TPM Vol. 32, No. S4, 2025
ISSN: 1972-6325
https://www.tpmap.org/

EFFECTS OF PLYOMETRIC DRILL ON DESIGNATED CORPOREAL ABILITY VARIABLES OF COLLEGE WOMEN BASKETBALL PLAYERS

C.VIJAYALAKSHMI
RESEARCH SCHOLAR (FULL-TIME), ALAGAPPA UNIVERSITY COLLEGE OF PHYSICAL EDUCATION, ALAGAPPA UNIVERSITY, KARAIKUDI.
EMAIL: vijayalakshmib.com95@gmail.com

DR.S. SAROJA
PROFESSOR, ALAGAPPA UNIVERSITY COLLEGE OF PHYSICAL EDUCATION, ALAGAPPA UNIVERSITY, KARAIKUDI.
EMAIL: dr.s.saroja@gmail.com

Abstract
The current study examined how a plyometric training regimen affected basketball players' physical strength and agility. The study's objectives were to create a thorough training regimen and assess how well it improved important aspects of physical fitness. Alagappa University College of Physical Education's thirty female basketball players took part in the study and were split into two groups: the experimental group and the matched control group. The training program spanned eight weeks and consisted of progressive exercises targeting strength, plyometrics, agility, and basketball-specific drills. The program progressively increased in intensity and complexity over time. Standardized testing procedures were employed to measure agility and muscular strength before and after training. The experimental cohort significantly outperformed the unaffected group in terms of muscular strength and agility, according to the data. In addition, the experimental group demonstrated a statistically significant increase in agility, indicating an enhanced change of direction ability.
Additionally, the experimental group's notable increase in muscle strength demonstrated how well the training regimen worked to build lower extremity power and muscle mass. Overall, this study provides valuable insights into the benefits of plyometric training and offers a comprehensive training program that can be tailored to enhance agility and muscular strength in basketball players. Coaches, trainers, and athletes can utilize these findings to design effective training programs to maximize performance and achieve specific goals related to agility and muscular strength in basketball and other sports.

Keywords: Plyometric Training, Physical fitness, Agility, and Muscular Strength

INTRODUCTION

Adams, K., O'Shea, J. P [1] Plyometric training is jump training that improves explosiveness to get a stride ahead of the competition, finish, or collect a rebound. Since most sports, including basketball, are explosive by nature, plyometric exercise enhances one's ability to jump higher, run faster, and change direction by increasing force development rate, reducing ground contact duration, and maximizing the stretch-shortening cycle. Hopping is a skill, and getting better at it will improve your leap and performance as a whole. Basketball players do a wide variety of jumps, and developing proper mechanics for each is essential to unlocking its full potential. Jumping is a basketball skill that, when improved, enhances overall performance, and achieving full triple extension—aligning the ankles, knees, and hips—is a primary goal during a jump, such as sprinting or reaching for the rim, where the legs are fully extended upon takeoff. Moreover, various types of jumps in basketball exist, such as two-foot or one-foot takeoffs, jumps for height or distance, or executing a Euro-Step, and acquiring proper mechanics for each jump is crucial to unlocking one's unlimited potential [2]. Therefore, depending on the specific program's objectives, skill development becomes essential for maximizing the benefits of each exercise and enhancing jump performance.

The study examined players' game-related statistics over an extended duration and revealed that experience could significantly enhance the effectiveness of players' game-related statistics. Basketball players exhibit inferior balance compared to athletes in other sports, rendering them more susceptible to injuries, as evidenced by their increased knee extension, knee valgus, quadriceps activation, and reduced hamstrings activation during side-step pivoting. College students who exercise regularly can improve and maintain their emotional and mental wellness as well as lessen daily stress [3]. Plyometric exercise is integral to late-phase rehabilitation following a musculoskeletal athletic injury. Cherni, Y., It assists in the progress of power, an

underpinning from which the participant can refine the assistances of their sport. The study determined that the plyometric training programme helps improve the basketball players' skill performance and fitness variables of college students.

In many nations, basketball is still a highly popular sport with high participation rates. For example, among team sports in the US, basketball participation is the most popular among all age groups and genders, ranking first and second, respectively. As a result, basketball tournaments are held at different skill levels, and players can follow developmental pathways to advance in the sport. A developmental route to the prestigious Women's National Basketball Association (WNBA) in the US is provided by Division I collegiate play in women's basketball. In Australia, a comparable hierarchy is also visible, with collegiate athletes entering the WNBA through the top Women's National Basketball League (WNBL) and athletes exiting the WNBA through the WNBL.

RELATED WORKS

The gender-specific intricacy of training is increasing along with the growth of basketball programs for female athletes, creating a need for data that will guide the training effort. Athlete profiles, for instance, are quite interesting and helpful to coaches and fitness professionals since they help with hiring, effective training plans, and injury prevention and rehabilitation [4]. The most easily accessible profile data are physical characteristics and body composition data. There are few performance metrics including lower-body anaerobic power profiles and vertical leap. Lastly, team profiles have been the main focus where data is available. Positional profiles of female basketball players have only lately come to light. This study set out to characterize Division 1-A female football players' physical and performance traits (by position).

U.S. soccer player Brandi Chastain showed off her powerful, muscular body by tearing off her shirt in an unplanned celebration after she scored the game-winning goal in the 1999 Women's World Cup. Numerous magazines and newspapers carried her picture and made remarks about her risqué behavior as well as her toned body. Thus, the strong image of a top female athlete was presented to the globe [5]. Chastain's representation of the new standard for female beauty may have contributed significantly to her enormous amount of media attention.

The psychological assessment seeks to gather data through a variety of methods to help establish pertinent causal relationships, aid in understanding reality, direct the best course of action to preserve or alter it, and aid in evaluating athletes' progress following a sport, organizational or psychological intervention [6]. Furthermore, it aims to support a more thorough and impartial approach to operations, predicated on the formulation of hypotheses, the application of suitable protocols to collect data, the acquisition and analysis of data, and frequently the active involvement of athletes. A crucial component of the assessment procedure is functional analysis. The psychological traits associated with athletic performance serve as the main axis of investigation when it comes to examining athletes' psychological experiences.

Another type of exercise that incorporates both upper and lower body movements is the jump rope. The goal of jump rope training is to maintain consistent vertical flight and landing phases until the finish of the workout by having the arms spin the rope while the legs repeatedly bounce. The muscles in the upper and lower body must work in unison to restore balance and propulsive force during consecutive jumps. Jump Rope can burn additional energy and is portable and inexpensive 7]. By strengthening the upper and lower limbs, jumping with a rope can help avoid knee injuries that may occur during the rush.

METHODS AND MATERIALS

Subjects

The participants were chosen from the College of Physical Education at Alagappa College [8], intercollegiate women's basketball players. Their age ranged between 18-22 years. A total of 30 subjects were selected and separated into two groups—the experimental group and the control group—each with fifteen participants. In order to be eligible to participate in the training course, the subjects were told to read and sign the consent form. Ethics and moral principles applied to every aspect of human endeavor in the study. They are applicable for dealing with our surroundings, livestock, and one.

Training Procedure

Week 1:

- Focus on building a solid foundation. Start with a thorough warm-up consisting of dynamic stretches and light cardio.
- Perform strength training exercises targeting major muscle groups, such as squats, lunges, deadlifts, bench presses, and shoulder presses. Aim for 2-3 groups of 8-12 repetitions with appropriate weights [9].
- Incorporate plyometric exercises like box jumps, squat jumps, and medicine ball throws to enhance power and explosiveness. Complete 2-3 sets of 8-10 reps.

- Include agility drills such as ladder drills, cone drills, and shuttle runs to improve change of direction ability. Perform 3-4 sets of 6-8 repetitions.
- Conclude each session with static stretching for improved flexibility and cool-down exercises.

Weeks 2-4:
- Continue with the same strength training exercises, progressively increasing the weights and intensity [10].
- Introduce variations and progressions in plyometric exercises, focusing on increasing height, distance, or speed.
- Enhance agility drills by incorporating more complex patterns, adding obstacles, or increasing speed and intensity.
- Implement specific basketball drills, such as dribbling, shooting, and defensive drills, to improve basketball skills and game-related performance.
- Maintain consistency in the warm-up, cool-down, and stretching routines.

Weeks 5-6:
- Shift the focus towards higher intensity and incorporate more sport-specific exercises.
- Increase the weights and intensity in strength training, aiming for 3-4 sets of 6-8 repetitions with challenging weights.
- Introduce advanced plyometric exercises like depth jumps, single-leg hops, and lateral bounds to enhance power and explosiveness further.
- Emphasize basketball-specific agility drills, such as defensive slides, closeouts, and cutting movements.
- Incorporate game simulations and small-sided scrimmages to improve decision-making, teamwork [11], and on-court performance.

Weeks 7-8:
- Maintain the intensity and challenge levels from the previous weeks.
- Continue with progressive overload in strength training, pushing towards the maximum effort.
- Perform advanced plyometric exercises with higher intensity and complexity.
- Focus on refining basketball skills through specific drills and game-like situations.
- Incorporate conditioning workouts to improve endurance and simulate game demands.
- Evaluate progress, make necessary adjustments, and conclude the program with a recovery week.

Note: It is recommended to consult with a qualified coach or trainer to customize the training program based on individual needs, abilities, and any specific goals or limitations.

Testing Procedure

Standardized Testing Procedure and Score for Agility:

1. Test: 20-Yard Shuttle Run (also known as the Pro Agility Test)
- Set up cones 10 yards apart.
- Start in a three-point stance behind the first cone.
- Upon the signal, sprint to the second cone; touch the line with one hand, change direction, and sprint back to the starting cone.
- Complete the test as quickly as possible.
- Record the time taken to thorough the test in seconds.

Scoring:
- The score is based on the time to complete the shuttle run.
- Faster times indicate better agility.
- Normative data can be used to compare the individual's performance to others in the same age and gender group.

Standardized Testing Procedure and Score for Muscular Strength:

1. Test: One-Repetition Maximum (1RM) test
- Choose an exercise that targets the specific muscle group of interest (e.g., bench press for upper body strength).
- Warm up adequately with light weights and gradually increase the load.
- Start with a manageable weight and perform 8-10 repetitions.
- Rest for 1-2 minutes, then increase the weight and perform another set of 3-5 repetitions.
- Continue increasing the weight until the individual can only perform one complete repetition with proper form.
- The heaviest weight successfully lifted through one complete repetition is the 1RM.
- Ensure proper spotting and safety measures during the test.

Scoring:
- The score is the maximum weight lifted for one complete repetition (1RM).
- Higher scores indicate greater muscular strength.
- Normative data can be used to compare the individual's performance to others in the same age and gender group.

It is important to note that standardized testing procedures and scoring systems depend on the specific context and testing protocols used. Additionally, the help of a qualified trainer administers the tests and ensures proper technique, safety, and supervision.

STATISTICAL TECHNIQUE

The paired sample Results on or after the research and comparison team after-training on the targeted variables analyzed was found using the t-test [12]. At 0.05, the significance level of confidence was set. As indicated in Tables 1 and 2, the results of paired sample t-tests were utilized to ascertain the participants' levels of muscular strength and agility.

RESULTS

Table 1.
Significance of mean gains/losses between pre and post-test of experimental and control groups on agility

Groups	Pre-Test Mean	Post-Test Mean	Mean. Difference	SEM	't'-ratio
Control Group	7.56	7.67	.003	.126	1.67
Experimental Group	7.82	8.45	.072	.097	2.42*

The table presents the mean gains/losses in agility between the pre-test and post-test for the experimental and control groups. For the control group, the mean agility score improved from 7.56 in the pre-test to 7.67 in the post-test. The mean difference in agility scores was .003, with a standard error of .126 [13]. The calculated 't'-ratio was 1.67.

In the experimental group, the mean agility score increased from 7.82 in the pre-test to 8.45 in the post-test. The mean difference in agility scores was .072, with a standard error of .097. The calculated 't'-ratio was 2.42*, indicating a statistically significant improvement in agility. These findings suggest that both the control and experimental groups demonstrated improved agility, with the experimental group showing a tremendous mean difference and a statistically significant difference from the control group.

Note: The asterisk (*) denotes statistical significance at a certain level of significance (e.g., $p < 0.05$).

Table 2.
Significance of the experiment versus control groups' mean gains and losses before and after tests on Muscular Strength

Groups	Pre-Test Mean	Post-Test Mean	Mean Difference	SEM	't'-ratio
Control Group	17.47	17.70	.27	.48	1.17
Experimental Group	17.97	18.27	3.83	.52	16.37*

The experimental and control groups' mean increases or decreases in muscular endurance between the pre-test and post-test are shown in the table. The mean strength-based score in the background group increased somewhat from 17.47 in the pre-test to 17.70 in the post-test. The mean difference in muscular strength was .27, with a standard error of .48. The calculated'-ratio was 1.17 [14].

On the other hand, the control group's muscle strength increased more noticeably. Between the pre-test and post-test, the mean physical strength score rose from 17.97 to 18.27. The mean difference in muscular strength was 3.83, with a standard error of .52. The calculated't'-ratio was 16.37*, indicating a highly significant improvement in muscular strength.

These findings indicate that both the switch and experimental groups experienced gains in muscular strength, with the experimental group showing a substantially higher mean difference and a statistically significant difference than the control group.

Note: The asterisk (*) denotes statistical significance at a certain level of significance (e.g., $p < 0.05$).

The following figure represents the experiment (plyometric training group) as well as control groups' mean scores before and after the test on agility and muscular strength graphically I and II**.**

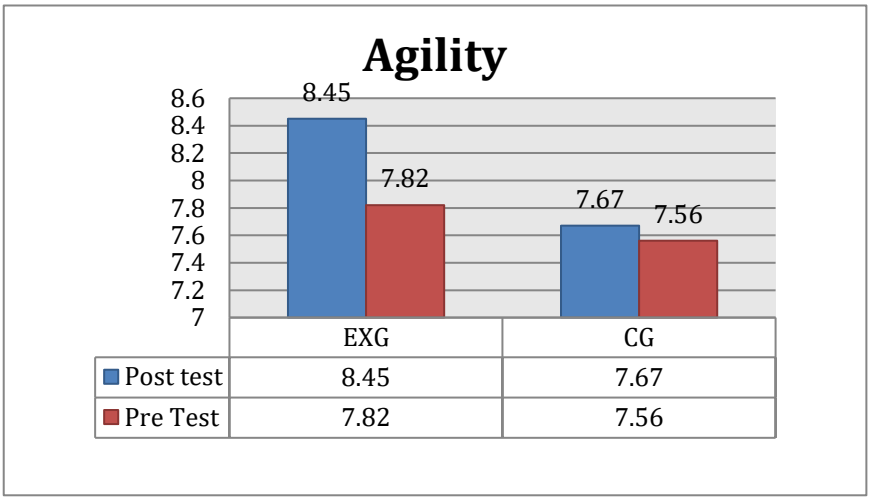

Figure 1. Agility

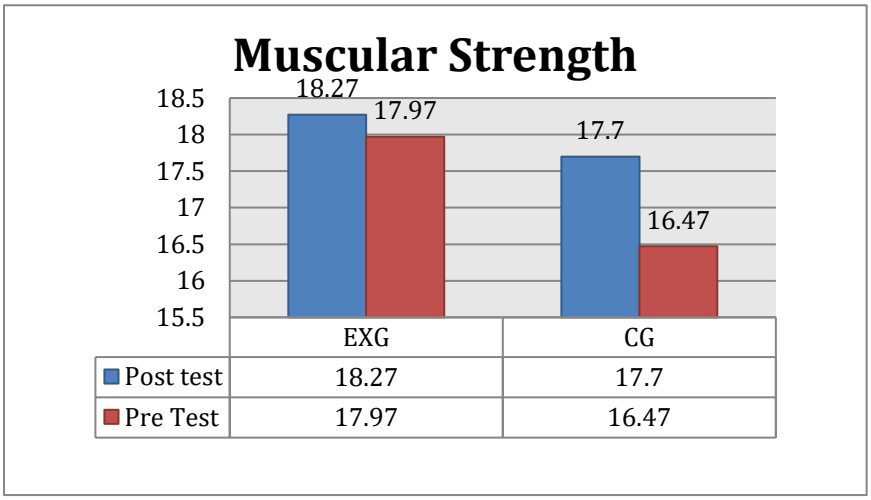

Figure 2. Muscular Strength

DISCUSSION

The Present study shows that the experimental group's result of agility and muscular strength of physical fitness variables was significantly improved through the plyometric training programme.

Although plyometric exercise has been shown to improve running efficiency and distance-running efficiency in earlier studies, it is still unknown exactly how this happens. Thus, the present research investigated the potential relationship between modifications to lower leg musculotendinous rigidity and variations in running ability brought about by physical activity [15]. Additionally, this study sought to examine how well three training regimens—squat, plyometric, and squat-plyometric—advanced the building of hip and hip power as shown by lateral leap performances. During a seven-week training session, 48 individuals were split up into four groups. All three therapy groups showed a significant rise in hip and hip power, according to statistical testing. However, the squat-plyometric collection demonstrated the most significant improvement, followed by the plyometric and squat groups. These findings suggest that combining squat and plyometric exercises is necessary to optimize hips and leg power and increase vertical leap ability (Adams et al., 1992).

Ramírez-Campillo et al., 2013 Plyometric exercises increase explosive power by the lower extremity muscles and are highly effective significantly less time, machinery, and physical space needed to finish those training programs.

CONCLUSION

To sum up, the results of this study highlight how crucial plyometric exercise is for enhancing basketball players' physical agility and strength. Plyometric exercises decrease ground contact time and optimize the stretch-shortening cycle, leading to improvements in sprint time and change of direction ability. Furthermore, developing proper mechanics for improving agility and muscular strength in basketball is crucial to unlocking an athlete's full potential and maximizing presentation.

The study also highlighted the significance of experience in enhancing players' game-related statistics and the importance of balance training to lower basketball players' risk of injury. Additionally, incorporating plyometric exercises in the late-phase rehabilitation following musculoskeletal athletic injuries assisted in power development and refined sport-specific movements.

The research's suggested training regimen, which included a mix of strength training, plyometric exercises, agility drills, and specific basketball drills, proved effective in improving hip and thigh power production, agility, as well as the experimental group's muscular strength. The squat-plyometric training program demonstrated the most significant improvements, followed by the plyometric and squat training programs.

Overall, the results suggest that plyometric training, when combined with other training components, is essential for maximizing athletic performance in basketball and other sports that require performance. Coaches, trainers, and athletes can utilize these findings to design comprehensive training programs to improve overall performance and achieve specific goals related to agility and muscular strength.

REFERENCE`

[1] Adams, K., O'Shea, J. P., O'Shea, K. L., & Climstein, M. (1992). The Effect of Six Weeks of Squat, Plyometric and Squat-Plyometric Training on Power Production. *The Journal of Strength & Conditioning Research*, *6*(1), 36.

[2] Cherni, Y., Jlid, M. C., Mehrez, H., Shephard, R. J., Paillard, T., Chelly, M. S., & Hermassi, S. (2019). Eight Weeks of Plyometric Training Improves Ability to Change Direction and Dynamic Postural Control in Female Basketball Players. *Frontiers in Physiology*, *10*. https://www.frontiersin.org/articles/10.3389/fphys.2019.00726

[3] Davies, G., Riemann, B. L., & Manske, R. (2015). Current Concepts Of Plyometric Exercise. *International Journal of Sports Physical Therapy*, *10*(6), 760–786.

[4] Lorenzo, J., Lorenzo, A., Conte, D., & Giménez, M. (2019). Long-Term Analysis of Elite Basketball Players' Game-Related Statistics Throughout Their Careers. *Frontiers in Psychology*, *10*. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00421

[5] Manosakthi, K., & Divya, D. K. (2023). *Insulated And United Influence Of Hydraulic Resistance And Ladder Agility Training On Selected Lipid Profile Among Working Women*. Eur. Chem. Bull. 2023, 12(Special Issue 4), 4723-4731.

[6] Manosakthi, K., & Kalimuthu, Divya. K. (2022). *Effect Of Hydraulic Training On Selected Physical Fitness Variables Among College Women Students*. Mukt Shabd Journal, *Volume XI, FEBRUARY/2022*, 643–649.

[7] Manosakthi, K., & Kalimuthu, Divya. K. (2023). *Physiological Parameters Response To Hydraulic Resistance Training Of College Students: A Study Of Women Health Vol 14*, 33–37. https://doi.org/10.47750/pnr.2023.14.01.007

[8] Ramírez-Campillo, R., Andrade, D. C., & Izquierdo, M. (2013). Effects of Plyometric Training Volume and Training Surface on Explosive Strength. *The Journal of Strength & Conditioning Research*, *27*(10), 2714. https://doi.org/10.1519/JSC.0b013e318280c9e9

[9] Spurrs, R. W., Murphy, A. J., & Watsford, M. L. (2003). The effect of plyometric training on distance running performance. *European Journal of Applied Physiology*, *89*(1), 1–7. https://doi.org/10.1007/s00421-002-0741-y.

[10] LAMONTE, M. J., MCKINNEX, J. T., QUINN, S. M., BAINBRIDGE, C. N., & EISENMAN, P. A. (1999). Comparison of physical and physiological variables for female college basketball players. The Journal of Strength & Conditioning Research, 13(3), 264-270.

[11] Spiteri, T., Binetti, M., Scanlan, A. T., Dalbo, V. J., Dolci, F., & Specos, C. (2019). Physical determinants of division 1 collegiate basketball, women's national basketball league, and women's National Basketball Association athletes: With reference to lower-body sidedness. The Journal of Strength & Conditioning Research, 33(1), 159-166.

[12] Murphy, S. (2018). " Strong in Body, Clean in Mind, Lofty in Ideals": Athletic Ability in Early Twentieth-Century US Women's Basketball (Doctoral dissertation, The University of Arizona).

[13] Lopez-Sierra, P., Reina, M., López-Araya, S., & Ibáñez, S. J. (2025). Impact of training on body composition in elite basketball players. E-balonmano com Journal Sports Science, 21(2), 299-312.

[14] Rovčanin, K. M., & Laskovic, M. (2023). The relationship between morphological characteristics and functional abilities in physically active students. Journal of Sport and Health Research, 15(1).

[15] Latorre Román, P. Á., Villar Macias, F. J., & García Pinillos, F. (2018). Effects of a contrast training programme on jumping, sprinting and agility performance of prepubertal basketball players. Journal of sports sciences, 36(7), 802-808.