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Effectiveness of an 8-Week Skill-Specific Training Program on Three-Point Shooting Accuracy and Physical Fitness among Male Polytechnic Students in Ji'an City, Jiangxi Province, China

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Abstract

Background and Aims: Three-point shooting is a critical offensive skill in modern basketball; however, male polytechnic students often demonstrate low shooting accuracy due to a lack of systematic and targeted training. This study aimed to examine the effectiveness of an 8-week skill-specific training program on improving three-point shooting accuracy and physical fitness among male polytechnic students in Ji'an City, Jiangxi Province, China.

Methodology: A quasi-experimental design with pre-test and post-test control groups was employed. Thirty male polytechnic students (aged 18–22 years) were assigned into an experimental group (n = 15) and a control group (n = 15). The experimental group participated in a skill-specific training program (3 sessions per week, 90 minutes per session), while the control group received conventional basketball training. Measurements included three-point shooting accuracy, upper-body muscular endurance (kneeling push-up test), and lower-limb explosive power (vertical jump test). Data were analyzed using mean, standard deviation, independent t-tests, and repeated measures ANOVA at a significance level of .05.

Results: There were no significant differences between groups at baseline ($p > .05$). After 8 weeks, the experimental group showed a significant improvement in three-point shooting accuracy (20.40±1.64% to 35.40±1.88%), whereas the control group showed only a slight increase (20.00±1.25% to 23.47±1.19%). Significant within-group improvements were also found in upper-body muscular endurance and lower-limb explosive power in the experimental group ($p < .05$). Post-test comparisons indicated that the experimental group performed significantly better than the control group across all variables ($p < .05$).

Conclusion: The 8-week skill-specific training program effectively improved both three-point shooting accuracy and related physical fitness, and was more effective than conventional basketball training. These findings support the implementation of structured and targeted training programs in vocational basketball education.

Keywords: Three-point Shooting Accuracy; Skill-specific Training; Basketball Performance; Physical Fitness; Quasi-experimental Study

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Introduction

Modern basketball is increasingly characterized by efficiency-oriented scoring strategies, in which three-point shooting has become a decisive factor influencing game outcomes and team performance. In professional leagues such as the National Basketball Association (NBA), the frequency of three-point attempts has increased significantly, reflecting the evolution of offensive strategies toward perimeter-oriented play (Zają̨c, 2023; Sliz, 2017). As a result, improving three-point shooting accuracy has become a central focus in contemporary basketball training research.

Despite this development, many non-elite players, particularly students in vocational institutions, still demonstrate relatively low and unstable three-point shooting accuracy. Previous studies have identified several key factors affecting shooting performance, including improper shooting mechanics, insufficient lower-limb strength, and poor coordination of force transmission (Chen et al., 2022; Liu et al., 2021). In addition, inadequate integration of technical training and physical conditioning has been identified as a major limitation in conventional basketball training programs, highlighting the need for more comprehensive and integrated training approaches (Li, 2025).

In China, basketball is widely practiced in higher vocational colleges and plays an important role in physical education and extracurricular activities. However, existing training models in many polytechnic institutions remain traditional and generalized, lacking systematic and targeted approaches to improve specific skills such as three-point shooting. Studies have shown that male polytechnic students often exhibit irregular shooting posture, insufficient lower-limb explosive power, and poor coordination between upper and lower body movements, which directly limit shooting accuracy (Li & Wang, 2024; Liu & Chen, 2022).

From a theoretical perspective, Skill-Specific Training Theory emphasizes that training effectiveness is maximized when practice conditions closely match the movement characteristics and physiological demands of the target skill (Matveyev, 1981; Liu, 2022). In the context of three-point shooting, this includes coordinated lower-limb power, core stability, and precise upper-body control. In addition, Motor Learning Theory suggests that skill acquisition progresses through structured stages, requiring systematic practice, repetition, and feedback to achieve stable performance (Fitts & Posner, 1967; Schmidt & Lee, 2019). These theoretical frameworks provide a strong foundation for designing effective training programs aimed at improving shooting performance.

Furthermore, physical fitness plays a critical role in supporting shooting performance. Lower-limb explosive power contributes to shooting distance and arc control, while upper-body muscular endurance supports consistency in repeated shooting actions (Chen & Zhang, 2024).

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Therefore, integrating physical conditioning with technical training is essential for improving three-point shooting accuracy among non-elite players.

Although previous studies have examined various aspects of shooting performance, limited research has focused specifically on male polytechnic students in Ji'an City, Jiangxi Province. In addition, many existing studies have addressed isolated components of performance without integrating technical and physical training into a structured program. Therefore, this study aimed to examine the effectiveness of an 8-week skill-specific training program designed to improve three-point shooting accuracy and related physical fitness among male polytechnic students. The findings are expected to provide practical guidance for vocational basketball training and contribute to the development of structured training models in educational settings.

Objectives

1. To examine the effectiveness of an 8-week skill-specific training program on three-point shooting accuracy.
2. To compare shooting accuracy between the experimental and control groups.
3. To examine the effects of the program on upper-body muscular endurance and lower-limb explosive power.

Literature Review

Three-point shooting is a complex motor skill that requires the integration of technical execution, physical fitness, and motor learning processes. Previous studies have indicated that shooting performance is influenced by factors such as shooting mechanics, force transmission, and coordination between the lower and upper body (Chen et al., 2022; Liu et al., 2021). Skill-Specific Training Theory emphasizes that training effectiveness is maximized when practice conditions closely replicate the movement patterns and physiological demands of the target skill (Matveyev, 1981; Liu, 2022). In addition, Motor Learning Theory suggests that skill acquisition requires structured practice, repetition, and feedback to develop stable movement patterns (Fitts & Posner, 1967; Schmidt & Lee, 2019). Physical fitness components, particularly lower-limb explosive power and upper-body muscular endurance, have also been identified as key contributors to shooting accuracy and consistency (Chen & Zhang, 2024). However, existing studies have often focused on isolated aspects of performance, and limited research has examined the combined effects of technical and physical training in structured programs for male polytechnic students. Therefore, this study aims to address this gap by examining the effectiveness of a skill-specific training program designed to improve both shooting accuracy and related physical fitness.

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Conceptual Framework

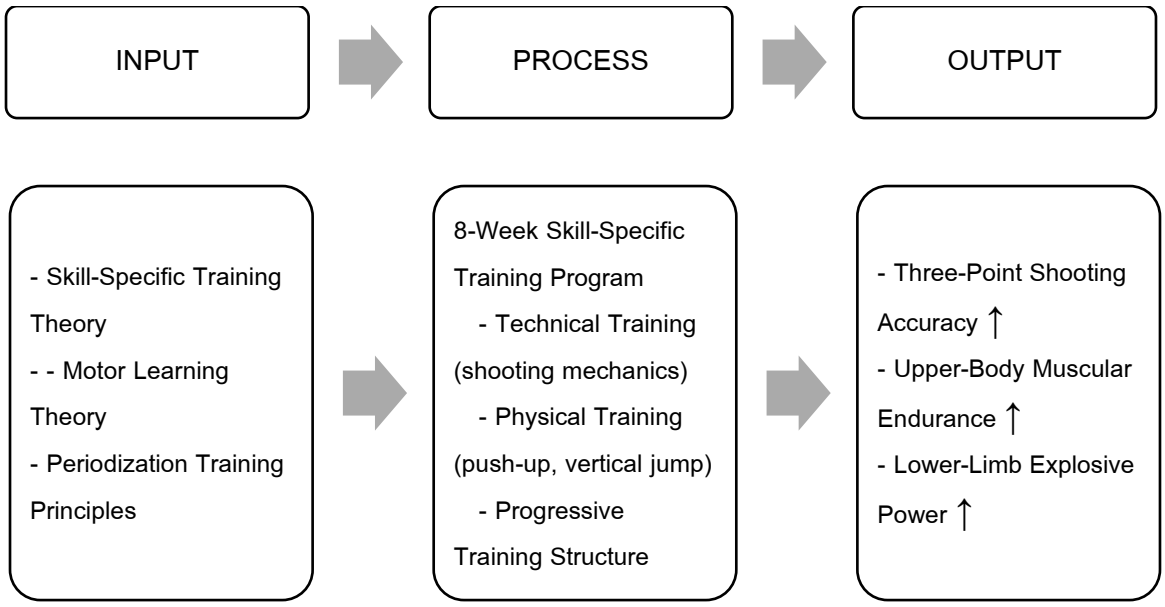


Figure 1 Conceptual Framework

Methodology

Research Design

This study employed a quasi-experimental research design using a pre-test and post-test control group approach to examine the effectiveness of an 8-week skill-specific training program on three-point shooting accuracy and physical fitness among male polytechnic students.

Participants

The participants consisted of 30 male polytechnic students aged 18–22 years from a polytechnic in Ji'an City, Jiangxi Province, China. All participants were actively involved in basketball club activities and had no formal professional basketball training experience. Participants were selected using purposive sampling and were assigned into an experimental group (n = 15) and a control group (n = 15) using a non-randomized procedure.

Inclusion criteria included: (1) male students aged 18–22 years, (2) regular participation in basketball activities, and (3) no history of musculoskeletal injury affecting performance.

Research Instruments

1. Three-Point Shooting Accuracy Test

Three-point shooting accuracy was assessed using five standardized positions: left corner, right corner, left 45-degree angle, right 45-degree angle, and top of the arc. Each participant

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performed 20 attempts from each position (total of 100 attempts). Shooting accuracy was calculated as the percentage of successful shots. This protocol was adapted from previous studies and demonstrated acceptable reliability in measuring shooting performance.

2. Physical Fitness Tests

Kneeling Push-Up Test: Used to assess upper-body muscular endurance (number of repetitions completed within 30 seconds).

Vertical Jump Test: Used to assess lower-limb explosive power (measured in centimeters using the best of three attempts).

Training Program

The experimental group participated in an 8-week skill-specific training program conducted three times per week, with each session lasting 90 minutes. The program was designed based on Skill-Specific Training Theory, Motor Learning Theory, and periodization principles.

Each training session consisted of:

- Warm-up (10 minutes)
- Technical training (30 minutes): shooting mechanics, force transmission, and follow-through
- Physical conditioning (30 minutes): lower-limb explosive power, core stability, and upper-body strength

Shooting practice (20 minutes): structured three-point shooting drills

Training intensity and complexity were progressively increased across the 8-week period.

The control group participated in conventional basketball training during the same period.

Data Collection Procedure

All participants completed pre-test assessments before the intervention and post-test assessments after the 8-week training period. Testing conditions were standardized to ensure consistency and reliability.

Statistical Analysis

Data were analyzed using descriptive statistics (mean and standard deviation). Independent t-tests were used to compare differences between groups, and repeated measures ANOVA was used to examine changes over time within groups. Bonferroni post hoc tests were applied where appropriate.

Assumptions of normality and homogeneity of variance were tested prior to inferential analysis. The significance level was set at .05.

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Results

Table 1 Baseline Comparison Between Groups

Variable	Experimental (Mean ± SD)	Control (Mean ± SD)	p-value
Shooting Accuracy (%)	20.40 ± 1.64	20.00 ± 1.25	> .05
Push-up (reps)	22.33 ± 1.95	22.00 ± 1.80	> .05
Vertical Jump (cm)	36.00 ± 1.93	35.80 ± 1.70	> .05

Values are presented as mean ± standard deviation. No significant differences were observed between the experimental and control groups at baseline ($p > .05$).

Table 2 Within-Group Changes (Experimental Group)

Variable	Pre-test	Post-test	p-value
Shooting Accuracy (%)	20.40 ± 1.64	35.40±1.88	> .05
Push-up (reps)	22.33 ± 1.95	35.87±2.17	> .05
Vertical Jump (cm)	36.00 ± 1.93	45.53±1.85	> .05

Values are presented as mean ± standard deviation. Significant differences were observed between pre-test and post-test within the experimental group ($p < .05$).

Table 3 Between-Group Comparison (Post-test)

Variable	Experimental	Control	p-value
Shooting Accuracy (%)	35.40 ± 1.88	23.47 ± 1.19	> .05
Push-up (reps)	35.87 ± 2.17	25.00 ± 2.00	> .05
Vertical Jump (cm)	45.53 ± 1.85	38.00 ± 1.90	> .05

Values are presented as mean ± standard deviation. The experimental group showed significantly higher values compared with the control group at post-test ($p < .05$).

Discussion

The present study aimed to examine the effectiveness of an 8-week skill-specific training program on improving three-point shooting accuracy and physical fitness among male polytechnic

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students. The findings revealed that the experimental group demonstrated significantly greater improvements in all variables compared with the control group, indicating the effectiveness of the structured training program.

The significant improvement in three-point shooting accuracy can be attributed to the integration of technical training and physical conditioning within a structured and progressive program. Specifically, the inclusion of shooting mechanics training, such as stance correction, force transmission, and follow-through practice, likely enhanced movement consistency and shooting precision. These findings are consistent with Skill-Specific Training Theory, which emphasizes that training outcomes are optimized when exercises closely match the movement patterns and demands of the target skill (Matveyev, 1981; Liu, 2022).

In addition, the progressive structure of the training program, based on Motor Learning Theory, may have contributed to the development of stable motor patterns through repeated practice and feedback. The gradual increase in training intensity and complexity across the 8-week period allowed participants to transition from the cognitive stage to more autonomous performance, thereby improving shooting stability (Fitts & Posner, 1967; Schmidt & Lee, 2019).

The improvements in physical fitness variables, including upper-body muscular endurance and lower-limb explosive power, also played an important role in enhancing shooting performance. The incorporation of lower-limb power training likely improved force generation during shooting, while upper-body endurance contributed to maintaining consistency during repeated shooting attempts. These findings are supported by previous studies, which reported that physical conditioning is closely related to shooting performance and stability (Chen & Zhang, 2024).

Compared with the experimental group, the control group showed only slight improvements, which may be attributed to general basketball practice without targeted training. This suggests that conventional training alone may be insufficient to produce substantial improvements in specialized skills such as three-point shooting.

Overall, the findings of this study highlight the importance of integrating technical training, physical conditioning, and structured progression in skill-specific programs. The results provide empirical support for the application of targeted training models in vocational basketball education and suggest that such programs can effectively enhance both performance and physical fitness.

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Recommendation

Practical Recommendations

Based on the findings of this study, several practical recommendations can be proposed for basketball training in vocational education settings. First, coaches and physical education instructors are encouraged to implement structured skill-specific training programs that integrate technical training and physical conditioning. The results of this study clearly demonstrate that combining shooting mechanics training with targeted physical exercises, such as lower-limb explosive power and upper-body muscular endurance training, can significantly enhance three-point shooting performance.

Second, training programs should be designed using a progressive structure based on motor learning and periodization principles. Gradual increases in training intensity and complexity allow learners to develop stable movement patterns and improve performance consistency over time. Coaches should ensure that training sessions include clear progression, feedback, and repetition to maximize learning outcomes.

Third, basketball training in vocational institutions should move beyond traditional and generalized approaches by incorporating evidence-based methods. The use of scientifically designed training programs can improve both skill performance and physical fitness, thereby enhancing overall player development and team competitiveness.

Recommendations for Future Research

Future studies are recommended to expand the scope of this research by including larger sample sizes from multiple institutions to improve the generalizability of the findings. In addition, further research may examine the long-term effects of skill-specific training programs by extending the duration of the intervention beyond 8 weeks.

Moreover, future studies could investigate the effectiveness of similar training programs among different populations, such as female students, beginner-level players, or professional athletes, to determine whether the training model can be adapted to various skill levels.

Finally, future research may incorporate additional variables, such as psychological factors, fatigue resistance, or in-game performance indicators, to provide a more comprehensive understanding of the factors influencing three-point shooting performance.

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