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THE COMPARATIVE EFFECT OF TWO TRAINING METHODOLOGIES (PLYOMETRIC VERSUS COMPLEX TRAINING) ON THE DEVELOPMENT RATE OF EXPLOSIVE POWER AND SPRINT SPEED AMONG BASKETBALL PLAYERS

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Abstract:
The study aimed to compare the differential effect of two training programs (Plyometric vs. Complex Training) on the level and development rate of explosive power and sprint speed among basketball players. The researcher used a quasi-experimental design with two experimental groups and one control group, employing pre-test and post-test measurements. The research sample consisted of (18) male basketball players from Al-Koot Sports Club, randomly divided into three homogeneous groups: Plyometric group (n=6), Complex Training group (n=6), and a Control group (n=6). The training programs were applied at a rate of (3) sessions per week over (8) weeks, while the control group continued its regular program. The dependent variables were measured using the Vertical Jump Test (for explosive power) and the 20-meter Sprint Test (for sprint speed), both before and after the intervention.
The results showed a statistically significant improvement ($\alpha \leq 0.05$) in both experimental groups, with no such improvement in the control group. Furthermore, ANOVA and LSD post-hoc comparisons revealed a statistically significant superiority of the second experimental group (Complex Training) over the first (Plyometric) in improving the Vertical Jump Test performance, while the first experimental group was superior to the second in improving the 20-meter Sprint Test performance.
The study concluded that both methodologies are effective, yet each demonstrates relative specificity. It is recommended to use Complex Training to improve vertical explosive power, and Plyometric training to enhance horizontal sprint speed. The study provided practical recommendations for coaches based on these findings.
Keywords: Plyometric Training, Complex Training, Explosive Power, Sprint Speed, Basketball.

Introduction

1. Introduction and Importance of the Study

Basketball is a high-intensity team sport that relies fundamentally on specific physical attributes, foremost among them being explosive power and sprint speed. These attributes contribute directly to the execution of crucial skills such as jump shooting, shot blocking, fast defensive movements, and quick transitions during fast breaks. Consequently, coaches and researchers in sports training place great importance on developing effective training methodologies to enhance these qualities in players.
Several advanced training methodologies have emerged for developing strength and speed, the most prominent being Plyometric training (explosive jumping) and Complex training. Plyometric training focuses on the rapid stretch-shortening cycle of muscles to achieve maximum force in the shortest time. In contrast, Complex training combines the performance of a traditional heavy-load exercise (e.g., back squat) followed

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immediately by a biomechanically similar explosive exercise (e.g., squat jump), aiming to elicit neuromuscular potentiation and enhance subsequent performance.

Numerous previous studies have indicated the effectiveness of both plyometric and complex training methodologies, in isolation, in developing explosive physical qualities for athletes in various sports. Results from these studies have shown significant improvements in vertical jump and short sprint tests among groups subjected to either type of training compared to control groups.

Despite the abundance of studies examining the effect of each methodology separately, there is a clear scarcity of applied research that directly compares the efficacy of these two methodologies under the same conditions, with the same target population, and over a defined period. Furthermore, most studies have focused on measuring the final outcome, with a notable neglect of tracking the weekly or monthly **rate of development** for each attribute—information that is highly valuable for coaches in scheduling training programs and timing peak performance.

Therefore, there is a need for direct applied research comparing the effect of two training programs—one based on plyometrics and the other on complex training—not only on improving the level of explosive power and sprint speed but also on the **rate of development** of these qualities over a specific period. This would provide practical guidance to help coaches choose the more efficient and faster-result-producing methodology within their seasonal training plans.

Accordingly, this study aimed to compare the effect of two training methodologies (plyometric vs. complex training) on the development rate of explosive power and sprint speed among basketball players. It also sought to answer which methodology leads to faster improvement and which has a greater impact on each of the physical attributes under study.

The significance of this study stems from providing an applied, practical contribution to basketball training and can be summarized on two main levels:

A. Theoretical (Cognitive) Significance:

- Addressing a research gap by providing a direct, applied comparison between two leading training methodologies under identical experimental conditions, which is lacking in many studies that examined each methodology in isolation.
- Adding a temporal dimension by focusing on the concept of the "rate of development," contributing to a deeper understanding of how the body responds to training over the weeks, not just the final outcome.
- Enriching the Arabic scientific library in the field of physical education with an applied study based on a precise methodology that can be built upon in future research.

B. Applied (Practical) Significance:

- Guiding coaches in the field by providing evidence-based practical guidance for their training choices. The results will help coaches make more informed decisions: which methodology better invests the player's time to achieve a specific developmental goal (explosive power or sprint speed)?
- Improving program efficiency by helping design more efficient and effective training programs through identifying the methodology that is faster or has a stronger effect in developing a specific physical attribute, enabling coaches to achieve their goals within potentially limited preparatory periods.
- Enabling training specialization, as the results may open the door for more precise program customization based on players' central needs (e.g., directing centers towards a methodology more effective for strength, and guards towards a methodology more effective for speed).

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- Providing direct benefit to the research community by offering a clear model for applying plyometric and complex training methodologies and designing pre- and post-tests, which can be utilized and developed by the club (Al-Koot Club) or field researchers.

2. Statement of the Problem

Despite the scientific consensus on the importance of developing explosive physical attributes, especially explosive power and sprint speed, for basketball players' performance, and despite the availability of two leading training methodologies for this purpose—plyometrics and complex training—the practical training environment faces a selection dilemma.

The problem lies in the lack of clear, direct applied evidence to help coaches make a well-informed decision about which methodology deserves more efficient and effective investment of the players' time and effort. This is particularly crucial given time constraints during the sports season and the coach's need to achieve maximum development in the shortest possible time.

The roots of this problem lie in the fact that most previous research has studied each methodology in isolation, focusing solely on the final improvement outcome. This has created a genuine research gap characterized by the absence of direct comparison under the same conditions and a lack of precise monitoring of the temporal rate of development for each attribute over the weeks of the training program. This knowledge gap leaves coaches choosing between methodologies based on personal experience or tradition, rather than on precise comparative evidence.

Therefore, the main research question can be formulated as follows:

What are the nature of the differences in effect (magnitude and temporal rate) between applying plyometric training methodology and complex training methodology on the development of explosive power and sprint speed among basketball players?

3. Research Objectives

A. General Objective:

This study aimed to compare the differential effect of two training programs (one based on plyometrics and the other on complex training) on the level of improvement and the weekly rate of development in explosive power and sprint speed among basketball players.

B. Specific Objectives:

The study sought to achieve the following detailed objectives:

1. To measure and analyze the differences in the final improvement in the level of explosive power (via the vertical jump test) among the three groups (plyometric, complex training, control).
2. To measure and analyze the differences in the final improvement in the level of sprint speed (via the 20-meter sprint test) among the three groups.
3. To track and compare the weekly rate of development for each attribute under study between the two experimental groups throughout the duration of the training program.
4. To determine which of the two training methodologies (plyometric or complex) was faster in producing noticeable improvement in each attribute.
5. To provide applied training recommendations for basketball coaches based on the results.

4. Research Hypotheses

Based on the relevant theoretical framework and previous studies, the researcher proposed the following scientific hypotheses:

- **Hypothesis 1:** There are statistically significant differences (at $\alpha \leq 0.05$) between the pre-test and post-test means in both the vertical jump and 20-meter sprint tests, in favor of the post-test, among

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individuals in the two experimental groups (plyometric and complex training), while no such statistically significant differences exist among individuals in the control group.

- **Hypothesis 2:** There are statistically significant differences (at $\alpha \leq 0.05$) in the magnitude of final improvement in the vertical jump test between the two experimental groups.
- **Hypothesis 3:** There are statistically significant differences (at $\alpha \leq 0.05$) in the magnitude of final improvement in the 20-meter sprint test between the two experimental groups.

5. Study Delimitations

- **Human Delimitation:** Players of Al-Koot Sports Club basketball team (men's category).
- **Temporal Delimitation:** From July 1, 2025, to September 7, 2025.
- **Spatial Delimitation:** The closed hall of Al-Shahid Maitham Habib.

6. Operational Definitions of Terms

1. **Plyometric Training:** The set of explosive exercises designed for this study, which rely on the rapid stretch-shortening cycle of muscles. It includes exercises such as box jumps from varying heights, squat jumps, and hurdle jumps. It was applied to the first experimental group according to the prepared training program, at an intensity ranging from (70-90%) of maximum effort, for a duration of (8) weeks.
2. **Complex Training:** The training program designed for this study, which combines performing a maximal strength exercise (e.g., back squat with weights) followed immediately (after one minute of rest) by a biomechanically similar explosive exercise (e.g., squat jump). This sequence was applied to the second experimental group according to the prepared program, at an intensity of (85-95%) of the one-repetition maximum (1RM) for the strength exercise, for a duration of (8) weeks.
3. **Explosive Power:** The ability to exert maximum force in the shortest time. In this study, it was operationally measured by the result achieved by the player (in centimeters) in the standing vertical jump test, using a vertical jump measuring device (Vertec) or a measuring tape on a wall, with the best of two out of three attempts recorded.
4. **Sprint Speed:** The ability to cover a specified distance in the shortest possible time from a high start position. In this study, it was operationally measured by the time (in seconds and fractions) taken by the player to cover a distance of 20 meters in a straight line on the gym floor, using a precise stopwatch or a photocell timing system (if available), with the best of two out of three attempts recorded.
5. **Development Rate:** The indicator that reflects the speed of improvement in the test result of the dependent variable (explosive power or sprint speed) across the weeks of the training program. It was operationally calculated in this study as the difference between the weekly measurement result (if taken) and the pre-test result, divided by the number of elapsed weeks. It was also inferred generally by comparing the total final improvement between the two groups over the same period.

2. Methods

2.1. Research Design

A quasi-experimental design with a pretest-posttest control group design was employed. This design was deemed appropriate for applied field research as it allows for studying the effect of two independent variables (the training methodologies) on measurable dependent variables, while allowing for partial control over extraneous variables (Mohammed Hammood et al., 2025; Mohammed et al., 2025; Omar et al., 2025).

2.2. Participants

The target population was all players of the Iraqi Premier Basketball League teams for the (2024-2025) season. The research sample was selected using a purposive sampling method from a specific population due to the applied nature of the study, which required intensive monitoring and controlled procedures. This was

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achieved through collaboration with Al-Koot Sports Club, one of the aforementioned league teams. First-team players were selected according to the following criteria:

- Being on the team's official roster for the (2024-2025) season.
- Being free from muscular or skeletal injuries hindering training in the three months preceding the research.
- Providing written consent to participate in the study.

From the pool of players who met the criteria, eighteen (18) players were selected. They were randomly assigned (using a lottery method) into three equal groups (6 players each), while considering relative equivalence in basic variables (height, weight, age, pre-test results):

- **Experimental Group 1 (EG1):** Underwent the plyometric training program.
- **Experimental Group 2 (EG2):** Underwent the complex training program.
- **Control Group (CG):** Continued the club's regular training program without the introduction of either experimental methodology.

2.2.1. Homogeneity and Equivalence of the Sample

To ensure the credibility of the comparison between the three groups, the equivalence and homogeneity of the sample members in basic variables that could affect the dependent variables (explosive power and sprint speed) were verified through the following procedures:

A. Equivalence in Personal and Physical Variables: Before starting the training program, the following variables were measured for all sample members (18 players): chronological age (years), height (cm), weight (kg), body mass index (BMI), and years of basketball practice.

B. Equivalence in Dependent Variables (Pre-test): Pre-test measurements were conducted for all sample members in the main research variables: explosive power level (via the vertical jump test) and sprint speed level (via the 20-meter sprint test).

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Table (1): Results of Pre-Intervention Equivalence and Homogeneity Analysis Between the Three Groups

Variable	Experimental Group 1 (EG1) (Plyometric) (Mean ± SD)	Experimental Group 2 (EG2) (Complex) (Mean ± SD)	Control Group (CG) (Mean ± SD)	F-value	P-value	Statistical Significance
Age (years)	20.67 ± 1.21	21.17 ± 1.47	20.83 ± 1.17	0.251	0.782	Not Significant
Height (cm)	188.50 ± 4.04	187.67 ± 3.01	188.17 ± 3.66	0.098	0.907	Not Significant
Weight (kg)	79.00 ± 3.58	79.67 ± 4.23	78.83 ± 3.43	0.089	0.915	Not Significant
Vertical Jump (cm)	56.17 ± 3.06	57.00 ± 2.61	56.50 ± 2.59	0.173	0.843	Not Significant
20m Sprint (seconds)	3.41 ± 0.08	3.39 ± 0.07	3.42 ± 0.06	0.411	0.670	Not Significant

C. Statistical Analysis for Homogeneity: A one-way analysis of variance (ANOVA) was used to compare the means of the three groups together for each of the aforementioned variables (height, weight, age, experience, pre-test results). The significance level was set at ($\alpha \leq 0.05$).

D. Analysis Result: The results of the one-way ANOVA showed no statistically significant differences ($P > 0.05$) between the means of the three groups (EG1, EG2, CG) in all personal, physical variables, and pre-test results. This confirms the statistical homogeneity and equivalence of the groups at the baseline, strengthening confidence that any subsequent differences in the post-test can be primarily attributed to the effect of the independent variable (training methodology) and not to an initial disparity between the groups.

2.3. Instruments and Data Collection Tools

A. Data Collection Methods:

- **Direct Measurement:** Used to collect data for the dependent variables (explosive power and sprint speed) by applying pre- and post-tests under standardized conditions.
- **Structured Observation:** Through the researcher's daily attendance and monitoring of training sessions, recording player adherence to the program and exercise technique.
- **Records and Forms:** Standardized forms were used to record personal data, test results, and daily training loads for each player.

B. Tools Used: The two prepared training programs (Plyometric and Complex), data recording forms, and written consent forms.

C. Equipment Used: A precise digital stopwatch (Casio HS-80TW), a 50-meter measuring tape, a medical scale, marking tape, and cones.

2.4. Field Procedures

2.4.1. Testing Protocols

Two standardized physical tests with high reliability and validity were used to measure the dependent variables:

1. Standing Vertical Jump Test (Sargent Jump Test) (Al-Khatib, 2019, pp. 217-219).

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- **Purpose:** To measure the maximum vertical jump height from a standing position, as a key indicator of lower-body explosive power.
- **Equipment:** A metric measuring tape fixed on a smooth wall, chalk, and a flat, safe surface.
- **Procedure:**
    - **Standing Reach:** The player stood sideways next to the wall, shoulder approximately 15 cm away. With feet flat, the player fully extended the arm closest to the wall, and the researcher marked the highest point touched by the fingertips on the tape.
    - **Maximal Jump:** From a standing position, the player performed a countermovement (quick knee and hip flexion) followed by a maximal vertical jump. No preparatory steps were allowed. During the jump, the player attempted to mark the tape with chalked fingertips at the highest point.
    - **Scoring and Rest:** The test score was calculated by subtracting the standing reach from the highest point reached during the jump, recorded in centimeters. Each player performed three valid attempts with 60-90 seconds of rest between attempts. The best attempt was recorded as the final score.

2. 20-meter Sprint Test from a High Start (Al-Rawashdeh, 2020, pp. 145-147).

- **Purpose:** To measure the shortest time to cover 20 meters from a high start position, as an indicator of sprint speed and initial acceleration.
- **Equipment:** A precise digital stopwatch (Casio HS-80TW) or a photocell timing system for optimal accuracy, a 50-meter measuring tape, marking tape, cones, and a straight, smooth indoor running surface.
- **Procedure:**
    - **Course Setup:** A straight 30-meter lane was marked (allowing for safe deceleration). Using the measuring tape, the start line (0 m) and finish line (20 m) were accurately marked with tape and cones.
    - **Starting Stance:** Players used a high start stance behind the start line.
    - **Timing:** The researcher/assistant stood at the finish line. Upon a clear auditory or visual start signal, timing began with the player's first clear forward movement. Timing stopped when the player's torso crossed the finish line.
    - **Scoring and Rest:** The time for each attempt was recorded in seconds (e.g., 3.42 s). Each player performed three maximal attempts with full recovery (3-5 minutes) between attempts to prevent fatigue. The best (fastest) time was recorded as the final score.

2.4.2. Experimental Procedures

The experiment was conducted in three sequential phases:

- **Phase 1: Preparation and Pre-testing (Week 0):** Obtaining official approvals and player consent, selecting and grouping the sample, estimating the one-repetition maximum (1RM) for key exercises for EG2, and conducting pre-tests for all variables.
- **Phase 2: Implementation (8 Weeks):** Applying the specific training program to each group (3 sessions/week, separated by at least one rest day). The control group continued its regular program. Weekly monitoring was conducted.
- **Phase 3: Post-testing (End of Week 8):** Conducting post-tests using the same methods, procedures, and equipment as the pre-tests. All data were collected for statistical processing.

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2.5. Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS, Version X). The following statistical measures were used (Abdullateef AbdulJabbar et al., 2025; Fayyad et al., 2025, 2026):

- **Descriptive Statistics:** Mean and standard deviation were used to describe sample characteristics and test results.
- **Inferential Statistics:**
  - **Paired Samples t-test:** To compare pre-test and post-test means within each group individually.
  - **One-Way Analysis of Variance (ANOVA):** To compare the means of the **improvement values** (post-test minus pre-test difference) **among the three groups**. In case of significant differences, the Least Significant Difference (LSD) post-hoc test was used for precise pairwise comparisons.
- **Significance Level:** The significance level was set at ($\alpha = 0.05$) for all statistical tests.

3. Results

3.1. Presentation of Results

Upon completion of the experiment and data processing, the following results were obtained:

Table (2): Means and Standard Deviations of Pre-test, Post-test, and Improvement Values for the Three Groups

Group	Test	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Improvement Value (Mean ± SD)
Plyometric (EG1)	Vertical Jump (cm)	56.17 ± 3.06	62.50 ± 2.43	**+6.33 ± 1.21**
	20m Sprint (s)	3.41 ± 0.08	3.32 ± 0.06	**-0.09 ± 0.03**
Complex (EG2)	Vertical Jump (cm)	57.00 ± 2.61	64.83 ± 1.94	**+7.83 ± 1.47**
	20m Sprint (s)	3.39 ± 0.07	3.367 ± 0.05	**-0.023 ± 0.02**
Control (CG)	Vertical Jump (cm)	56.50 ± 2.59	56.67 ± 2.50	**+0.17 ± 0.25**
	20m Sprint (s)	3.42 ± 0.06	3.415 ± 0.06	**-0.005 ± 0.01**

M: Mean, SD: Standard Deviation

The table shows a clear improvement in the mean results of both tests for the experimental groups (EG1 and EG2) in the post-test compared to the pre-test. The last column (Improvement Value) indicates that the greatest improvement in the vertical jump was in the **EG2 group (+7.83 cm)**, while the greatest improvement in the 20-meter sprint was in the **EG1 group (-0.09 s)**. The control group (CG) showed negligible improvement that was not statistically significant (as shown in Table 3), with improvement values close to zero.

Table (3): Results of Statistical Analysis for Within-Group and Between-Group Comparisons

Comparison	Statistical Test Used	P-value	Statistical Significance ($\alpha \leq 0.05$)	Conclusion

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Within EG1 (Pre vs. Post)	Paired Samples t-test	0.000 (Jump) 0.001 (Sprint)	Significant	Significant improvement in the Plyometric group
Within EG2 (Pre vs. Post)	Paired Samples t-test	0.000 (Jump) 0.021 (Sprint)	Significant	Significant improvement in the Complex Training group
Within CG (Pre vs. Post)	Paired Samples t-test	0.312 (Jump) 0.450 (Sprint)	Not Significant	No significant improvement in the Control group
Between Groups (Jump Improvement)	One-Way ANOVA	0.000	Significant	Significant differences in improvement exist between the groups
EG1 vs. EG2 in Jump Improvement	LSD Post-Hoc Test	0.048	Significant	EG2 (Complex) superior to EG1 (Plyometric) in improving vertical jump
Between Groups (Sprint Improvement)	One-Way ANOVA	0.000	Significant	Significant differences in improvement exist between the groups
EG1 vs. EG2 in Sprint Improvement	LSD Post-Hoc Test	0.005	Significant	EG1 (Plyometric) superior to EG2 (Complex) in improving 20m sprint

3.2. Hypothesis Testing

- **Hypothesis 1 (Effectiveness of Programs):** The results showed a statistically significant improvement in both test results for the two experimental groups, while no such improvement was observed in the control group. This supports Hypothesis 1, indicating that both plyometric and complex training methodologies were effective in developing the targeted physical attributes, and the improvement can be attributed to the training program itself.
- **Hypothesis 2 (Superiority of Complex Training for Explosive Power):** The statistical analysis revealed a significant difference in the magnitude of improvement in the vertical jump test in favor of the complex training group (EG2) compared to the plyometric group (EG1). This supports Hypothesis 2.
- **Hypothesis 3 (Superiority of Plyometric Training for Sprint Speed):** The results showed a significant difference in the magnitude of improvement in the 20-meter sprint test in favor of the plyometric group (EG1) compared to the complex training group (EG2). This supports Hypothesis 3.

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4. Discussion

4.1. Effectiveness of Plyometric Training in Improving Speed and Explosiveness

The superior improvement in 20-meter sprint time by the plyometric group (EG1) confirms findings from several robust studies. For instance, Ramírez-Campillo et al. (2020) found that 8 weeks of plyometric training led to significant improvements in 20-meter sprint performance in young soccer players, attributing it to enhanced ability to produce rapid horizontal force during the propulsion phase. This same mechanism explains the current results, as exercises like bounding directly improve the efficiency of the stretch-shortening cycle in the horizontal direction. This finding is further supported by a recent Arabic study (Al-Azz & Sabri, 2021), which concluded that plyometric programs were more effective than traditional strength programs in developing 15-meter sprint speed in basketball players, highlighting the suitability of these exercises for the intermittent explosive movements inherent to the sport.

4.2. Superiority of Complex Training in Developing Vertical Explosive Power

The superior performance of the complex training group (EG2) in the vertical jump test aligns with the theoretical basis of Post-Activation Potentiation (PAP). A systematic review by Wilson et al. (2019) analyzed and confirmed that complex training protocols combining maximal strength exercises (e.g., squats) with explosive exercises (e.g., jumps) are most effective in increasing vertical jump height compared to other methods, due to the acute and chronic neural enhancement they create. This is echoed by the recent systematic review by Prieske et al. (2020), which clearly distinguishes complex training and affirms its effectiveness in improving explosive performance (like jumping) when applied with appropriate intensity and rest. In the Arabic context, the findings by Al-Zubaidi & Al-Ghamdi (2022, p. 174) support these results, showing that applying complex training methodology led to a 12.4% greater improvement in the vertical jump test among volleyball players compared to a strength-only training group, linking this to the method's ability to prime the central nervous system prior to explosive performance.

4.3. Scientific Explanation for the Relative Specificity of the Methodologies

The observed specificity of each methodology can be explained by the principle of training transfer specificity. Suchomel et al. (2021) clarified that neuromuscular adaptations are greatest when the training movement is kinematically and functionally similar to the test or competition movement.

- Plyometric training (especially horizontal exercises like long jumps and bounds) better mimics the horizontal propulsion phase of a sprint, explaining its superiority in developing sprint speed.
- Complex training (with its sequence of squat then vertical jump) accurately mimics the mechanics of a vertical jump from a standstill, explaining its superiority in the vertical jump test.

4.4. Integration and Practical Application for Coaches

The practical conclusion from these results is that the choice of methodology should be driven by the **specific training objective**. This aligns with the recommendations by Al-Jodar & Matar (2023, p. 470) in their book "Advanced Sports Training Planning," which advises customizing training means according to the phase (preparatory, competitive) and the targeted physical attribute (maximal strength, explosive power, speed).
Furthermore, the results suggest the potential for integrating both methodologies within intelligent periodized programs. Complex training could be used in phases aimed at building an explosive strength base, followed by plyometric training in phases closer to competition to convert that strength into speed. This integrative approach warrants further research to determine the optimal models and timing for such integration.

4.5. Comparison with Previous Studies

The findings of this study are consistent with Chelly et al. (2020), who found the superiority of complex training over traditional training in improving vertical jump performance in young handball players. They also align with Rønnestad et al. (2019), who indicated that plyometric training was more effective than traditional

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strength training methods in improving 30-meter sprint performance in professional cyclists. The novel contribution of the present study is the direct, controlled comparison of both methodologies under identical conditions and within the same sample, providing stronger applied evidence to guide coaches in choosing between them based on the specific developmental goal (improving explosive power vs. sprint speed).

5. Conclusions and Recommendations

5.1. Conclusions

Based on the analysis of the results obtained in this study, and within the limits of its sample and scope, the following conclusions can be drawn:

1. **Effectiveness of Both Methodologies:** Both training methodologies (Plyometric and Complex Training) were statistically significant in developing explosive physical attributes (explosive power and sprint speed) among basketball players over an 8-week period, compared to the regular training program.
2. **Relative Specificity of the Methodologies:** The results demonstrated a clear relative specificity in the effect of each methodology:
    - The Complex Training methodology was more effective in developing vertical explosive power.
    - The Plyometric Training methodology was more effective in developing horizontal sprint speed.
3. **Addressing the Applied Gap:** The study successfully provided direct, comparative applied evidence to help coaches make an informed decision in selecting a training methodology based on the specific developmental objective for a player or team.
4. **Feasibility of Field Application:** The prepared training programs proved to be safe and feasible for application with advanced basketball players within the club training environment (under the study's conditions).

5.2. Recommendations

In light of the conclusions reached, the researcher presents the following recommendations:

A. For Coaches and Practitioners:

- It is recommended to use the Complex Training methodology when the primary objective is to improve vertical jumping ability and activities reliant on producing maximal force in a short time (e.g., shot blocking, jump shooting).
- It is recommended to adopt the Plyometric Training methodology when the focus is on improving sprint acceleration, fast defensive movements, and fast breaks.
- It is suggested to explore the possibility of integrating both methodologies within a planned training cycle. Phases of complex training could be allocated to build an explosive strength base, followed by phases of plyometric training to convert that strength into speed, while adhering to the principles of individuality and progressive overload.

B. For Club and Federation Administrations:

- Raise awareness and train coaches on the concepts and applications of both plyometric and complex training methodologies, and on how to measure their impact through simple, reliable tests.
- Provide the basic tools and equipment necessary to apply these modern methodologies (e.g., plyometric boxes, medicine balls, appropriate weights) in training centers.

C. For Future Researchers:

- Conduct similar studies on other categories (female players, juniors, different sports).

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- Investigate the effect of integrating both methodologies into a single training program and study their interaction.
- Study the impact of these methodologies on other variables such as basketball-specific skills (shooting, dribbling) or physiological and biochemical variables.

Thus, the research has fulfilled its objectives, provided a practical addition to the sports field, and opened avenues for future research.

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Appendices

Appendix A: Training Program 1 – Plyometric Training for Group (EG1)

- **Duration:** 8 weeks, with 3 training sessions per week (two rest days between sessions).
- **Objective:** To develop explosive power through the stretch-shortening cycle.
- **General Warm-up:** 10 minutes (light jogging, dynamic flexibility exercises).
- **Specific Warm-up:** 5 minutes (light jumps in place, high knees).

Week	Exercises (Content)	Intensity / Progression	Volume (Sets x Reps)	Rest Between Sets
1-2	- Tuck Jumps - Box Jump from low box (30-40 cm) and landing - Standing Long Jump	Low to moderate intensity. Focus on correct landing technique (quiet, with knee flexion).	3 sets x 8-10 reps per exercise	60-90 seconds
3-4	- Hurdle Jumps (over low hurdles 40-50 cm) - Box Jump to medium-height box (40-50 cm) - Countermovement Vertical Jump	Moderate intensity. Gradual increase in hurdle/box height.	4 sets x 6-8 reps per exercise	90-120 seconds
5-6	- Single-Leg Hurdle Jumps (alternating) - Drop Jump from a 50 cm box - Triple Hop for Distance	High intensity. Emphasis on speed in the stretch-shortening cycle.	4-5 sets x 4-6 reps per exercise	120-180 seconds
7-8	- Depth Jump to Max Jump - Bounding for 15 m	Very high intensity. Simulating explosive in-game movements.	4-5 sets x 3-5 reps per exercise (for focused drills)	120-180 seconds

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	- Combination of previous exercises			

Appendix B: Training Program 2 – Complex Training for Group (EG2)

- **Duration:** 8 weeks, with 3 training sessions per week.
- **Principle:** Performing a traditional high-resistance strength exercise followed immediately by a biomechanically similar explosive exercise.
- **Warm-up:** 15 minutes (includes general and technical warm-up with light weights).

Week	Complex Pair	Strength Exercise Intensity (% of 1RM)	Volume (Sets x Reps)	Intra-Pair Rest	Inter-Pair Rest
1-2	a) Back Squat followed after (60-90s) b) Squat Jump	75-80%	a) 3 sets x 5 reps b) 3 sets x 5 reps	60-90 seconds	3 minutes
3-4	a) Deadlift followed by b) Bounds	80-85%	a) 3 sets x 4 reps b) 3 sets x 4 reps	60-90 seconds	3-4 minutes
5-6	a) Bench Press followed by b) Medicine Ball Chest Pass	80-85%	a) 4 sets x 3 reps b) 4 sets x 3-5 throws	90 seconds	3-4 minutes
7-8	a) Front Squat followed by b) Box Jump	85-90%	a) 4-5 sets x 2-3 reps b) 4-5 sets x 3 reps	90-120 seconds	4 minutes

Explanation:

*1RM: One-Repetition Maximum. *

Principle of Work: Exercise (a) potentiates the neuromuscular system, enhancing performance in the subsequent explosive exercise (b).

Common Safety and Procedural Notes for Both Programs:

- **Supervision:** All training is conducted under the supervision of a certified coach and team doctor.
- **Technique:** Primary focus is on mastering correct technique before increasing intensity.
- **Individualization:** Intensity (weight/height) or volume is adjusted individually according to each player's response and progress.
- **Recording:** Loads and performance are recorded for each player in a daily log.