International Journal of Sociologies and Anthropologies Science Reviews
Volume 5 Issue 5: September-October 2025: ISSN 2985-2730
Website: **https://so07.tci-thaijo.org/index.php/IJSASR/index**

Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability

Li Yicong[1*], Pornteap Leethong-in[2], and Wisute Tongdecharoen[3]
[1,2,3]Faculty of Sports Science and Technology, Bangkokthonburi University, Thailand
[1]E-Mail: 962690742@qq.com, ORCID ID: https://orcid.org/0000-0002-1082-0198
[2]E-mail: Pornteap.lee@bkkthon.ac.th, ORCID ID: https://orcid.org/0000-0002-2691-3727
[3]E-mail: wisute.ton@bkkthon.ac.th, ORCID ID: https://orcid.org/0009-0008-5233-7533

Received 22/02/2025 Revised 18/03/2025 Accepted 20/04/2025

Abstract

Background and Aim: The proficiency level of the basketball program for students aged 14-16 years at Wuhan Sports School is a significant concern, as there is a noticeable lack of tailored training programs specifically designed for this age group. Therefore, this research aims to improve efficiency in three-point shooting ability, cognitive ability, and specific fitness for youth basketball players.

Materials and Methods: This research employed a quasi-experimental design. The population consisted of 128 male youth basketball players aged 14-16 from Wuhan Sports School. Participants were assessed on three-point shooting ability, cognitive ability, and specific fitness. They were then divided into control and experimental groups using systematic sampling. The training intervention was conducted over 8 weeks to improve three-point shooting ability, cognitive ability, and specific fitness, with measurements taken before training, after 4 weeks of training, and after 8 weeks of training. Data analysis included mean, standard deviation, one-way repeated measures ANOVA, and dependent t-tests. The level of statistical significance was set at 0.05.

Results: Following 8 weeks of training, statistically significant differences at the 0.05 level were observed in three-point shooting ability, cognitive ability, and sport-specific fitness across pre-test, 4-week training, and post-test measurements. These findings indicate that the developed basketball training program can effectively enhance three-point shooting ability, cognitive ability, and specific fitness.

Conclusion: The intervention program improved three-point shooting and cognitive ability for youth basketball players.

Keywords: Intervention Training Program; Three-point Shooting Ability; Cognitive Ability; Youth Basketball Player

Introduction

The increasing competitiveness of basketball necessitates a more scientific and systematic approach to training, particularly for young athletes. Three-point shooting, a critical skill in modern basketball, requires not only technical proficiency but also cognitive efficiency for optimal decision-making and execution under pressure (Yang, Tian, & Wang, 2024). However, conventional training programs predominantly emphasize physical and technical aspects while neglecting the development of cognitive abilities, which are crucial for situational awareness and game intelligence (Kumar & Amer, 2024). This study addresses these gaps by developing a comprehensive intervention program integrating technical training with cognitive enhancement exercises, aiming to improve young athletes' shooting accuracy and overall game performance.

Three-point shooting influences both individual and team success by increasing scoring efficiency and altering game dynamics. Effective training must incorporate biomechanics, sports psychology, and motor learning principles to optimize performance (Cabarkapa et al., 2023). Previous studies indicate that stability, shooting speed, and force coordination are fundamental technical elements, while cognitive functions like decision-making speed and visual processing play pivotal roles in successful execution (Zhao et al., 2024). Additionally, mental fatigue has been shown to impair three-point shooting accuracy and decision-making, highlighting the need for cognitive resilience in training (Cao et al., 2022; Daub et al., 2022). The integration of cognitive psychology with sports training offers a novel approach to skill acquisition, allowing players to adapt quickly to game situations and improve shooting consistency under varying conditions (Zhang et al., 2023).

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: **https://doi.org/10.60027/ijsasr.2025.6726**

This research synthesizes these multidisciplinary insights to formulate an evidence-based training model tailored to young basketball players. Studies on functional training have demonstrated its effectiveness in improving explosive ability and three-point shooting skills (Abbood et al, 2022). Furthermore, ecological-dynamic training approaches have been found superior to traditional methods in enhancing shooting accuracy (Aliberti, 2022). Research also suggests that factors such as balance, core strength, and coordination significantly impact shooting performance, reinforcing the need for holistic training programs (Zhang et al., 2023).

This study is significant for coaches, athletes, and sports scientists aiming to refine training methodologies. Incorporating experimental validation, it offers a replicable model for enhancing both technical and cognitive abilities in young basketball players. The findings contribute to the broader discourse on scientific training methods and provide practical implications for optimizing basketball education programs. Future research can further investigate long-term cognitive development in athletes and explore its correlation with sustained performance improvements. This work underscores the necessity of integrating cognitive training into athletic development to foster well-rounded, high-performing basketball players.

Objectives

1. To investigate the effects of an intervention program on three-point shooting ability and cognitive performance among youth basketball players.
2. To compare the means and standard deviations of three-point shooting ability, cognitive performance, and specific fitness between experimental and control groups at pre-test, mid-test, and post-test intervals using t-test analysis.
3. To analyze within-group differences in the experimental group using Analysis of Variance (ANOVA).

Literature review

The modern game of basketball places increasing emphasis on three-point shooting, making it a critical skill for players at all levels. A player's ability to execute successful three-point shots is influenced by multiple factors, including technical proficiency, cognitive abilities, and physical fitness. From a review of the latest research, key areas essential for three-point shooting development include shooting technique, cognitive processing, and physical conditioning.

Technical Proficiency in Three-Point Shooting: Developing an accurate and consistent three-point shot requires mastering proper biomechanics. Critical elements include balance, foot positioning, hand placement, and follow-through. Jelsma, Renshaw, and Munzert (2017) emphasize that shooting drills, such as form shooting and one-hand shooting, reinforce muscle memory and optimize shot trajectory. Recent studies indicate that balance, core strength, and coordination significantly correlate with shooting accuracy (Zhang et al., 2023). Assessing three-point shooting proficiency involves performance-based tests such as shooting accuracy trials under varying conditions. Technologies like motion capture and eye-tracking software provide deeper insights into biomechanics and focus strategies (Zhao et al., 2024). These findings support the necessity of structured shooting drills and biomechanical training for improving three-point shooting.

Cognitive Abilities and Three-Point Shooting: Cognitive abilities play a pivotal role in basketball performance, influencing decision-making speed, visual attention, and reaction time. In high-pressure game situations, players must rapidly assess defensive setups and determine the optimal shot selection. Research suggests that elite basketball players outperform amateur players in cognitive tests following spring training, demonstrating superior visual processing and decision-making under fatigue (Mancı et al., 2023). Training cognitive abilities involves integrating decision-making drills, such as shooting under defensive pressure or responding to unexpected stimuli. Studies highlight the significance of "quiet eye" focus, where players maintain visual fixation on the target before executing a shot, enhancing shooting accuracy (Roca,

Citation
Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

Ford, and Memmert, 2020). Additionally, cognitive-motor training, which combines physical movement with cognitive challenges, has been shown to improve anticipatory responses and decision-making efficiency in athletes (Lucia et al., 2021). Cognitive function assessments commonly include reaction time tests, visual tracking tasks, and decision-making simulations. These assessments help coaches tailor cognitive training interventions to individual players' needs, ultimately enhancing their ability to make quick and effective in-game decisions.

Physical Conditioning and Three-Point Shooting Performance: Physical fitness is a cornerstone of three-point shooting success, particularly in maintaining shooting form under fatigue. Key physical attributes contributing to three-point accuracy include lower-body strength, core stability, and cardiovascular endurance. Research indicates that core strength and coordination are positively correlated with shooting accuracy, suggesting that strength training targeting the lower body and core enhances shooting performance (Zhang et al., 2023). Fatigue significantly affects three-point shooting by reducing shot consistency and altering biomechanics. High-intensity interval training (HIIT) has been found to improve both cognitive and physical performance in basketball players, supporting sustained shooting accuracy throughout a game (Shiraz et al., 2024). Additionally, explosive power exercises, such as plyometrics and Olympic lifts, have been linked to improved shooting performance by increasing force generation during the jump shot (Abbood et al., 2022). Assessing physical readiness for three-point shooting includes tests for lower-body power (e.g., vertical jump test), core stability, and aerobic endurance. By integrating strength training, endurance conditioning, and fatigue management strategies, players can maintain shooting accuracy even in high-stress game conditions.

Optimizing three-point shooting in basketball requires a holistic approach that integrates technical training, cognitive skill development, and physical conditioning. By emphasizing proper biomechanics, enhancing cognitive processing, and improving physical fitness, players can achieve greater shooting consistency and effectiveness. Implementing evidence-based training interventions ensures that athletes develop the necessary skills to excel in three-point shooting and overall basketball performance.

Conceptual Framework

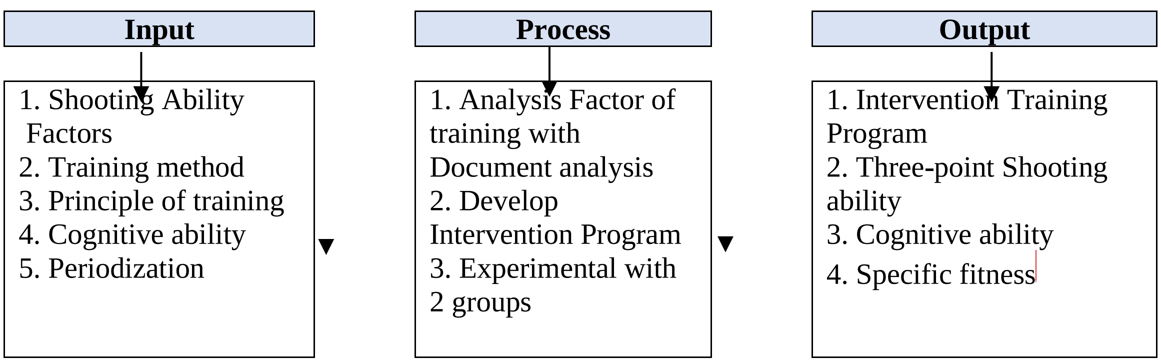

Figure 1 Conceptual Framework

Methodology

This research is Quasi-Experimental Research.

Population and Sample

The sample group used in this research comprised 128 male basketball players, 14-16-year-olds in the 2024 academic year of the Wuhan Sports Basketball School, and the exact population was known to the researcher. Therefore, the sample size used in this research was determined according to Yamane's formula (1973), resulting in a total of 48 people through simple random sampling for the Three-point Shooting ability, Cognitive ability, and Specific fitness test. The students were ranked according to their scores on

Citation
Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

the test from low to high in the order of 1-48, and then the sample was divided into 2 groups of 24 people each through the matching method.

Research Instrument

The intervention program for youth basketball players includes shooting ability, cognitive ability, and specific fitness for three-point shooting. The program was designed by research with the principle of training theory that 8-week training duration, 8-week duration training, 5 days each week, and 120 minutes per session. The training program was evaluated for content validity (Index of Item-Objective Congruence, IOC=0.93-1.00) by 3 experts, which consisted of 2 basketball coaches and 1 sports scientist, and then evaluated with 5 samples of basketball players who tried out the result of the exercise drills, intensity training, and time of training and recovery, which were appropriate for use in experimental training.

Data collection

The steps for data collection were as follows:

1. A formal request for permission to use the location and equipment for data collection was submitted to the Wuhan Sports Basketball School.
2. The sample group was briefed on the research objectives, data collection procedures, and consent forms.
3. The training location was prepared, and research assistants were enlisted to help with data collection.
4. Division of Sample Group: The sample group was divided into two groups: the experimental group and the control group. Pre-tests were conducted before the start of the training.
5. Both groups followed their respective training plans for 8 weeks. The experimental group underwent an intervention program training, while the control group continued their regular training.
6. The control group was subjected to three types of tests—pre-test, mid-test (after 4 weeks), and post-test (after 8 weeks).
7. The research results were summarized, and the findings were discussed about the objectives of the study

Data Analysis

1. Mean and standard deviation.
2. Compare the means between two groups with a t-test for independent.
3. Compare the mean within the experimental group with one-way ANOVA repeated measurement and pairwise Bonferroni post hoc.
4. Significant difference level at .05

Results

The results found that.

Table 1 Mean comparison between the experiment and control groups with the pretest of the three-point shooting ability by t-test independent.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	Lower	Upper		
Three-point shooting ability (score)	8.92+1.44	9.50+2.37	-1.54	0.62	-0.85	0.40

*P<.05

Table 1 shows that the three-point shooting ability is not significantly different.

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

Table 2 Mean comparison between the experiment and control groups with the pretest of cognitive ability by t-test independent.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	Lower	Upper		
Simple reaction time test (ms)	245.63+22.76	240.41+19.01	-6.97	17.39	0.86	0.39
Choice reaction time test (sec)	359.17+12.67	158.00+12.66	-6.19	8.52	0.31	0.75
Trail making test(sec)	1.60+0.09	1.60+0.06	-0.05	0.03	-0.46	0.69
Flanker test (frequency)	90.92+1.35	91.04+1.75	-1.03	0.78	-0.27	0.78
Design fluency test (frequency)	6.67+1.43	7.00+1.38	-1.15	0.48	-0.81	0.42
Mental rotation test (frequency)	6.67+1.55	6.66+1.68	-0.94	0.94	0.00	1.00
Spatial visualization test (frequency)	10.17+3.13	8.58+2.46	-0.05	3.22	1.94	0.06

*p<.05

Table 2 showed that all pairwise of cognitive abilities were not significantly different.

Table 3 Mean comparison between the experiment and control groups with the pretest of the specific fitness by t-test independent.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	Lower	Upper		
Push up-30sec (times)	41.21+3.18	41.41+3.24	-2.07	1.65	-0.22	0.82
Sit-up 30sec (times)	21.13+2.25	21.16+2.14	-1.13	1.23	-0.06	0.95
Vertical Jump (cm)	56.33+3.38	56.50+1.97	-1.77	1.44	-0.20	0.84
Balance test (sec)	53.66+4.71	55.54+4.08	-7.57	-0.60	-2.36	0.16

*P<.05

Table 3 showed that all pairwise comparisons of specific fitness were not significantly different.

Table 4 Mean comparison between the experiment and control groups of the posttest of the three-point shooting ability by t-test independent.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	Lower	Upper		
Three-point shooting ability (score)	14.21+1.32	10.29+1.98	3.67	5.98	8.42	.01*

*P<.05

Table 4 showed that the three-point shooting ability pairwise was significantly different (*p<.05).

Citation
Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

Table 5 Mean comparison between the experiment and control groups of the posttest of the cognitive ability by t-test independent.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	Lower	Upper		
Simple reaction time test (ms)	225.83+14.63	238.08+17.81	-21.72	-2.77	-2.60	0.12
Choice reaction time test (sec)	330.88+23.67	357.45+11.85	-37.45	-15.70	-4.92	.01*
Trail making test(sec)	1.37+0.06	1.57+0.10	-0.26	-0.16	-8.39	.01*
Flanker test (frequency)	96.75+2.23	91.08+1.74	4.50	6.82	9.80	.01*
Design fluency test(frequency)	11.25+1.67	7.25+1.62	3.04	4.95	8.40	.01*
Mental rotation test (frequency)	11.71+1.57	7.12+1.59	3.66	5.50	10.01	.01*
Spatial visualization test (frequency)	15.00+2.86	9.16+2.69	4.21	7.44	7.27	.01*

*(P<.05)

Table 5 showed that all pairwise variables of cognitive ability were significantly different (*p<.05), but the simple reaction time test was not significantly different.

Table 6 The mean comparison between the experimental and control groups of the post-test of specific physical fitness by an independent t-test.

Variables	Expert. G	Cont. G	95% Confidence Interval of the Difference		t	p
	M+ SD	M+ SD	Lower	Upper		
Push up 30sec (score)	46.12+3.10	40.95+2.77	3.45	6.87	6.08	.01*
Sit-up 30sec (score)	26.08+2.19	21.20+2.14	3.61	6.13	7.79	.01*
Vertical Jump (cm)	62.04+3.26	57.16+2.63	3.15	6.59	5.69	.01*
Balance test (sec)	96.02+6.42	54.35+2.43	38.83	44.48	29.71	.01*

*P<.05

Table 6 showed that all variables of specific physical fitness were significantly different (*P<.05).

Table 7 Mean comparison of three-point shooting ability within the experimental group by using one-way ANOVA repeated measurement and Bonferroni post hoc.

variables	Test		Bonferroni			M+SD	F	p
			Mean Difference	Std. Error	p			
Three-point shooting ability	Pre-test	Mid test	-2.29	0.11	.05*	8.92+1.44	1675.97	.05*
		Post-test	-5.29	0.11	.05*			
	Mid test	Pre-test	2.29	0.11	.05*	11.21+1.32		
		Post-test	-3.00	0.00	.05*			

Citation
Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

variables	Test		Bonferroni Mean Difference	Std. Error	p	M+SD	F	p
	Post-test	Pre-test	5.29	0.11	.05*	14.21+1.32		
		Mid test	3.00	0.00	.05*			

*P<.05

Table 8 showed that all post hoc pairwise three-point shooting abilities were significantly different (*p<.05).

Table 8 Mean comparison of cognitive ability within the experimental group by one-way ANOVA, repeated measurement, and Bonferroni post hoc pairwise.

Variables	Test		Bonferroni Mean Difference	Std. Error	p	M+SD	F	p
Simple reaction time test	Pre-test	Mid test	5.04	0.04	.05*	245.63+22.76	49.76	.05*
		Post-test	19.79	2.52	.05*			
	Mid test	Pre-test	-5.04	0.04	.05*	240.58+22.80		
		Post-test	14.75	2.53	.05*			
	Post-test	Pre-test	-19.79	2.52	.05*	225.83+14.63		
		Mid test	-14.75	2.53	.05*			
Choice reaction time test	Pre-test	Mid test	4.96	0.04	.05*	359.17+12.67	30.66	.05*
		Post-test	28.29	4.73	.05*			
	Mid test	Pre-test	-4.96	0.04	.05*	354.20+12.62		
		Post-test	23.33	4.74	.05*			
	Post-test	Pre-test	-28.29	4.73	.05*	330.88+23.67		
		Mid test	-23.33	4.72	.05*			
Trail making test	Pre-test	Mid test	0.06	0.01	.05*	1.60+0.09	331.84	.05*
		Post-test	0.23	0.01	.05*			
	Mid test	Pre-test	-0.06	0.01	.05*	1.54+0.09		
		Post-test	0.18	0.01	.05*			
	Post-test	Pre-test	-0.23	0.01	.05*	1.37+0.06		
		Mid test	-0.18	0.01	.05*			
Flanker test	Pre-test	Mid test	-2.20	0.36	.05*	90.92+1.35	120.25	.05*
		Post-test	-5.83	0.43	.05*			
	Mid test	Pre-test	2.20	0.36	.05*	93.13+2.03		
		Post-test	-3.63	0.34	.05*			
	Post-test	Pre-test	5.83	0.43	.05*	96.75+2.23		
		Mid test	3.63	0.34	.05*			
Design fluency test	Pre-test	Mid test	-1.96	0.04	.05*	6.67+1.43	663.08	.05*
		Post-test	-4.60	0.16	.05*			
	Mid test	Pre-test	1.96	0.04	.05*	8.63+1.44		
		Post-test	-2.63	0.15	.05*			
	Post-test	Pre-test	4.58	0.16	.05*	11.25+1.67		
		Mid test	2.63	0.15	.05*			
Mental rotation test	Pre-test	Mid test	-1.88	0.13	.05*	6.67+1.55	1136.93	.05*
		Post-test	-5.04	0.04	.05*			
	Mid test	Pre-test	1.88	0.13	.05*	8.54+1.45		
		Post-test	-3.17	0.13	.05*			

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

Variables	Test		Bonferroni Mean Difference	Std. Error	p	M+SD	F	p
	Post-test	Pre-test	5.04	0.04	.05*	11.71+1.57		
		Mid test	3.18	0.13	.05*			
Spatial visualization test	Pre-test	Mid test	-1.96	0.15	.05*	10.17+3.13	1381.64	.05*
		Post-test	-4.83	0.13	.05*			
	Mid test	Pre-test	1.96	0.15	.05*	12.13+2.82		
		Post-test	-2.88	0.07	.05*			
	Post-test	Pre-test	4.83	0.13	.05*	15.00+2.86		
		Mid test	2.88	0.07	.05*			

*P<.05

Table 8 shows that all post hoc pairwise cognitive abilities were significantly different (*p<.05).

Table 9 Mean comparison of specific fitness within the experimental group by using one-way ANOVA repeated measurement and Bonferroni post hoc.

Variables	Test		Bonferroni Mean Difference	Std. Error	p	M+SD	F	p
Push up	Pre-test	Mid test	-1.88	0.13	.05*	41.21+3.18	1050.20	.05*
		Post-test	-4.92	0.13	.05*			
	Mid test	Pre-test	1.88	1.13	.05*	43.08+3.03		
		Post-test	-3.04	0.04	.05*			
	Post-test	Pre-test	4.92	0.13	.05*	46.12+3.10		
		Mid test	3.04	0.04	.05*			
Sit up	Pre-test	Mid test	-1.92	0.18	.05*	21.13+2.25	452.59	.05*
		Post-test	-4.96	0.10	.05*			
	Mid test	Pre-test	1.92	0.18	.05*	23.04+2.29		
		Post-test	-3.04	0.20	.05*			
	Post-test	Pre-test	4.96	0.10	.05*	26.08+2.19		
		Mid test	3.04	0.20	.05*			
Vertical Jump	Pre-test	Mid test	-1.67	0.19	.05*	56.33+3.38	351.23	.05*
		Post-test	-5.71	0.29	.05*			
	Mid test	Pre-test	1.67	0.19	.05*	58.00+3.32		
		Post-test	-4.04	0.17	.05*			
	Post-test	Pre-test	5.71	0.29	.05*	62.04+3.26		
		Mid test	4.04	0.17	.05*			
Balance	Pre-test	Mid test	-15.19	1.52	.05*	53.66+4.71	389.39	.05*
		Post-test	-42.36	1.55	.05*			
	Mid test	Pre-test	15.19	1.52	.05*	68.85+5.11		
		Post-test	-27.16	1.55	.05*			
	Post-test	Pre-test	42.36	1.55	.05*	96.02+6.42		
		Mid test	27.17	1.55	.05*			

*P<.05

Table 9 showed that all post hoc pairwise comparisons of specific fitness were significant differences (*p<.05).

Discussion

The significance of pretest comparisons in experimental sports research lies in ensuring group equivalence before intervention, which upholds internal validity in study design. In experimental studies

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

examining the effects of training programs on three-point shooting accuracy, cognitive function, and physical fitness, statistical analyses confirming no significant baseline differences ($p > 0.05$) between experimental and control groups reinforce the validity of causal inferences (Campbell & Stanley, 1963). The absence of pre-existing disparities ensures that post-test improvements can be attributed to the intervention rather than confounding variables, aligning with principles of experimental control and randomization. Research has demonstrated that robust pretest assessments enhance the reliability of findings in sports performance studies, as they allow researchers to isolate the true effects of training interventions (Ko et al., 2023). Furthermore, studies highlight that failing to establish baseline equivalence can introduce bias, potentially undermining the credibility of experimental results (Makaruk et al., 2022). Ensuring initial comparability between groups is particularly crucial in sports science, where multiple factors—such as prior skill level, cognitive capacity, and physical conditioning—can influence training outcomes (Riemann, Wilk, and Davies, 2023). By confirming that both groups exhibit similar characteristics at the outset, researchers provide a strong methodological foundation for assessing the efficacy of training interventions, thereby reinforcing the integrity of the study's conclusions (Fields and Paone, 2020). This methodological rigor is essential for producing valid, generalizable findings that contribute meaningfully to the field of sports performance research.

Effects Between Groups: The results from Tables 4–6 demonstrate that an integrated training program incorporating cognitive and physical elements significantly enhances three-point shooting performance, cognitive abilities, and physical fitness compared to a control group. Although there was no statistically significant difference in the simple reaction time test in terms of cognitive abilities, this may be due to the limited impact of short-term interventions on basic cognitive functions (Brito et al., 2022). Overall, this aligns with research indicating that cognitive training enhances visual attention, reaction time, and decision-making, all of which are crucial for shooting accuracy (Lucia et al., 2024). Additionally, physical training, particularly lower-body strength exercises, improves shot power and stability, leading to more consistent shooting performance (Faulks, Sansone, and Boycott 2024). Research supports the notion that cognitive and physical training should not be treated in isolation, as their integration leads to superior performance outcomes (Shiraz et al., 2024). For instance, cognitive tasks that require working memory, reaction speed, and mental rotation ability have been linked to enhanced shooting accuracy under pressure. (Daub et al., 2022). Likewise, explosive strength and balance training improve postural control, which is critical for maintaining shooting form (Wang, Taek, and Wang, 2023). Integrating both cognitive and physical training optimizes neurophysiological processes, reinforcing the effectiveness of a holistic approach to skill development (Lucia et al., 2023). In conclusion, the statistical differences observed in the study underscore the necessity of integrated training programs for enhancing basketball performance, aligning with contemporary research that emphasizes the synergistic effects of cognitive and physical conditioning (Borkar and Badwe, 2023).

Effects within the experimental group: Based on Tables 7–9, the analysis employs a one-way ANOVA with repeated measures and Bonferroni post hoc tests to evaluate improvements in three-point shooting ability, cognitive ability, and specific fitness components among experimental groups at pre-test, mid-test, and post-test phases. The significant F-values ($p < .05$) indicate overall differences across testing periods. In Table 7, three-point shooting ability significantly improved over time, with post hoc tests confirming that all pairwise comparisons (pre-mid, pre-post, and mid-post) were statistically significant. This suggests that the experimental intervention effectively enhanced shooting performance. Table 8 assesses cognitive abilities, including reaction time, trail-making, and spatial visualization, which are crucial for sports performance. The significant results indicate progressive improvement in cognitive function across testing periods. This is supported by recent research emphasizing the role of cognitive training in improving decision-making and perceptual-motor skills in athletes (Zhu et al., 2024). Finally, Table 9 examines fitness components such as push-ups, sit-ups, vertical jumps, and balance, all of which demonstrated significant improvement over time. Physical fitness directly influences athletic performance, with strength, endurance, and balance being key determinants (Wang et al., 2023). These findings align

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: **https://doi.org/10.60027/ijsasr.2025.6726**

with studies showing that sport-specific training programs enhance both physical and cognitive abilities, contributing to overall athletic performance (Trecroci et al., 2022). Additionally, improvements in executive functions, such as working memory and attentional control, have been linked to enhanced sports skills and decision-making (Cao et al., 2024). This aligns with studies demonstrating that training interventions targeting cognitive abilities can significantly benefit athletic performance (Isorna-Folgar et al., 2022). Further research has highlighted the interdependence of motor and cognitive functions in sports, emphasizing the need for integrated training approaches (Donka and Balogh, 2022). Therefore, the study results reinforce the importance of cognitive and physical training for basketball players to enhance overall performance.

Conclusion

An effective three-point shooting training program must integrate biomechanical precision, cognitive skill development, and physical conditioning. Statistical analysis confirms that such a holistic approach leads to significant performance improvements.

Recommendation

Recommendation for Current Research

1. Extend the intervention period beyond eight weeks to examine whether prolonged training leads to sustained improvements in three-point shooting and cognitive ability.
2. Incorporate qualitative data, such as player feedback and psychological assessments, to better understand the impact of cognitive training on decision-making and game performance.
3. Introduce additional control groups using alternative training methods, such as traditional shooting drills or purely cognitive training, to compare their effectiveness with the integrated program.

Recommendation for further research

1. Investigate the effects of the intervention program on players of different age groups and skill levels to determine its applicability across broader basketball populations.
2. Explore the long-term impact of cognitive training on basketball performance, including retention of cognitive gains after the intervention has ended.
3. Examine the relationship between cognitive ability and game-specific performance metrics, such as passing accuracy, defensive awareness, and real-time decision-making in competitive matches.

References

Abbood, M. A., Abdullha, J. S. F. A., & AL Midhatee, S. A. H. (2022). The effect of functional exercises on the strength characteristics of speed and the skill of shooting with three points in basketball for advanced players. Journal of STEPS for Humanities and Social Sciences.1(3), 73. https://doi.org/10.55384/2790-4237.1136

Altavilla, G., Aliberti, S., D'Isanto, T., & Raiola, G. (2022). A Comparison between Ecological-Dynamic and Cognitive Approach to Improve Accuracy in Basketball Shot. Studia Sportiva, 1, 6-12. https://doi.org/10.5817/StS2022-1-1

Borkar, P., & Badwe, A. (2023). A Study to Determine the Effect of 12 Weeks Sports Specific Training Program on Physical and Physiological Variables in Amateur Basketball Players - A Randomized Controlled Trail. International Journal of Health Sciences and Research. 13 (7), 280-298.

Brito MA, Fernandes JR, Esteves NS, Müller VT, Alexandria DB, Pérez DIV, Slimani M, Brito CJ, Bragazzi NL, and Miarka B (2022) The Effect of Neurofeedback on the Reaction Time and Cognitive Performance of Athletes: A Systematic Review and Meta-Analysis. *Front Hum Neurosci*. 16, 868450

Cabarkapa, D., Cabarkapa, D., Ciccone, A., Whiting, S., Philipp, N., Eserhaut, D., & Fry, A. (2023). Acute influence of resistance exercise on basketball shooting mechanics and accuracy. Frontiers in Sports and Active Living, 5, 1272478. https://doi.org/10.3389/fspor.2023.1272478.

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: https://doi.org/10.60027/ijsasr.2025.6726

Campbell, D. T., Stanley, J. C., & Gage, N. L. (1963). *Experimental and quasi-experimental designs for research.* Houghton, Mifflin, and Company.

Cao, L. Z., He, H., Miao, X., & Chi, L. (2024). The contributions of executive functions to decision-making in sport. *International Journal of Sport and Exercise Psychology*, 1–20. https://doi.org/10.1080/1612197X.2024.2371483

Cao, S., Geok, S., Roslan, S., Sun, H., Lam, S., & Qian, S. (2022). Mental Fatigue and Basketball Performance: A Systematic Review. Frontiers in Psychology, 12, 819081. https://doi.org/10.3389/fpsyg.2021.819081.

Daub, B., McLean, B., Heishman, A., Peak, K., & Coutts, A. (2022). Impacts of mental fatigue and sport-specific film sessions on basketball shooting tasks. European Journal of Sport Science, 23, 1500 - 1508.

Donka, D. B., & Balogh, L. (2022). EXAMINATION OF EXECUTIVE FUNCTIONS AFFECTING SPORTS PERFORMANCE IN THE CONTEXT OF ATHLETE EXPERIENCE. *Stadium - Hungarian Journal of Sport Sciences*, *5*(1). https://doi.org/10.36439/shjs/2022/1/11318

Faulks, T., Sansone, P., & Boycott, S. (2024). A Systematic Review of Lower Limb Strength Tests Used in Elite Basketball. *Sports. 12*(9), 262; https://doi.org/10.3390/sports12090262

Fields, L., & Paone, D. (2020). Training Modality and Equivalence Class Formation under the Simultaneous Protocol: A Test of Stimulus Control Topography Coherence Theory. *The Psychological Record,* 70, 293-305.

Isorna-Folgar, M., Leirós-Rodríguez, R., López-Roel, S., & García-Soidán, J. (2022). Effects of a cognitive-behavioral therapy intervention on the rowers of the Junior Spain National Team. Healthcare, 10(12), 2357.

Jelsma, D., Renshaw, I., & Munzert, J. (2017). Biomechanical analysis of three-point shot in basketball. Periodicals of Engineering and Natural Sciences (PEN).9(2), 684-690. https://doi.org/10.21533/pen.v9i2.1838

Ko, Y., Kwak, D., Jang, E., Lee, J., Asada, A., Chang, Y., Kim, D., Pradhan, S., & Yilmaz, S. (2023). Using Experiments in Sport Consumer Behavior Research: A Review and Directions for Future Research. Sport Marketing Quarterly, 32, 33 - 46.

Kumar, R., & Amer, A. (2024). Mental arrangement in cognitive processes, processing information accurately, and performing the skill of shooting from both sides in basketball. Journal of Physical Education. 36(1), 197-185. https://doi.org/10.37359/JOPE.V36(1)2024.2060

Lucia, S., Bianco, V., Boccacci, L., & Di Russo, F. (2021). Effects of cognitive-motor training on anticipatory brain functions and sports performance in semi-elite basketball players. Brain Sciences, *12*(1), 68; https://doi.org/10.3390/brainsci12010068

Lucia, S., Digno, M., Madinabeita, I., & Di Russo, F. (2024). Integration of cognitive-motor dual-task training in physical sessions of highly-skilled basketball players. Jurnal Sport Science, 42(18), 1695-1705. https://doi.org/10.1080/02640414.2024.2408191

Lucia, S., Digno, M., Madinabeitia, I., & Di Russo, F. (2023). Testing a Multicomponent Training Designed to Improve Sprint, Agility, and Decision-Making in Elite Basketball Players. Brain Sciences, *13*(7), 984; https://doi.org/10.3390/brainsci13070984

Makaruk, H., Starzak, M., Płaszewski, M., & Winchester, J. (2022). Internal validity in resistance training research: A systematic review. Journal of Sports Science and Medicine, 21(2), 308-331.

Mancı, E., Herold, F., Günay, E., Güdücü, Ç., Müller, N., & Bediz, C. Ş. (2023). The influence of acute sprint interval training on the cognitive performance of male basketball players. International Journal of Environmental Research and Public Health. *20*(6), 4719; https://doi.org/10.3390/ijerph20064719

Riemann, B., Wilk, K., & Davies, G. (2023). Reliability of Upper Extremity Functional Performance Tests for Overhead Sports Activities. International Journal of Sports Physical Therapy, 18, 687 – 697.

Roca, A., Ford, P., & Memmert, D. (2020). Perceptual-cognitive processes underlying creative expert performance in soccer. Psychological Research, 85, 1146 - 1155.

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: **https://doi.org/10.60027/ijsasr.2025.6726**

Shiraz, S., Salimei, C., Aracri, M., Di Lorenzo, C., Farsetti, P., Parisi, A., Iellamo, F., Caminiti, G., & Perrone, M. (2024). The Effects of High-Intensity Interval Training on Cognitive and Physical Skills in Basketball and Soccer Players. Journal of Functional Morphology and Kinesiology, *9*(3), 112; https://doi.org/10.3390/jfmk9030112

Trecroci, A., Cavaggioni, L., Rossi, A., Moriondo, A., Merati, G., Nobari, H., Ardigò, L., & Formenti, D. (2022). Effects of speed, agility, and quickness training program on cognitive and physical performance in preadolescent soccer players. PLOS ONE, 17(12), e0277683. https://doi.org/10.1371/journal.pone.0277683.

Wang X, Soh KG, Samsudin S, Deng N, Liu X, Zhao Y, et al. (2023) Effects of high-intensity functional training on physical fitness and sport-specific performance among the athletes: A systematic review with meta-analysis. PLoS One. 19(2), e0299281. https://doi.org/10.1371/journal.pone.0295531.

Wang, D., Taek, J., & Wang, S. (2023). Combined training and explosive strength in basketball players' lower limbs. Revista Brasileira de Medicina do Esporte. 29(6). https://doi.org/10.1590/1517-8692202329012022_0572

Yamane, T. (1973). *Statistics: An introductory analysis (3rd ed.).* Harper & Row.

Yang, L., Tian, Y., & Wang, Y. (2024). Noisy condition and three-point shot performance in skilled basketball players: the limited effect of self-talk. Frontiers in Sports and Active Living, 5, 1-10. https://doi.org/10.3389/fspor.2023.1304911

Zhang, M., Miao, X., Rupčić, T., Sansone, P., Vencúrik, T., & Li, F. (2023). Determining the Relationship between Physical Capacities, Metabolic Capacities, and Dynamic Three-Point Shooting Accuracy in Professional Female Basketball Players. Applied Sciences. *13*(15), 8624; https://doi.org/10.3390/app13158624

Zhao, X., Zhao, C., Liu, N., & Li, S. (2024). Investigating the eye movement characteristics of basketball players executing 3-point shots at varied intensities and their correlation with shot accuracy. Peer J. 12, e17634. http://doi.org/10.7717/peerj.17634

Zhu, R., Zheng, M., Liu, S., Guo, J., & Cao, C. (2024). Effects of Perceptual-Cognitive Training on Anticipation and Decision-Making Skills in Team Sports: A Systematic Review and Meta-Analysis. Behavioral Sciences, *14*(10), 919; https://doi.org/10.3390/bs14100919

Citation Li, Y., Leethong-in, P., & Tongdecharoen, W. (2025). Effects of Intervention Program for Youth Basketball Players on Three-Point Shooting and Cognitive Ability. International Journal of Sociologies and Anthropologies Science Reviews, 5 (5), 75-86; DOI: **https://doi.org/10.60027/ijsasr.2025.6726**