogging and stretching exercises to promote recovery.

Training Progression Schedule:

| Week | Reps | Time | Rest |
|---------|------|------|------|
| 1 to 4 | 2 | 30s | 30s |
| 5 to 8 | 2 | 45s | 30s |
| 9 to 12 | 3 | 45s | 30s |

Phase III: Post-Test

Post-tests identical to pre-tests were conducted to evaluate improvement in skill variables.

Statistical Analysis

Data were analyzed using ANCOVA via SPSS software. Significance was tested at $p < 0.05$.

Results and Interpretation

1. **Ippon Seoi Nage** ANCOVA indicated significant improvement in the experimental group (Mean = 18.388) vs. control (Mean = 15.912). This confirms plyometric training positively influenced performance.

2. **Tomoe Nage**

The experimental group (Mean = 12.305) outperformed the control group (Mean = 11.220). Results confirmed significant enhancement due to training.

3. **O Soto Gari**

Post-test results showed significant improvement in the experimental group (Mean = 15.056) compared to control (Mean = 13.369).

Discussion

The findings reinforce existing literature on the benefits of plyometric training in developing explosive strength, coordination, and skill execution. In all three techniques measured, the experimental group demonstrated substantial gains. The controlled nature of the study and careful subject monitoring add reliability to these outcomes. Plyometric training likely contributed to improved neuromuscular efficiency, enhanced motor unit recruitment, and better muscle-tendon elasticity. As the subjects adapted progressively, performance outcomes improved significantly over the 12-week period. Notably, the control group exhibited minimal changes, emphasizing the effectiveness of targeted intervention versus regular practice alone.

Conclusions

This research proves that when young judo players (called **sub-junior judokas**, usually aged 11–14) follow a **well-organized plyometric training program**, their **judo skills improve significantly**. The study focused on three specific judo throwing techniques:

- **Ippon Seoi Nage** (one-arm shoulder throw)
- **Tomoe Nage** (stomach throw)
- **O Soto Gari** (major outer reaping throw)

After 12 weeks of plyometric training, the young athletes were able to perform these throws **more effectively and with better power, speed, and control** than before. This means that adding **plyometric exercises** (such as jump squats, box jumps, or push-up variations that build explosive strength) to regular training **can help young judokas develop their skills faster** and become better performers in the sport. In short, the study suggests that **plyometric training should be an important part of judo training programs** for young athletes to help them reach higher levels of performance.

Recommendations

- Coaches should include plyometric drills suitable for age and skill level.
- Future studies should explore long-term retention and physiological markers such as hormonal changes.
- Integrating biomechanical analysis could provide deeper insight into the mechanisms driving performance improvement.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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