



CLASS-INTEGRATED FITNESS TRAINING AND HEALTH-RELATED FITNESS IN STUDENTS AT THE UNIVERSITY OF FINANCE - MARKETING

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Abstract:

This study examined the effects of an integrated physical fitness program embedded within Physical Education classes on selected health-related fitness components among students at the University of Finance - Marketing. A quasi-experimental pre-test-post-test design was employed with 80 first-year students, including 40 students in the experimental group and 40 in the control group. Both groups participated in regular Physical Education classes twice per week for 10 weeks, while the experimental group additionally completed a brief circuit-based fitness routine consisting of jumping jacks, bodyweight squats, push-ups, and plank exercises. Three health-related fitness components were assessed before and after the intervention, including cardiovascular endurance, flexibility, and muscular strength. The results showed that the experimental group achieved greater improvements than the control group across all variables. Cardiovascular endurance increased from 32.45 ± 4.21 to 38.70 ± 4.56 laps in the experimental group, compared with an increase from 32.10 ± 4.08 to 34.05 ± 4.19 laps in the control group. Flexibility improved from 20.35 ± 5.12 cm to 25.82 ± 4.88 cm in the experimental group, whereas the control group improved from 20.02 ± 5.06 cm to 21.43 ± 4.91 cm. Muscular strength rose from 18.60 ± 4.32 to 22.48 ± 4.41 repetitions in the experimental group, while the control group increased from 18.25 ± 4.11 to 19.63 ± 4.07 repetitions. After controlling for pre-test scores, ANCOVA results indicated significant between-group differences in cardiovascular endurance, flexibility, and muscular strength. These findings suggest that integrating a short and structured physical fitness circuit into regular university Physical Education classes may be an effective and feasible strategy for improving students' health-related fitness.

Keywords: Physical Education; university students; health-related fitness; cardiovascular endurance; flexibility; muscular strength; intervention program

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1. Introduction

Health-related fitness has become an increasingly important issue in higher education because university students are often exposed to prolonged sitting, academic pressure, irregular exercise habits, and reduced participation in organized physical activity. Regular physical activity contributes to improvements in cardiorespiratory fitness, muscular fitness, and general health, whereas sedentary behavior is associated with poorer physical outcomes.

Among the components of health-related fitness, cardiovascular endurance, flexibility, and muscular strength are especially relevant in educational settings because they can be assessed using low-cost field tests and can respond to repeated training exposure. These characteristics make such tests suitable for intervention studies conducted in university environments.

The present study adapted the logic of a class-integrated fitness intervention to the context of students at the University of Finance - Marketing, where Physical Education is a compulsory subject and therefore offers a realistic platform for health-oriented exercise integration.

The study aimed to examine the effects of an integrated physical fitness program within Physical Education classes on selected health-related fitness components among students at the University of Finance - Marketing.

2. Methods

This study employed a quasi-experimental pre-test-post-test design with an experimental group and a control group. The participants consisted of 80 first-year students enrolled in compulsory Physical Education classes at the University of Finance - Marketing. They were divided into two groups: the experimental group (n = 40) and the control group (n = 40).

Both groups attended regular Physical Education classes twice per week for 10 weeks. The control group followed the usual curriculum only. The experimental group followed the same curriculum but additionally performed a short physical fitness circuit immediately after the warm-up segment of each session.

The circuit consisted of four exercises: jumping jacks, bodyweight squats, push-ups, and plank hold. Each exercise was performed for 30 seconds, followed by 15 seconds of rest. Students completed two rounds in the early phase of the intervention and progressed to three rounds in the later weeks. The total additional training time was approximately 12-15 minutes per session.

Three fitness components were assessed before and after the intervention: cardiovascular endurance, flexibility, and muscular strength. Descriptive statistics were used to summarize the data. Independent-samples t-tests were conducted to examine baseline equivalence between groups. Paired-samples t-tests were used to assess within-group changes from pre-test to post-test. ANCOVA was then applied to compare post-

test scores between groups while controlling for pre-test scores. Statistical significance was set at $p < .05$.

3. Results

At pre-test, the experimental group and the control group showed similar mean values across the three fitness variables. At post-test, however, the experimental group demonstrated greater gains in cardiovascular endurance, flexibility, and muscular strength.

Table 1: Descriptive statistics of pre-test and post-test scores in the experimental and control groups

Variable	Group	Pre-test (M ± SD)	Post-test (M ± SD)	Mean change
Cardiovascular endurance (laps)	Experimental	32.45 ± 4.21	38.70 ± 4.56	+6.25
	Control	32.10 ± 4.08	34.05 ± 4.19	+1.95
Flexibility (cm)	Experimental	20.35 ± 5.12	25.82 ± 4.88	+5.47
	Control	20.02 ± 5.06	21.43 ± 4.91	+1.41
Muscular strength (repetitions/min)	Experimental	18.60 ± 4.32	22.48 ± 4.41	+3.88
	Control	18.25 ± 4.11	19.63 ± 4.07	+1.38

Table 1 presents the descriptive statistics of pre-test and post-test scores in the experimental and control groups. The results show that, at the pre-test stage, the two groups had relatively similar mean scores across all three fitness variables: cardiovascular endurance, flexibility, and muscular strength. This indicates that the initial fitness levels of the two groups were generally comparable.

After the 10-week intervention, both groups showed improvement. However, the experimental group demonstrated clearly greater gains than the control group. Specifically, cardiovascular endurance in the experimental group increased from 32.45 ± 4.21 to 38.70 ± 4.56 laps, with a mean increase of +6.25 laps, whereas the control group increased by only +1.95 laps. Flexibility in the experimental group improved by +5.47 cm, which was much higher than the +1.41 cm observed in the control group. Similarly, muscular strength in the experimental group increased by +3.88 repetitions per minute, compared with +1.38 repetitions per minute in the control group. These findings initially suggest that the fitness training program integrated into Physical Education classes produced greater improvements in the experimental group.

Table 2: Independent-samples t-test results for baseline differences between groups

Variable	Experimental (M ± SD)	Control (M ± SD)	t	p
Cardiovascular endurance	32.45 ± 4.21	32.10 ± 4.08	0.377	.707
Flexibility	20.35 ± 5.12	20.02 ± 5.06	0.289	.773
Muscular strength	18.60 ± 4.32	18.25 ± 4.11	0.370	.712

Table 2 presents the results of the independent-samples t-test used to compare baseline differences between the experimental and control groups. The results indicate that there were no statistically significant differences between the two groups in any of the three variables, as all p-values were greater than .05.

Specifically, cardiovascular endurance had a value of $p = 0.707$, flexibility had $p = 0.773$, and muscular strength had $p = 0.712$. These results confirm that, before the intervention, the two groups had equivalent initial fitness levels. This is an important condition for ensuring that any post-intervention changes can be attributed to the intervention program rather than to pre-existing differences between the groups.

Table 3: Paired-samples t-test results for within-group changes from pre-test to post-test

Variable	Group	Pre-test (M ± SD)	Post-test (M ± SD)	t	p
Cardiovascular endurance	Experimental	32.45 ± 4.21	38.70 ± 4.56	-10.842	< .001
	Control	32.10 ± 4.08	34.05 ± 4.19	-4.126	< .001
Flexibility	Experimental	20.35 ± 5.12	25.82 ± 4.88	-9.537	< .001
	Control	20.02 ± 5.06	21.43 ± 4.91	-3.284	.002
Muscular strength	Experimental	18.60 ± 4.32	22.48 ± 4.41	-8.116	< .001
	Control	18.25 ± 4.11	19.63 ± 4.07	-2.917	.006

Table 3 presents the paired-samples t-test results used to examine within-group changes from pre-test to post-test. The results show that both the experimental group and the control group achieved statistically significant improvements in all three variables, as all p-values were lower than .05.

In the experimental group, cardiovascular endurance improved significantly with $t = -10.842$, $p < .001$; flexibility improved with $t = -9.537$, $p < .001$; and muscular strength improved with $t = -8.116$, $p < .001$. In the control group, improvements were also statistically significant but smaller in magnitude: cardiovascular endurance $t = -4.126$, $p < .001$, flexibility $t = -3.284$, $p = .002$, and muscular strength $t = -2.917$, $p = .006$.

These findings indicate that regular Physical Education classes can also contribute to certain improvements in students' fitness. However, when a short, structured, and regularly repeated fitness training program is added, the improvement becomes more pronounced.

Table 4: ANCOVA results for post-test differences between groups controlling for pre-test scores

Variable	F	p	Partial η^2
Cardiovascular endurance	24.816	< .001	.244
Flexibility	19.372	< .001	.201
Muscular strength	11.458	.001	.130

Table 4 presents the ANCOVA results comparing post-test scores between the two groups after controlling for pre-test scores. The results show statistically significant differences between the experimental and control groups in all three fitness variables.

Specifically, cardiovascular endurance showed $F = 24.816$, $p < .001$, $\text{Partial } \eta^2 = .244$; flexibility showed $F = 19.372$, $p < .001$, $\text{Partial } \eta^2 = .201$; and muscular strength showed $F = 11.458$, $p = .001$, $\text{Partial } \eta^2 = .130$. These values indicate that the intervention program had a positive effect on all three health-related fitness components. Among them, the strongest intervention effect was observed in cardiovascular endurance, followed by flexibility, while the effect on muscular strength was comparatively smaller.

4. Discussion

The findings indicate that students in the experimental group improved more than those in the control group across cardiovascular endurance, flexibility, and muscular strength. These results suggest that adding a short and structured exercise circuit to regular class sessions can generate meaningful improvements in health-related fitness, even when the total training time is relatively limited.

The strongest intervention effect was found in cardiovascular endurance. The experimental group improved by 6.25 laps, whereas the control group improved by only 1.95 laps. This pattern suggests that repeated dynamic movement performed at moderate to vigorous intensity can stimulate cardiorespiratory adaptation over time.

Flexibility also improved substantially in the experimental group, with a gain of 5.47 cm compared with 1.41 cm in the control group. Muscular strength increased significantly as well, although its effect size was smaller than those of cardiovascular endurance and flexibility. This pattern is reasonable because a brief equipment-free program often produces faster gains in movement tolerance and mobility than in maximal strength.

From a practical perspective, the findings support a feasible teaching model for the University of Finance - Marketing. Since many students may not participate in organized exercise outside class, embedding a 12-15 minute fitness circuit into standard lessons may provide an efficient strategy for improving physical fitness across a broad student population.

5. Conclusion

This study investigated the effects of an integrated physical fitness program within Physical Education classes on selected health-related fitness components among students at the University of Finance - Marketing. After 10 weeks of intervention, the experimental group demonstrated better outcomes than the control group in cardiovascular endurance, flexibility, and muscular strength.

Among the three fitness components, cardiovascular endurance showed the strongest response to the intervention, followed by flexibility and muscular strength. These results indicate that a brief circuit-based training routine added to regular Physical Education lessons can serve as an effective and feasible strategy for improving student fitness in a university context.

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Conflict of Interest Statement

The author declares that there are no conflicts of interest regarding the publication of this paper.

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Le Huu Trieu is a lecturer at the Center for Physical Education, University of Finance – Marketing, Vietnam. He is involved in teaching physical education courses, including bodybuilding, basketball, athletics, and other sports-related subjects. His research interests focus on physical education, student fitness development, extracurricular sports activities, sports training, and the improvement of health-related physical fitness among university students. He has participated in teaching, training, and academic activities related to university physical education and student sports development.

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