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Effects of physical education interventions on physical fitness and mental health among university students with poor physical fitness at Can Tho University

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Abstract
Objective: To evaluate physical fitness and self-reported mental health outcomes associated with differentiated physical education measures for university students with poor physical fitness.
Methods: The dissertation reports an intervention and comparison group (80 students each), with sex-stratified physical fitness testing, mental health questionnaires and student evaluations. Selected post-intervention measures are reported descriptively.
Results: The intervention group had more favorable mean outcomes in flexibility, muscular strength, speed, agility and running endurance for both male and female students. Selected mental health item scores and student evaluations were also higher in the intervention group.
Conclusions: The results suggest that differentiated physical education may be a suitable approach for students with poor physical fitness. Complete baseline comparisons, statistical verification, and study dates require confirmation before publication.

Keywords: Physical education, intervention, physical fitness, mental health, university students, Vietnam

Introduction

Physical education plays a fundamental role in promoting physical fitness, mental well-being, and healthy lifestyles among university students. Regular participation in physical activity can contribute to cardiovascular endurance, muscular strength, flexibility, and overall physical functioning. Physical activity is also associated with psychological well-being and stress reduction. The World Health Organization (2020) [5] recommends regular physical activity to support health and reduce risks associated with sedentary behavior. Nevertheless, university students may experience academic pressures, changes in lifestyle and reduced opportunities for exercise. These challenges are especially relevant to students with poor physical fitness, who may encounter difficulties meeting the requirements of conventional physical education programs.

Students with poor physical fitness deserve particular consideration because physical limitations can affect their participation, confidence, and engagement in sports. Conventional physical education programs frequently use common instructional content and assessment criteria, which may not sufficiently accommodate individual differences in exercise capacity. Differentiated instruction, achievable performance goals and supportive teaching may offer a more inclusive alternative. Previous evidence has identified a relationship between physical activity and mental health (Biddle & Asare, 2011) [1], while reviews have described broader health benefits of exercise (Warburton & Bredin, 2017) [4]. However, evidence from other populations should not automatically be assumed to establish similar effects in students with poor physical fitness.

At Can Tho University, preliminary assessments reported in the source dissertation identified students whose physical fitness performance was below the reference standards applied in the study. A detailed baseline assessment of 160 students, including 48 males and 112 females, showed limitations in muscular strength, flexibility, speed, agility and cardiovascular endurance. Questionnaire responses also suggested psychological and emotional difficulties. In response, the researchers developed and selected physical education measures intended to modify teaching methods, instructional content, assessment and health education support. The resulting intervention approach sought to align teaching activities with students' physical capacities and to encourage positive participation experiences.

Although systematic reviews support physical activity programs for university students (Plotnikoff *et al*., 2015) [2], evidence for differentiated physical education interventions among students specifically identified as having poor physical fitness remains limited in the context of Can Tho University. The present study therefore aimed to evaluate the reported effects of selected physical education measures on post-intervention physical fitness, mental health questionnaire outcomes and students' evaluations of physical education. The dissertation describes intervention and comparison groups comprising 160 students in total. To distinguish observation from causal inference, this article presents the reported group differences with explicit attention to the limitations of the available baseline and statistical information.

Materials and Methods

Design and participants. The dissertation describes 160 university students with poor physical fitness assigned to an intervention group (n = 80) and a comparison group (n = 80). The source reports a baseline study subgroup of 48

males and 112 females; detailed group allocation by sex should be confirmed against the original participant records. No assumptions regarding random allocation are made here.

Intervention and setting. The differentiated physical education approach included modification of teaching methods and course content, adaptation of assessment, and education/support measures for health-related exercise. The dissertation describes a two-semester schedule; actual completion dates and intervention fidelity should be confirmed before publication.

Outcome assessment. Physical fitness was assessed using sit-and-reach, handgrip strength, sit-ups (30 seconds), standing long jump, 30-m sprint, 4 × 10-m shuttle run, and five-minute run, among other measures recorded in the dissertation. Mental health was measured using a study-specific five-point questionnaire. Higher item values indicate less frequent occurrence of the adverse experiences assessed, provided that item coding is confirmed. Students evaluated teaching methods, course content and practical activities.

Statistical analysis. Selected post-intervention group means, standard deviations, and reported t statistics were extracted from the dissertation. The present manuscript does not calculate new inferential results or claim statistically significant differences beyond what is verifiable from the original analyses. Exact p-values and the full scoring key remain to be checked.

Results

1. Physical fitness outcomes after the intervention

Post-intervention performance was evaluated using seven indicators reflecting flexibility, muscular strength, abdominal endurance, lower-limb power, speed, agility and cardiovascular endurance. As shown in Table 1, the intervention group achieved more favorable mean results than the comparison group on all seven selected measures in both sexes. Because these values are post-intervention observations, they should be distinguished from estimates of within-person improvement or adjusted intervention effects.

Table 1: Selected post-intervention physical fitness outcomes by sex (means; source dissertation Tables 3.31 and 3.35).

Outcome	Male intervention	Male comparison	Female intervention	Female comparison
Sit-and-reach (cm)	14.13	10.92	9.44	6.18
Handgrip (kg)	39.26	37.04	26.62	24.13
Sit-ups (30 s)	18.43	17.24	16.45	15.34
Standing long jump (cm)	207.16	177.40	163.43	160.89
30-m sprint (s)	5.13	5.79	6.41	6.58
4 × 10-m shuttle run (s)	12.44	13.03	13.00	13.75
Five-minute run (m)	795.13	774.40	740.09	701.50

Flexibility was higher in the intervention group: male students had a mean sit-and-reach result of 14.13 cm versus 10.92 cm in the comparison group, a difference of 3.21 cm. Female students recorded 9.44 cm versus 6.18 cm, a difference of 3.26 cm. These results suggest more favorable flexibility performance among students participating in the differentiated program. They are consistent with the possibility that suitably adapted exercises can support mobility, although specific training components and baseline differences must be examined before attributing the differences to the intervention.

Handgrip strength was also higher in the intervention group. The male means were 39.26 kg and 37.04 kg, respectively, while the female means were 26.62 kg and 24.13 kg. In the 30-second sit-up test, male students completed 18.43 versus 17.24 repetitions and female students completed 16.45 versus 15.34 repetitions. These modest descriptive advantages suggest more favorable muscular strength and endurance profiles in the intervention group after the reported program.

For lower-limb explosive power, male students in the intervention group attained a standing long jump distance of 207.16 cm compared with 177.40 cm in the comparison group, a between-group difference of 29.76 cm. The female difference was much smaller: 163.43 cm versus 160.89 cm, or 2.54 cm. Such variation indicates that the magnitude of observed differences was not uniform across sexes and indicators, and it should not be interpreted as evidence of a sex-specific treatment effect without suitable interaction tests and variance estimates.

The intervention group recorded lower completion times for the two timed tests, where lower values indicate better performance. In the 30-m sprint, male students recorded 5.13 versus 5.79 seconds, and female students 6.41 versus 6.58 seconds. In the 4 × 10-m shuttle run, the corresponding values were 12.44 versus 13.03 seconds for males and 13.00 versus 13.75 seconds for females. These results indicate more favorable post-intervention speed and agility performance among the intervention participants.

Cardiovascular endurance, represented by the five-minute running distance, showed the same descriptive pattern. Male intervention participants covered an average of 795.13 m versus 774.40 m in the comparison group; among females, the respective means were 740.09 m and 701.50 m. Taken together, the seven measures consistently favored the intervention group numerically. However, complete baseline-adjusted comparisons and inferential statistics are necessary before concluding that these differences were caused by the program.

2. Mental health outcomes

Mental health questionnaire results provide an additional perspective on the reported intervention outcomes. Table 2 displays six selected questionnaire items for which the source dissertation gives group means, standard deviations and between-group t values. The instrument uses a five-point frequency response format in which a higher score generally corresponds to less frequent reporting of an adverse psychological experience. The exact wording and direction of each individual item must nonetheless be confirmed.

Table 2: Selected post-intervention mental health item scores (source dissertation Table 3.36).

Item	Intervention mean ± SD (n=80)	Comparison mean ± SD (n=80)	Reported t	Reported p
TC1.1	3.41 ± 0.89	2.31 ± 0.62	8.992	0.00
TC1.2	3.73 ± 0.83	2.38 ± 0.77	10.602	0.00
TC1.3	4.11 ± 0.72	2.72 ± 0.74	11.899	0.00
TC1.5	3.72 ± 0.71	2.40 ± 0.83	10.799	0.00
TC1.6	3.86 ± 0.74	2.28 ± 0.74	13.357	0.00
TC2.2	3.65 ± 0.78	2.58 ± 0.83	8.299	0.00

All six selected items showed higher mean scores in the intervention group than in the comparison group. For TC1.1, the means were 3.41 ± 0.89 and 2.31 ± 0.62, a difference of 1.10 points. For TC1.2, the corresponding values were 3.73 ± 0.83 and 2.38 ± 0.77, a difference of 1.35 points. These patterns suggest more favorable self-reported responses among students exposed to the differentiated program, under the questionnaire's presumed scoring direction.

Indicator TC1.3 showed means of 4.11 ± 0.72 and 2.72 ± 0.74 in the intervention and comparison groups, respectively, representing a 1.39-point difference. For TC1.5, the means were 3.72 ± 0.71 and 2.40 ± 0.83, a 1.32-point difference. The largest mean difference among the selected items was observed for TC1.6, at 3.86 ± 0.74 versus 2.28 ± 0.74, equivalent to 1.58 points. On TC2.2, group means were 3.65 ± 0.78 and 2.58 ± 0.83, a difference of 1.07 points.

The dissertation lists t values ranging from 8.299 to 13.357 for these six items and displays two-tailed significance as "0.00". That notation should not be interpreted as a literal zero probability. Exact p-values, degrees of freedom and the relevant statistical assumptions should be verified from the original analytical output. Furthermore, the questionnaire assesses self-reported experiences rather than providing clinical diagnoses of depression, anxiety or another mental disorder.

Overall, these results show a consistent descriptive difference in selected mental health questionnaire scores, favoring the intervention group. Although this pattern is compatible with the potential psychological benefits of adapted, supportive physical education, causal attribution requires verification of the baseline measurements, group comparability and the timing of the post-intervention assessment.

3. Student evaluations of the program

The study also asked students to evaluate the educational experience, covering teaching methods, course content and practical activities. These responses help assess program acceptability, complementing physical fitness and mental health measures. As shown in Table 3, intervention participants gave higher mean evaluations in every assessed domain.

Table 3: Student evaluations after the reported intervention (source dissertation Table 3.37).

Evaluation domain	Intervention mean ± SD	Comparison mean ± SD
Teaching methods	4.23 ± 0.679	2.78 ± 0.837
Course content	4.27 ± 0.762	2.86 ± 0.937
Practical class activities	4.22 ± 0.745	2.76 ± 0.679

Teaching methods received a mean score of 4.23 ± 0.679 in the intervention group and 2.78 ± 0.837 in the comparison group, a difference of 1.45 points. This finding indicates that students exposed to differentiated teaching rated the instructional approach more positively. Such favorable perceptions may reflect an improved match between teaching methods and students' capacities, though they might also be affected by instructor characteristics and expectations.

Course content had the highest intervention-group mean among the three domains, at 4.27 ± 0.762 compared with 2.86 ± 0.937 in the comparison group. Practical activities were similarly rated at 4.22 ± 0.745 versus 2.76 ± 0.679. These differences suggest that students perceived the adapted content and class activities as more suitable and satisfactory than the conventional provision received by the comparison group.

The consistency of student feedback across these three domains adds contextual support to the program's acceptability. Nevertheless, self-reported satisfaction is not a substitute for direct measurement of learning or health gains. It should therefore be considered an auxiliary outcome alongside the objective tests and mental health questionnaire.

4. Synthesis of outcomes

Across the three outcome domains, a generally consistent descriptive pattern emerged. First, mean physical fitness performance favored the intervention group on flexibility, muscular strength, muscular endurance, explosive power, sprinting, agility and five-minute running distance. Second, selected mental health questionnaire scores were higher in the intervention group in the direction considered more favorable by the source study. Third, participants in the intervention group evaluated teaching methods, course content and practical sessions more positively.

These convergent findings suggest that a differentiated physical education approach warrants consideration for university students with poor physical fitness. However, differences in post-intervention means alone are insufficient to establish intervention efficacy, particularly where baseline equivalence, allocation procedures, adherence, and full significance testing remain uncertain. The findings are best presented as dissertation-reported outcomes requiring final verification before formal journal submission.

Discussion

The observed pattern of more favorable physical fitness performance in the intervention group aligns with the broad evidence that exercise participation can support multiple dimensions of physical health (Warburton & Bredin, 2017) [4]. The World Health Organization (2020) [5] emphasizes the value of regular activity and reduced sedentary behavior. Nonetheless, the present findings involve a selected population with low baseline physical fitness and a specific university setting; external evidence should be used to

contextualize rather than substitute for complete statistical analyses of the local intervention.

Mental health questionnaire results also favored the intervention group on selected items. Previous syntheses have documented associations and intervention effects between physical activity and psychological outcomes, including anxiety and depressive symptoms (Biddle & Asare, 2011; Rebar *et al*., 2015) [1, 3]. The present questionnaire findings are compatible with that literature but cannot be treated as clinical outcomes. The item wording, scoring rules and baseline equivalence should be reported transparently to strengthen interpretability.

More positive student evaluations suggest that differentiated instructional methods and adapted course content may be acceptable to students with poor physical fitness. A systematic review of health-related interventions among university students found that campus-based initiatives can be a relevant context for promoting physical activity (Plotnikoff *et al*., 2015) [2]. The applicability of a specific approach depends on implementation quality, instructional resources, student needs and the extent to which outcomes can be sustained beyond the intervention period.

Study limitations include incomplete detail about allocation procedures; inconsistencies requiring reconciliation among reported participant subtotals; limited access to baseline-adjusted outcome statistics; and incomplete information concerning the precise content, reliability and scoring of the mental health items. The dissertation also describes an experimental schedule that should be checked against actual data collection completion. Consequently, the present article avoids definitive causal claims and emphasizes the need for source-data verification before submission.

Conclusion

Students participating in the dissertation-reported differentiated physical education program showed more favorable post-intervention mean physical fitness results, selected self-reported mental health scores and evaluations of teaching than comparison-group students. These findings provide preliminary support for further study of adapted physical education for university students with poor physical fitness. Final conclusions about intervention effectiveness require verified participant records, baseline comparisons, complete statistical outputs and confirmation of data collection dates.

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