DOI: 10.4025/jphyseduc.v36i1.3613

Original Article

IMPACT OF AN 18-WEEK BASKETBALL PROGRAM ON FITNESS OUTCOMES: A CLUB-BASED (BPCM) APPROACH FOR FEMALE STUDENTS

EFEITOS DE UM PROGRAMA DE BASQUETE DE 18 SEMANAS SOBRE O DESEMPENHO FÍSICO DE ESTUDANTES DO SEXO FEMININO: UMA ABORDAGEM BASEADA NO PROGRAMA DE BASQUETE MODELO CLUBE (BPCM)

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RESUMO

Introdução: Programas inovadores de educação física são cruciais para atender às necessidades de condicionamento físico dos alunos e explorar novas metodologias de treinamento. Este estudo investigou a eficácia de um programa de basquete estruturado em clube nos resultados de condicionamento físico em estudantes universitárias do sexo feminino em comparação com as aulas tradicionais de educação física. Métodos: Sessenta e uma estudantes saudáveis da Universidade de An Giang-Universidade Nacional do Vietnã-Cidade de Ho Chi Minh foram aleatoriamente designadas para um grupo experimental participando de um Programa de Basquete Modelo Clube de 18 semanas ou um grupo de controle continuando o curso regular de educação física. Cinco testes físicos avaliaram os resultados: abdominais em 30 segundos, corrida de 30 metros, corrida de vai e vem de 4 x 10 metros, salto em distância e uma corrida de 5 minutos para velocidade aeróbica máxima. Resultados: O grupo experimental demonstrou melhorias significativas em velocidade (aumento de 6,13%), agilidade e VAM (aumento de 23,56%) em comparação com o grupo de controle. O grupo de controle mostrou melhora mínima, com um aumento de 1,88% na velocidade e um aumento de 6,84% na VAM. Não foram observadas diferenças significativas entre os grupos para explosão de membros inferiores ou força do core. Discussão: O PBCM provou ser mais eficaz do que a educação física tradicional em aprimorar parâmetros específicos de condicionamento físico, sugerindo que o formato de clube pode fornecer um ambiente mais envolvente e motivador para o desenvolvimento do condicionamento físico. A falta de resultados significativos em explosão de membros inferiores e força do core justifica investigação adicional e possíveis modificações no programa. Conclusão: A implementação do PBCM é promissora para melhorar os níveis de condicionamento físico das alunas da Agu-VNU-HCM, promovendo uma experiência de educação física mais envolvente e aumentando a satisfação das alunas. Pesquisas futuras devem explorar os efeitos de longo prazo do programa e o potencial de adaptação em diversas populações estudantis.

Palavras-chave: Educação física, Programa de basquetebol, Melhoria do condicionamento físico, Modelo de clube, Estudantes do sexo feminino.

ABSTRACT

Introduction: Innovative physical education programs are crucial for addressing student fitness needs and exploring novel training methodologies. This study investigated the effectiveness of a club-structured basketball program on fitness outcomes in female university students compared to traditional PE classes. Methods: Sixty-one healthy female students from An Giang University-Vietnam National University-Ho Chi Minh City (Agu-VNU-HCM) were randomly assigned to either an experimental group participating in an 18-week Basketball Program Club Model (PBCM) or a control group continuing regular PE coursework. Five fitness tests assessed outcomes: 30-second sit-ups, 30-meter sprint, 4 x 10-meter shuttle run, long jump, and a 5-minute run for maximal aerobic speed (MAS). Results: The EG demonstrated significant improvements in speed (6.13% increase), agility, and MAS (23.56% increase) compared to the CG. The CG showed minimal improvement, with a 1.88% increase in speed and a 6.84% increase in MAS. No significant differences were observed between groups for leg explosiveness or core strength. Discussion: The BPCM proved more effective than traditional PE in enhancing specific fitness parameters, suggesting that the club format may provide a more engaging and motivating environment for fitness development. The lack of significant findings in leg explosiveness and core strength warrants further investigation and potential program modifications. Conclusion: Implementing the BPCM holds promise for improving the fitness levels of Agu-VNU-HCM students, fostering a more engaging PE experience, and increasing student satisfaction. Further research should explore the program's long-term effects and potential for adaptation across diverse student populations.

Keywords: Physical Education. Basketball Program. Fitness Improvement. Club Model. Female Students.

Introduction

Future workers are college students, crucial for the nation's development, industrialization, and innovation. Improving their physical fitness is important for maintaining a vital workforce and raising living standards[1]. Herophilus, the founder of scientific anatomy, stated, "Without health and fitness, riches are without worth, knowledge is meaningless, art cannot become evident, and music cannot be sung".

Achieving this goal requires careful control of exercise, relaxation, food, and frequent medical care. The club model of physical education in schools promotes a healthy training environment, enhances physical fitness, and inspires students. However, PE curriculum still emphasize academics and offer limited options[2]. Thus, physical education aims to improve students' physical prowess, stamina, abilities, and social interaction[3].

There is insufficient longitudinal research, assessment tests in conditions requiring maximal effort[4], position-playing studies[5], and real-time movement investigations to apply basketball training programs effectively. Physical ability and skill-related fitness are critical for competitive performance in basketball. Coaches seek effective methods to help players acquire these fitness components. Creating a strong training program based on each activity's unique physiological requirements is essential[6] .

Understanding if pairing PE lectures with a club model training regimen suitable and impacts students' sports engagement frequency is crucial. However, creating such programs faces challenges, including limited facilities, lack of board interest, insufficient student assessments, and a shortage of qualified trainers[7]. Despite these challenges, adopting this approach offers students more opportunities to improve academically and physically within regular study schedules, fostering a conducive training environment. Basketball is a favored team sport among Agu-VNU-HCM students.

Exercise science research has provided recommendations for creating secure and effective programs to increase individual fitness[8]. A single curriculum for all students is impractical due to their full-time study plans and varying demands. Many students need to work out harder in PE classes, so a training schedule should follow the club model, requiring less competition preparation time. This study aims to establish a new basketball training program for female students at Agu-VNU-HCM based on the club model to meet this demand.

The study assessed the effectiveness of a basketball club program on female students' fitness levels at Agu-VNU-HCM after an 18-week period.

Describe the method of research, study, or analysis applied to the problem.

The study employed a randomized controlled trial design, with 61 healthy female university students randomly allocated to either an experimental group or a control group. The EG participated in a novel 18-week basketball program structured using a club model, while the CG continued their standard physical education curriculum. To assess the intervention's impact on fitness, five standardized tests were administered: a 30-second sit-up test for abdominal endurance, a 30-meter sprint for acceleration, a 4 x 10-meter shuttle run for agility, a standing long jump for lower body power, and a 5-minute run to determine MAS.

Methods

Participants

The study sample comprised 61 healthy female students enrolled in a basketball course at An Giang University-Vietnam National University-Ho Chi Minh City. Inclusion criteria included no history of smoking, alcohol consumption, prescription medication use, or current illness. All participants provided written informed consent after receiving a comprehensive explanation of the study protocols, adhering to ethical guidelines approved by VNU-HCM.

Participants were randomly allocated to either an experimental group (n=31), receiving an 18-week intervention utilizing a novel club-based basketball program, or a control group (n=30), continuing with the standard VNU-HCM physical education basketball curriculum.

Importantly, both groups were instructed to maintain their typical diet and exercise habits throughout the study duration to control for outside influences on fitness outcomes.

Procedures:

Pre-Intervention Assessments

Two weeks before the intervention, all participants completed a baseline questionnaire collecting personal information and history of sports-related injuries. Participants with any reported issues during this assessment were excluded from the study. One week later, baseline fitness assessments were conducted for all participants (pre-test).

Fitness Assessments

Two weeks before the intervention, all participants completed a baseline questionnaire collecting personal information and history of sports-related injuries. Participants with any reported issues during this assessment were excluded from the study[9]. One week later, baseline fitness assessments were conducted for all participants (pre-test), consisting of five standardized tests selected for their relevance to basketball and suitability for evaluating amateur athletes[10,11,12] .

The fitness tests included the Standing Long Jump to assess leg explosive power, Standing Sit-Up to measure core strength, 30-Meter Sprint to evaluate speed, 4 x 10-Meter Shuttle Run to assess agility, and 5-Minute Run to determine maximum aerobic speed[10,13,14].

Intervention and Analysis

Intervention Protocol: Both groups participated in 18 weeks of basketball instruction under standardized conditions, including training duration, facility, weather, and environment. Sessions took place weekly on Mondays from 7:00 to 8:30 a.m., aligning with the existing physical education program schedule. The control group followed the standard PE basketball curriculum, emphasizing physical conditioning, dribbling, and shooting skills in preparation for final evaluations. Conversely, the experimental group participated in the novel Basketball Program Club Model, structured around four key components:

- Fitness: Progressive training regimens designed to enhance overall physical fitness.
- Proficiency: Development of fundamental basketball skills through integrated drills and technique-focused exercises, including tip-ins, lay-ups, blocks, rebounds, and spins.
- Strategy: Implement tactical elements such as man-to-man defense, triangle defense, and fast breaks.
- Supplementary Instruction: Sessions dedicated to enhancing mental preparedness for competitions and familiarizing participants with official game regulations.

Post-Intervention Assessments and Analysis: Following the 18-week intervention, all participants underwent a post-test identical to the pre-test to assess changes in fitness parameters. Data were analyzed using SPSS version 20.0. Descriptive statistics characterized the sample, while independent samples t-tests compared between-group differences in fitness outcomes. Paired samples t-tests examined within-group changes from pre-test to post-test. Statistical significance was set at $p < 0.05$.

Table 1. Structure and Content of the 18-Week Basketball Program Club Model Intervention

Weeks	H	T	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	T
1. Fitness training																					

Agility						Td	Td	Td	Td	Td	Td								
Cooperation								Td	Td	Td	Td	Td	Td	Td	Td	Td	Td	Td	
Endurance			Td	Td	Td	Td	Td	Td	Td										
Flexibility						Td	Td	Td	Td										
Mixed training									Td	Td	Td	Td	Td	Td	Td	Td	Td	Td	
Reaction time								Td	Td	Td	Td								
Speed			Td	Td	Td	Td	Td												
Strength					Td	Td	Td												
2. Skill																			
Dribble-pass control			Td	Td	Td	Td	Td	Td	Td										
Jump-shot														Td	Td	Td	Td		
Lay-up and block											Td	Td	Td	Td	Td				
Mixed training														Td	Td	Td	Td	Td	
Personalization				Td	Td	Td	Td	Td	Td	Td	Td	Td							
3. Tactic																			
Defensive								Td	Td	Td	Td								
Individuals						Td	Td	Td	Td	Td	Td								
Mixed training																			
Offensive										Td	Td	Td	Td	Td	Td				
4. Other training																			
Rules			Td	Td	Td	Td	Td												
Mental training	Td	Td	Td	Td															Td

Note: Td = Testing days; Shaded areas = Instructional days; H = Initial physical assessment; T = Post-intervention testing.
Source: Authors.

Results

Baseline Characteristics and Pre-Intervention Fitness Comparisons.

The study sample consisted of 61 healthy female students with a mean age of 19.81 years (SD = 0.58), a mean height of 158.76 cm (SD = 4.72), and a mean weight of 47.92 kg (SD = 5.76). No participants were excluded during the study.

Before the 18-week basketball training intervention, baseline assessments revealed no significant differences in fitness parameters between the control group and the experimental group. As detailed in Table 2, the average age, height, and weight were comparable between the CG (19.87 years, 157.81 cm, and 48.06 kg, respectively) and the EG (20.01 years, 157.68 cm, and 48.12 kg, respectively).

Table 3 further illustrates the homogeneity of the groups at baseline across all five fitness tests: 30-second sit-up test 30-meter sprint test 4 x 10-meter shuttle run test standing long jump test, and 5-minute run test for maximal aerobic speed. The absence of statistically significant differences in pre-intervention fitness levels between the CG and EG confirms the groups' comparability and supports the implementation of the distinct 18-week training plans.

Fitness Test Abbreviations:(S30) 30-m Sprint (s); (SU30) 30-s Sit-Up Test repetitions (times); (SR4) 4 x 10-meter Shuttle Run Test (s); (5-min Run) 5-minute Run (m); (SLJ) Standing Long Jump (cm).

Table 2. Qualities of the subjects (n = 61)

	Height (cm		Weight (kg)		Age (years)	
	M	SD	M	SD	M	SD
CG; n = 30	157.81	4.51	48.06	3.99	19.87	0.74
EG; n = 31	157.68	3.96	48.12	6.82	20.01	0.53
All (n = 61)	158.76	4.72	47.92	5.76	19.81	0.58

Source: Authors

Table 3. Before the experiment, the control and experimental groups had different means.

Tests	CG		EG		t	p
	M	SD	M	SD		
S30	5.92	0.52	6.05	5.35	0.088	0.742
SU30	15.75	1.43	15.88	15.18	-0.205	0.607
SR4	12.2	0.46	12.33	11.63	0.202	0.65
5-min Run	772.63	37.41	772.76	772.06	-0.142	0.752
SLJ	169.72	14.88	169.85	169.15	-0.274	0.805

Source: Authors.

Female pupils enrolled in PE programs were subjected to all basketball fitness tests at Agu-VNU-HCM before and after the implementation of the two training programs showed improvement in both the EG and the CG. Studies by several authors, including[15,16,17,18,19,20], confirm this rise.

Table 4. Pre- and post-test mean variations in both groups

	Tests	Pre-test		Post-test		t	P	V%
		M	SD	M	SD			
	S30	5.92	0.52	5.81	0.39	0.93	.000	**-1.88**
	SU30	15.75	1.43	15.42	0.91	1.07	.002	**-2.12**
CG	*SR4*	12.2	0.46	12.02	0.33	1.74	.000	**-1.49**
	5-min Run	772.63	37.41	827.32	40.64	-5.42	.000	**6.84**
	SLJ	169.72	14.88	175.11	9.85	-1.65	.000	**3.13**
	S30	6.05	0.35	5.69	0.39	3.76	.000	**-6.13**
	SU30	15.88	15.18	15.28	0.91	0.22	.004	**-3.85**
EG	SR4	12.33	11.63	11.73	0.33	0.28	.000	**-4.99**
	5-min Run	772.76	42.06	979.16	40.42	-19.38	.000	**23.56**
	SLJ	169.85	19.15	189.25	9.85	-4.93	.000	**10.80**

Notes: The mean (M), standard deviation (SD), (V%) percentage of change, and value are used to represent the values.
Source: Authors.

In both the CG and EG, The mean difference between the students' fitness levels before and after the test is shown in Table 4 (before and after the 18-week training program was administered). The results showed a significant change between the pre-test and post-test in all fitness indices for (CG and EG). This implies that both of these fitness enhancement courses are appropriate for female students at Agu - VNU-HCM. Additionally, while speed, endurance, and MAS rose in the EG at higher rates than in the CG, speed, endurance, and MAS increased at the highest rates achievable (Figure 1 provides more details).

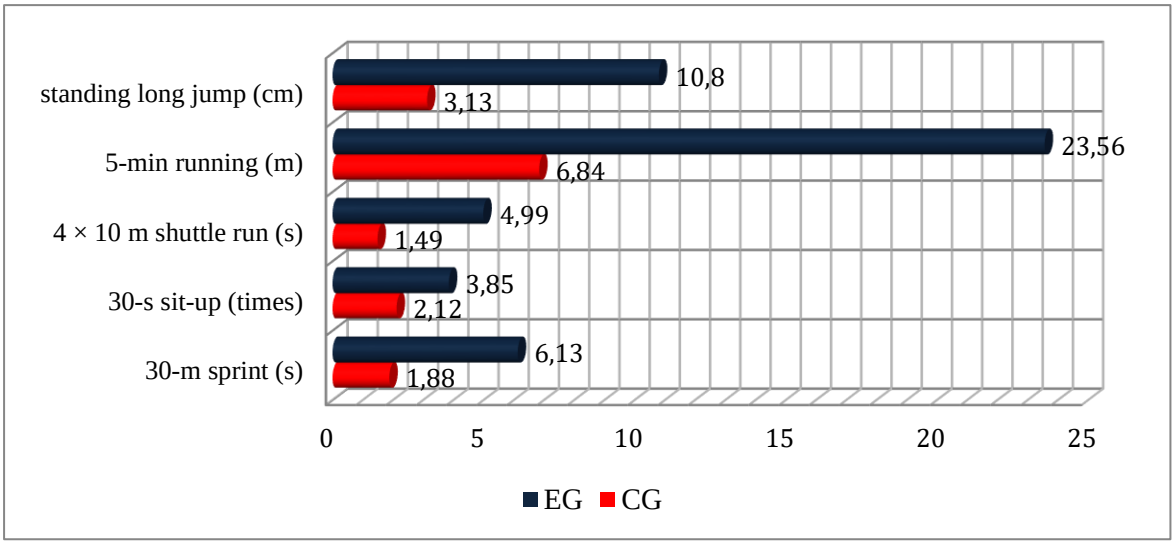

Figure 1. Changes in both groups' percentages following the experiment
Source: Authors.

Table 5 displays the fitness differences between the EG and CG student groups following the 18-week training course at Agu-VNU-HCM. The explosive power of the legs and core strength (30-s sit-up test) did not significantly differ between the EG and CG, but agility (shuttle run 4×10-m), speed (sprint 30-m), and MAS (running 5-min) did (standing broad jump test).

Table 5: Following the experiment, shows the mean differences between the EG and CG.

Tests	**CG**		**EG**		t	p
S30	5.81	0.39	5.69	0.39	1.19	.015
SU30	15.42	0.91	15.28	0.91	0.60	.205
SR4	12.02	0.33	11.73	0.33	3.40	.002
5-min Run	827.32	40.64	979.16	40.42	-14.51	.000
SLJ	175.11	9.85	189.25	9.85	-5.56	.018

Source: Authors.

According to Table 5's findings, the EG outperformed the CG in terms of speed, agility, and MAS following the administration of BPCM. One of the sports with the highest rates of speed is basketball. Basketball players must thus be fit for speed and agility to enhance their footwork during tournaments. Additionally, it was crucial for reducing the number of player injuries[19]. In addition, basketball players must be able to shift direction quickly based on the circumstances of the game while maintaining a constant focus on their opponent or the ball[21]. Therefore, increasing speed and agility is a must for every basketball training program[22]. BPCM satisfied the increasing need for training for female students at Agu-VNU-HCM and achieved

outcomes in speed and agility fitness that were superior to those of the present program in this research. The experimental group's participants were given more encouragement to run and move when the training program was put into practice, which accounts for their superior performance in terms of speed, agility, and MAS indices compared to the control group's individuals. These discrepancies could arise due to the integration of conditioning exercises (including campus and on-court jogging), targeted scenario-based drills (within skill training sessions), and positional strategies implemented during tactical training sessions. Additional information is available in Table 1.

Discussion

The primary objective was to evaluate the effectiveness of a basketball club program on the fitness levels of female students at Agu-VNU-HCM. The results demonstrated significant improvements in speed, agility, and MAS in the EG compared to the CG, aligning with the objective of enhancing physical fitness through an innovative training model.

Strong trunk muscles, essential for basketball players, were not significantly improved in our study. This aligns with Lehnert et al[23] and Erculj et al[24], who noted limited improvements in explosive strength and agility in lower-trained athletes. Similar to Fort et al[25] and Asadi [26], our findings indicate that specific training regimens can yield gains in physical performance metrics like power and agility, though our results differ due to the participants' initial low physical condition.

Our study's unique finding is the significant increase in MAS due to the BPCM, which is essential for basketball players to effectively manage energy during sport-specific activities and recover quickly from anaerobic loads[27]. This improvement was not observed in the CG, indicating the superior efficacy of the BPCM in enhancing aerobic fitness. Additionally, the study provided the first evidence of the BPCM's effectiveness for female basketball players at Agu-VNU-HCM, despite their initial unfamiliarity and occasional fatigue with the new training methods.

While previous studies have explored various training methods, our research focused on the practical application of the BPCM within a university setting, addressing the specific needs and conditions of female students at Agu-VNU-HCM. This study bridges the gap between theoretical knowledge and practical implementation, providing a tailored approach to improve students' fitness alongside their academic commitments.

Our findings suggest that the BPCM significantly improves aerobic fitness, speed, and agility in female basketball players. These results align with previous research highlighting the importance of tailored training regimens for enhancing physical performance. Despite the initial challenges, the BPCM proved more effective than the traditional PE curriculum in meeting the training needs of Agu-VNU-HCM students. To maximize these benefits, we recommend increasing the number of PE classes based on the BPCM and grouping students according to their training levels in the upcoming academic year. This approach will ensure students receive appropriate training intensity, fostering a conducive environment for both academic and physical development.

Conclusion

The study aimed to evaluate the effectiveness of an 18-week basketball instructional program, utilizing the club framework, on the fitness levels of female students at Agu-VNU-HCM. The results demonstrated significant improvements in speed, agility, and MAS in the EG compared to the CG. Specifically, the EG showed superior performance in the 30-meter sprint, 4×10-meter shuttle run, and 5-minute running tests, indicating enhanced speed, agility, and

aerobic capacity. These findings suggest that the BPCM is more effective than traditional physical education curricula in improving specific fitness parameters essential for basketball.

The study's unique contribution lies in the significant increase in MAS observed in the EG, which is crucial for managing energy and recovery during basketball activities. This enhancement was not seen in the CG, underscoring the efficacy of the BPCM. Additionally, the program provided tailored training that met the specific needs of female basketball players at Agu-VNU-HCM, demonstrating practical application within a university setting.

While the BPCM significantly improved speed and agility, it did not yield substantial gains in core strength, aligning with previous research on the limited improvement in explosive strength among lower-trained athletes. Despite initial challenges and unfamiliarity with the new training methods, the program proved beneficial for the students' fitness development.

Based on these results, it is recommended to increase the number of physical education classes employing the BPCM and to group students according to their training levels to maximize training intensity and effectiveness. This approach will help create a balanced environment for both academic and physical development, ensuring comprehensive fitness enhancement for female students.

The 18-week basketball instructional program, conducted within the framework of the club, has demonstrated its efficacy in enhancing the fundamental fitness attributes essential for optimal basketball performance. This program has thus emerged as a valuable addition to the physical education curriculum at Agu-VNU-HCM.

Contributions of authors

The article was prepared, written, and corrected by Dao Chanh Thuc (the corresponding author), with assistance from coauthor Ha Minh Diu. The last iteration of the article was authorized by both writers. On the presentation's sequence, both writers were in agreement.

Ethical endorsement

All procedures conducted in this research adhered to the principles outlined in the 1964 Helsinki Declaration and its subsequent revisions, or equivalent ethical standards, along with meeting the ethical guidelines set forth by the institutional and/or national research committee.

Competing interests

The authors affirm that there are no conflicts of interest that may be taken to prevent this paper from being published.

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Acknowledgements: The authors express their sincere gratitude to the students of An Giang University - VNU-HCM, Vietnam who generously participated in this research. We extend our appreciation to the AGU-VNU-HCM administration, faculty, and staff for their invaluable support throughout this project. We also thank all individuals who contributed to the successful completion of this study.

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Editor: Carlos Herold Junior.
Received on Aug 13, 2024.
Reviewed on Sep 17, 2024.
Accepted on Sep 22, 2024.

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