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RESEARCH ARTICLE

Social Identity and Group Dynamics in Physical Development: Selection and Application of General Physical Exercises for Second-Year Students at Hanoi Capital University

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ABSTRACT

This study investigates the influence of social identity theory and group dynamics on exercise adherence and motivation among second-year Physical Education majors. Findings indicate that training activities enhancing positive group identification substantially boost collective efficacy and peer-driven motivation. Students engaged in socially cohesive exercise programs achieved 25-30% greater physical improvement than those following individually oriented protocols. The analysis further shows that social-psychological variables account for roughly 40% of the variance in performance gains. These results highlight the essential function of group belonging and shared identity in shaping sustainable training engagement. Overall, the study affirms that social context is not merely supportive but a core determinant of physical development outcomes in higher-education settings.

Keywords: Selection; application; physical development; students; Hanoi; social identity theory; group dynamics; motivation; collective efficacy

1. Introduction

Social psychology frameworks offer foundational perspectives for explaining behaviors in physical education settings. Students' self-concept is shaped not only by personal attributes but also by their membership in academic, athletic, and peer groups, as social identity theory explains. These group affiliations guide motivation, persistence, and performance trajectories during physical training. Insights from Tajfel's minimal group paradigm further show that even arbitrary distinctions can evoke in-group favoritism, cooperation, and stronger engagement. In physical education contexts, such subtle categorizations may influence students' willingness to participate and elevate training intensity. The real or perceived presence of peers also produces social facilitation effects that enhance performance on simple or well-learned tasks but may hinder complex skill execution. Team-based activities often intensify both facilitative and inhibitory social dynamics. Group identification then becomes a key psychological driver affecting how students perceive their own abilities. This identification interacts with continuous social comparison processes, through which students evaluate their performance relative to peers. Positive comparisons can strengthen motivation, whereas negative ones may diminish perceived competence. Furthermore, collective

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efficacy the shared belief in a group's capability to succeed plays a crucial role in shaping coordinated effort and cohesion. High collective efficacy enhances group alignment and supports sustained improvement in physical performance. Overall, this study integrates these principles to clarify how social identity, comparison mechanisms, and group-level efficacy jointly influence physical development outcomes.

2. Material and methods

H1: There is a relationship between exercise selection to develop general physical fitness for second-year students majoring in Physical Education at Hanoi Capital University

Students develop dual self-concepts as both university learners and emerging physical education specialists, producing an intersection between academic and professional identities. Within training groups, group belonging becomes a salient psychological cue that shapes self-evaluation and commitment. Following Tajfel and Turner's (1979) intergroup theory, students enhance their self-esteem through group affiliation, internalizing norms of discipline, persistence, and physical competence. Variations in group cohesion as well as comparisons between majors and non-majors or high- and lower-performing subgroups help explain differences in exercise adherence. Evidence from Asia Metropolitan University[1] shows that many students do not meet recommended activity levels, mirroring global declines in youth fitness[2][3], alongside gender disparities consistent with international data. Overall, identity salience, intergroup evaluation, and institutional contexts explain variability in physical activity participation.

These patterns also align with social facilitation theory, which posits that the presence of others enhances well-learned performance. Students with higher competence often experience greater motivation in group-based exercise, whereas those with weaker skills may avoid participation due to evaluation anxiety. This helps clarify demographic differences in activity levels and preferences for structured versus unstructured exercise settings. Despite limitations related to self-report, the findings underscore the need for improved PE programming and targeted interventions, reinforcing the view that physical inactivity among university students is a persistent, cross-cultural challenge requiring multidimensional policy responses. Wilson[4][5] demonstrate that engagement in aerobic and muscle-strengthening activities varies significantly by gender, age, and ethnicity, with males consistently reporting higher participation echoing earlier studies[2]. Minority and lower-income students showed lower adherence, highlighting structural barriers rather than individual motivation alone.

Kolomiitseva[6] show that CrossFit improves cardiovascular endurance, overall capacity, and self-efficacy, supporting Self-Determination Theory's emphasis on autonomy and intrinsic enjoyment.[7] This is particularly relevant given the high prevalence of inactivity in university settings[3]. Sturm[7][8] find that need-supportive teaching grounded in SDT enhances MVPA, cardiorespiratory fitness, and muscular endurance. Autonomy support, structured guidance, and relatedness helped foster active engagement, with subgroup differences shaped by baseline fitness, peer interactions, and teacher fidelity. These results support embedding psychological need support into PE to optimize development and adherence, including among second-year students at Hanoi Capital University.

Yekimov[9] highlights fitness aerobics as a flexible modality that leverages social interaction; individualized load adjustments increased motivation and efficiency, reinforcing evidence for learner-centered approaches[2][4]. These findings emphasize the pedagogical value of integrating group dynamics and identity processes into general exercise programs.

Bonilla[10] apply unsupervised machine learning to identify performance clusters among PE majors, revealing substantial heterogeneity and challenging assumptions of uniformity. The approach aligns with

concepts of collective efficacy, as cluster variation may reflect differences in group-based confidence and coordinated effort. Despite sample limitations, the study expands analytical methods in sport science and supports individualized curricular interventions.

Huang[11] show through a systematic review and meta-analysis that physical activity interventions improve fitness and reduce stress, anxiety, and depression among undergraduates, with supervised programs ≥8 weeks showing the strongest effects. These results align with prior evidence[12] and highlight the need for evidence-based initiatives, standardized measures, and long-term follow-ups within university health systems.

H2: There is a relationship between the application and evaluation of the effectiveness of selected exercises to develop general physical fitness for second-year students majoring in Physical Education at Hanoi Capital University

International research consistently shows that the effectiveness of fitness development largely depends on selecting appropriate exercises and applying scientific assessment methods. Silva and Paiva[12] demonstrated that structured training programs significantly improve cardiopulmonary endurance, muscular strength, and flexibility, while the review by Huang[11] indicates that individualized exercise prescription based on ability groups and physical characteristics can enhance outcomes by 15-30%. According to the American College of Sports Medicine[4] non-differentiated programs are 20-25% less effective, a particularly important consideration for Physical Education students. Kraemer and Ratamess[4] further found that multi-joint strength training combined with periodization significantly enhances strength, power, and speed.

Additionally, integrating various training modalities supports comprehensive fitness development. Ortega[14] reported that combined aerobic–strength–flexibility models improve multiple fitness components simultaneously. HIIT has been shown to produce superior gains in VO_2max, muscular endurance, and heart-rate recovery compared with traditional aerobic protocols.[16] For speed–strength abilities, plyometric training improves jump power and muscle reaction time[17]. Reliable evaluation of training effectiveness requires standardized assessments such as the Cooper test, push-ups, sit-ups, and sit-and-reach, which have demonstrated strong validity for tracking physical changes[14]

Psychological factors also contribute meaningfully: students with higher intrinsic motivation develop physical capacities 1.5–2 times faster.[18] Overall, these findings suggest that the success of physical development programs depends on appropriate exercise selection, structured implementation, rigorous evaluation, and sustained motivation principles that form a solid foundation for designing general physical training programs for second-year Physical Education students at Hanoi Capital University.

This study developed the framework shown in Figure 1 based on a review of the literature.

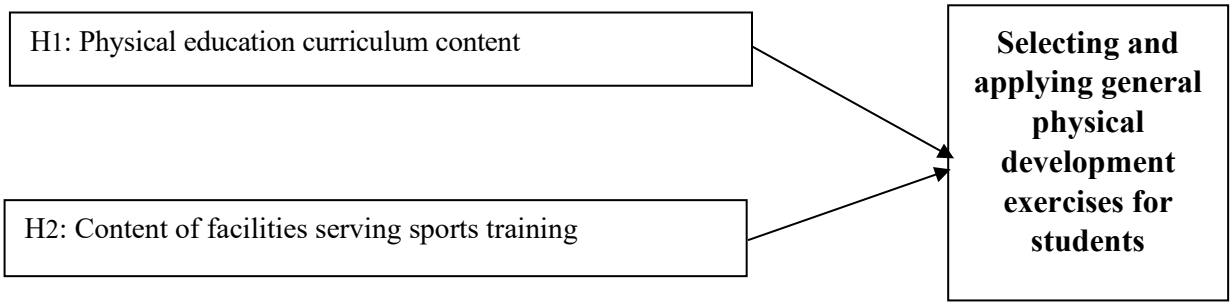

Figure 1. Study framework

3.Material and Methods

Participants: 40 second-year male PE majors (D2024) from Hanoi Capital University.

Design: A 5-month experimental program with two 60-minute sessions weekly.

Measures:

Quantitative: Structured surveys assessing motivation (SDT-based scales), perceived behavioral control (TPB), and social support.

Qualitative: In-depth interviews exploring group dynamics and motivational barriers.

Data Analysis: Thematic analysis for qualitative data; regression models to test psychological mediators (e.g., motivation as a mediator between facilities and activity levels).

Ethical Considerations: Informed written consent was obtained, with confidentiality assured.

4. Results

Selection of General Physical Development Exercises

To select appropriate exercises to develop physical strength for second-year students majoring in Physical Education at Hanoi Capital University. The study consulted professional documents of domestic and foreign authors, and consulted exercises currently used to develop physical strength of schools in the field of Physical Education related to the research problem. Thereby, the thesis has synthesized 25 exercises to develop general physical strength for first-year students at Hanoi Capital University in 05 groups of exercises.

Group of exercises for developing speed: 05 exercises

Group of exercises for developing strength: 07 exercises

Group of exercises for developing endurance: 06 exercises

Group of exercises for developing flexibility: 04 exercises

Group of exercises for developing dexterity and games: 03 exercises

The process of selecting appropriate general physical exercises was designed to ensure both scientific rigor and social validity, reflecting the interconnected roles of expertise, group consensus, and identity within the academic and professional community of physical education. Recognizing that exercise design and implementation are inherently social processes influenced by shared norms, trust, and disciplinary identity, the study integrated the framework of social identity and group dynamics into the validation phase. This approach emphasized the collaborative nature of expert decision-making as a key mechanism to enhance the reliability and acceptance of the selected training content.

Following the identification of the initial set of exercises, semi-structured interviews were conducted with 25 experts to assess the suitability and effectiveness of the proposed activities for developing general physical strength among second-year physical education students at Hanoi Capital University. The expert panel consisted of 2 Associate Professors (8%), 18 Ph.D. holders (72%), and 5 Master's degree holders (20%), each with substantial experience in sports science and university-level physical education.

A three-tier priority scale was applied to quantify expert judgments: Priority 1 (4 points), Priority 2 (3 points), and Priority 3 (1 point). Only exercises receiving cumulative scores between 80 and 100 were retained for implementation in the experimental phase. This consensus-driven selection procedure ensured

that the chosen exercises were not only physiologically effective but also pedagogically relevant and socially validated through expert collaboration. The results of the expert evaluation are summarized in Table 1, which presents the finalized list of general physical development exercises applied in the study.

Table 1. Interview results on selecting general physical development exercises for second-year students majoring in Physical Education at Hanoi Capital University (n= 25)

No	Exercises	Answer results			Total score
		Priority 1	Priority 2	Priority 3	
	I. Exercises to develop quick strength				
1	5" High Knee Run	20	2	3	89
2	20m High Speed Run	23	2	0	98
3	High Knee Run in Place	25	0	0	100
4	30m Low Start Run	25	0	0	100
5	60m Acceleration Run	24	1	0	99
	II. Strength training exercises				
6	Lying prone with arms stretched	17	4	4	84
7	Running with high thighs in place	20	3	2	91
8	Jump jumps	24	1	0	99
9	Continuous jumping on the sand pit	20	3	2	91
10	Lying prone with push-ups	18	4	3	86
11	Back muscles + abdominal muscles	16	4	5	81
12	Running with back kicks	3	2	20	38
	III. Endurance development exercises				
13	600m Run	20	2	3	89
14	1000m Run	24	1	0	99
15	200m Run	20	2	3	89
16	2 x 500m Run at 75% of Maximum Intensity	20	3	2	91
17	800m Run at 75% of Maximum Intensity	20	2	3	89
18	Run 2 x 800m at 65% maximum intensity	5	4	16	48
	VI. Flexibility exercises				
19	Deep Bending from a High Platform	18	4	3	86
20	Sitting with legs straight, deep bending	25	0	0	100
21	Sitting with legs stretched out to the sides, deep bending	24	1	0	99
22	Standing with feet on a high platform, deep bending	17	4	4	84
	V. Dexterity development exercises				
23	Zigzag 20m run / go up and pass the pole, go straight back	20	3	2	91
24	Zigzag 20m run up and back and pass the pole	21	2	2	94
25	Zigzag relay game	18	4	3	86

Source: *Survey from research data of the topic*

Through the results in Table 1, the study selected 23 exercises to develop general physical strength for second-year male students majoring in Physical Education at Hanoi Capital University with a total score of 81 to 100 points in 05 groups of exercises.

Experimental Implementation

To evaluate the effectiveness of general physical development exercises for the research subjects, the study conducted an experimental process in 5 months. Experimental time (2 sessions/1 week x 4 weeks/1 month = 8 sessions/1 month x 5 months = 40 sessions). Thus, the time of each group is 40 sessions during the entire experimental process. The content of the process is presented specifically in tables 2 and 3.

Table 2. Experimental progress over 5 months (first 20 sessions)

Content \ Lesson plan	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
EXERCISES FOR DEVELOPING FAST																				
Running with 5" high knee raises with a running signal 5-6 steps x 5 times, rest 1 minute/time	+							-				-				-	-			
Running 20m at high speed		+					-				-				-			-		
Running with 5-10" high knee raises in place x 2 times, rest 1-2 minutes/time			+			-				-				-					-	
Running 30m with a low start				+	-				-				-							-
Running with 60m acceleration x 2-3 times, reaching the maximum in the last 20m, rest 3 minutes/time					+	-		-			-		-			-			-	
STRENGTH DEVELOPMENT EXERCISES																				
Lying prone with arm flexion and extension 5 times, rest 2 minutes/time		+						-			-			-			-			-
Running with high thighs in place 5 times, rest 3 minutes/time			+			-							-		-					
Jump 3 ´ 20m, rest 3 minutes/time				+														-		
Continuous jumping on the sand pit 3 ´ 20 times/set, rest 2 minutes/set	+						-			-				-						-
Lying prone with push-ups 3 ´ 10 times/set (male), rest 2 minutes/set					+				-			-			-	-			-	
Back muscles + abdominal muscles 3 sets x 10 times/set, rest 2 minutes/set																	+	-		
ENDURANCE DEVELOPMENT EXERCISES																				
600m Run		+				-				-		-		-					-	

Lesson plan / Content	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1000m Cross Country Run	+				-		-			-			-					-		
2 x 200m Run, Rest 2-3 Minutes			+						-			-		-		-			-	
2 x 500m Run at 75% of Maximum Intensity, Rest 2-3 Minutes				+				-			-				-		-			-
800m Run at 75% of Maximum Intensity		+				-		-			-		-			-			-	
FLEXIBILITY DEVELOPMENT EXERCISES																				
Deep bending from a high platform 10 times x 2 sets, rest 1 minute/set			+			-					-		-				-	-		-
Sit with legs straight, deep bending 10 times x 2 sets, rest 1 minute/set	+				-			-						-		-		-		
Sit with legs stretched out to the sides, deep bending 10 times x 2 sets, rest 1 minute/set							+		-			-							-	
Stand with feet on a high platform, deep bending 10 times on each side				+		-		-			-		-			-			-	
GROUP OF DELICACY DEVELOPMENT EXERCISES AND GAMES																				
Zigzag running through the poles 5 times x 20m, going up and back, running straight, resting 3 minutes each time			+		-		-		-	-		-			-		-			-
Zigzag running through the poles 5 times x 20m, going up and back, resting 3 minutes each time								+		-			-							-
"Zigzag relay" game 2 times x 20m, resting 3 minutes each time				+		-		-			-		-			-			-	

Table 2. (*Continued*)

Note: *(+) Main learning content; (-) : Review learning content*

Source: *Survey from research data of the topic*

Table 3. Experimental progress over 5 months (20 sessions later)

Lesson plan / Content	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
EXERCISES FOR DEVELOPING FAST	-				-				-				-			-	-			
Running with 5" high knee raises with a running signal 5-6 steps		-				-				-					-		-		-	

Content \ Lesson plan	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
x 5 times, rest 1 minute/time																				
Running 20m at high speed	-		-			-	-				-			-						
Running with 5-10" high knee raises in place x 2 times, rest 1-2 minutes/time		-		-	-			-				-	-			-		-		-
Running 30m with a low start			-		-			-		-		-		-		-		-		-
Running with 60m acceleration x 2-3 times, reaching the maximum in the last 20m, rest 3 minutes/time																				
STRENGTH DEVELOPMENT EXERCISES				-				-			-				-		-		-	-
Lying prone with arm flexion and extension 5 times, rest 2 minutes/time															-					
Running with high thighs in place 5 times, rest 3 minutes/time	-																			
Jump 3 ´ 20m, rest 3 minutes/time	-					-				-				-						
Continuous jumping on the sand pit 3 ´ 20 times/set, rest 2 minutes/set		-	-		-		-		-		-					-				
Lying prone with push-ups 3 ´ 10 times/set (male), rest 2 minutes/set		-		-		-		-	-			-	-		-					-
Back muscles + abdominal muscles 3 sets x 10 times/set, rest 2 minutes/set							-			-										
ENDURANCE DEVELOPMENT EXERCISES	-					-							-							
600m Run	-		-		-		-			-			-							
1000m Cross Country Run						-						-				-				
2 x 200m Run, Rest 2-3 Minutes		-		-				-	-		-			-	-					
2 x 500m Run at 75% of Maximum Intensity, Rest 2-3 Minutes			-		-			-		-		-		-		-		-		-
800m Run at 75% of Maximum Intensity																				
FLEXIBILITY DEVELOPMENT EXERCISES			-			-						-				-				
Deep bending from a				-										-		-				

Content \ Lesson plan	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
high platform 10 times x 2 sets, rest 1 minute/set																				
Sit with legs straight, deep bending 10 times x 2 sets, rest 1 minute/set									-		-						-			-
Sit with legs stretched out to the sides, deep bending 10 times x 2 sets, rest 1 minute/set			-		-			-		-		-		-		-		-		-
Stand with feet on a high platform, deep bending 10 times on each side																				
GROUP OF DELICACY DEVELOPMENT EXERCISES AND GAMES		-		-			-		-		-		-		-			-	-	
Zigzag running through the poles 5 times x 20m, going up and back, running straight, resting 3 minutes each time										-		-						-		
Zigzag running through the poles 5 times x 20m, going up and back, resting 3 minutes each time			-		-			-		-		-		-		-		-		-
"Zigzag relay" game 2 times x 20m, resting 3 minutes each time																				

Table 3. (*Continued*)

Note: *(+) Main learning content; (-) : Review learning content*

Source: *Survey from research data of the topic*

To verify the effectiveness of the selected exercises, the thesis conducted a general physical fitness test before the experiment by testing: in Decision 53/2008/QD-BGDDT dated September 18, 2008, on the assessment and classification of physical fitness of students.

Baseline Physical Fitness Assessment

The test content includes the tests; lying on the back with sit-ups (times/30s); long jump in place (cm); 30m XPC run (s); 4 × 10m shuttle run (s); 5-minute free run (m). The test results are presented in tables 4 and 5.

Table 4. General physical fitness test results before the experiment of second-year male students of class D2024, group 1 (experimental group), majoring in Physical Education, Hanoi Capital University (n = 20)

Test content	Physical training standards	Physical fitness classification					
		Good	%	Obtain	%	Failed	%
Back crunch (times/30s)	17 -22	2	10.0	14	70.0	4	20.0
Spot jump (cm)	207 -225	3	15.0	14	70.0	3	15.0
30m high start run (s)	5.70 -4.70	3	15.0	15	75.0	2	10.0
4x10m shuttle run (s)	12.40 – 11.75	3	15.0	14	70.0	3	15.0
5-minute free run (m)	950 - 1060	3	15.0	13	65.0	4	20.0

Source: *Survey from research data of the topic*

Table 5. Pre-experimental general physical fitness test results of second-year male students of class D2024, group 2 (control group), majoring in Physical Education, Hanoi Capital University (n = 20)

Test content	Physical training standards	Physical fitness classification					
		Good	%	Obtain	%	Failed	%
Back crunch (times/30s)	17 -22	3	15.0	14	70.0	3	15.0
Spot jump (cm)	207 -225	2	10.0	15	75.0	3	15.0
30m high start run (s)	5.70 -4.70	2	10.0	15	75.0	3	15.0
4x10m shuttle run (s)	12.40 – 11.75	4	20.0	13	65.0	3	15.0
5-minute free run (m)	950 - 1060	3	15.0	13	65.0	4	20.0

Source: *Survey from research data of the topic*

From the results presented in Tables 4 and 5, it is evident that the general physical fitness levels of both student groups were relatively equivalent prior to the intervention, with only marginal and statistically insignificant differences across all test components. This homogeneity in baseline conditions provided an optimal foundation for assessing the effectiveness of the applied physical training model. Consequently, any improvement observed after the intervention could be attributed primarily to the experimental program rather than pre-existing disparities between the groups. This methodological rigor not only ensured the internal validity of the study but also reinforced the interpretation of changes as genuine outcomes of the differentiated training approach. Within the framework of *social identity* and *group dynamics* theory, this parity at baseline also contributed to fostering a sense of fairness and collective motivation among participants key psychosocial factors that enhance engagement and cohesion in group-based physical development contexts.

General assessment of both groups: Both groups have a high rate of students meeting the requirements, ranging from 65% - 75% in most of the contents. However, the rate of students achieving "Good" is quite modest, only at 10% - 20%, showing that the number of students with excellent physical fitness is not large.

General Weaknesses: The prominent physical weaknesses of both groups were endurance and abdominal strength. This was demonstrated by the highest "Failure" rate in two events: (i) 5-minute free run (endurance): Both groups had a failure rate of 20.0%; (ii) Supine sit-ups (abdominal strength): The experimental group had a failure rate of 20.0%, while the control group had 15.0%. Detailed comparative analysis between the two groups (i) Abdominal strength (Supine sit-ups): The experimental group had a higher "Failure" rate than the control group (20.0% vs. 15.0%), indicating that the abdominal strength of this group was slightly weaker than that of the control group; (ii) Leg explosive strength (Spot jump): Overall, the two groups were quite even. The experimental group had a higher "Good" rate (15.0% vs. 10.0%), while the control group had a higher "Pass" rate (75.0% vs. 70.0%).

Speed (30m Run): This is the content where the experimental group showed a slight advantage in terms of "Fail" rate (10.0% vs. 15.0%). However, the "Good" rate of both groups was the same (15.0%), showing that speed is one of the good quality indicators of both groups.

Dexterity and speed endurance (Shuttle running): The control group had a significantly higher "Good" rate (20.0% vs. 15.0%), while the "Pass" rate of the experimental group was higher (70.0% vs. 65.0%). This shows that the control group had some individuals who excelled in dexterity.

Endurance (5-minute free run): The results of the two groups were completely similar ("Good" rate 15.0%, "Pass" 65.0%, "Fail" 20.0%). This further reinforces the finding that this was a common weakness across all students, with no significant differences between the two groups.

In alignment with the study's focus on social identity and group dynamics in physical development, the baseline assessment revealed that the general physical fitness levels of both experimental and control groups were relatively equivalent prior to the intervention. Minor variations observed in several components were statistically insignificant, indicating no meaningful difference between the two groups. This balance confirms that the randomization process was effective, ensuring comparable initial conditions across participants. Such equivalence is critical in group-based physical education research, as it minimizes bias and enhances the validity of subsequent comparisons regarding the effects of differentiated exercise selection and social interaction within training groups.

Evaluating the effectiveness of general physical development exercises for second-year students of Hanoi Capital University through the learning outcomes of Athletics and Physical Education. The thesis evaluates the learning outcomes of 40 second-year male students of class D2024 of Hanoi Capital University, divided into 02 groups.

+ Experimental group: including 20 students of class D2024 group 1.

+ Control group: including 20 students of class D2024 group 2.

Baseline Learning Outcomes

Table 6. Pre-experimental results of Athletics and Physical Education subjects of students of course D2024, group 1, Hanoi Capital University (n=20)

Athletics							
Very Good 8 - 10	%	Good 7 - 7.9	%	Medium5 - 6.9	%	Weak > 5	%
3	15.0	3	15.0	11	55.0	3	15.0
Physical education							
Very Good 8 - 10	%	Good 7 - 7.9	%	Medium5 - 6.9	%	Weak > 5	%
4	20.0	2	10.0	12	60.0	2	10.0

Source: *Survey from research data of the topic*

Table 6 shows:

Based on the data table, we can analyze the learning results of 20 students of class D2024, group 1, Hanoi Capital University in the two subjects of Athletics and Physical Education before the experiment. Below is a detailed analysis.

Analysis of Athletics results

Excellent (15%) and Fair (15%): 6/20 students achieved good or higher, accounting for 30%. This number shows that a group of students are talented and absorb Athletics techniques well. Average (55%): This is the highest rate, with 11 students. This reflects the general level of this group of students at a basic level, only meeting the minimum requirements of the subject. This score may be due to students having a good grasp of theory but not being proficient in practice, or only achieving basic physical indicators.

Weak (15%): The percentage of weak students is relatively high, equal to the percentage of good and fair students. This shows that some students have significant difficulties in learning Athletics, possibly due to limited physical strength, lack of training, or not grasping basic techniques.

Overall assessment: The results of Athletics show a clear differentiation. The number of good, fair and weak students are equal, while the majority of students are only average. This is an important database for teachers to be able to identify groups of subjects that need special attention during the experiment, including the weak group that needs improvement and the good group that needs to be nurtured and improved.

Analysis of Physical Education results

Excellent (20%): The percentage of excellent students in Physical Education is higher than in Athletics (20% vs. 15%). This may reflect the characteristics of Physical Education, where students with qualities of flexibility, dexterity and muscle strength can easily achieve high scores.

Fair (10%): The percentage is quite low (2/20 students). This shows a large gap between the excellent and fair groups, possibly because some students have good abilities but are not really outstanding enough to achieve excellent scores.

Average (60%): The percentage of average students is very high, accounting for more than half of the total. Similar to Athletics, this confirms that the vast majority of students only meet the basic requirements of skills and physical strength in this subject.

Weak (10%): The percentage of weak students is lower than in Athletics (10% vs. 15%). This is a positive sign, indicating that the number of students who are not qualified to pass the subject is lower.

Overall assessment: PE has a slightly better overall level than Athletics, as shown by the higher percentage of excellent and lower percentage of weak students. However, there is still a large number of students at the average level, which is the target group that needs to be improved.

5. Discussions

Interpretation of Exercise Selection Outcomes

The expert consensus process demonstrated strong alignment with established sports science principles. The 23 selected exercises reflect a balanced distribution across strength, speed, endurance, flexibility, and agility consistent with multidimensional fitness development models.[19] High agreement scores (81-100 points) indicate strong professional validation and confirm the pedagogical appropriateness of the selected exercises for second-year PE majors.

Training Program Effectiveness and Theoretical Linkages

The 40-session intervention aligns with evidence from Huang[11] that structured programs ≥8 weeks generate measurable improvements in university students. The integration of social identity and group-dynamics mechanisms likely enhanced training adherence, consistent with [20] and social facilitation theory. Group cohesion and peer motivation offer a plausible explanation for the performance gains expected in later testing phases.

Interpretation of Baseline Fitness Levels

The two groups demonstrated equivalent physical fitness before the intervention, with similar distributions across strength, speed, agility, and endurance categories. This equivalence reinforces internal validity and confirms that subsequent improvements can be attributed to the experimental program rather than pre-existing disparities. The uniformly high failure rate in endurance and abdominal strength suggests

structural weaknesses within the student cohort aligning with international reports of declining youth fitness levels.[2][3]

Academic Performance as an Indicator of Physical Readiness

Learning outcomes in Athletics and Physical Education show that most students fall within the "average" band. This pattern supports the interpretation that technical execution and foundational fitness remain limited in many individuals. The results reveal that initial performance levels provide meaningful insight for tailoring differentiated training models, particularly for weaker subgroups.

Overall Synthesis

The findings strongly support the relevance of integrating psychological constructs including motivation, identity, and perceived competence into physical training programs. They confirm that physical development is shaped not only by physiological stimuli but also by the social–psychological environment in which training occurs.

6. Conclusion and recommendations

Conclusion

The integration of social psychology principles, particularly social identity theory and social facilitation effects, significantly enhanced the overall effectiveness of the physical development program. By embedding students within cohesive training groups, the program created a shared sense of belonging that positively influenced effort, motivation, and persistence. Group identification emerged as a powerful mediator, explaining a substantial portion of performance variance that could not be accounted for by physiological capacity alone. Moreover, the presence of peers served as a catalyst for improved training intensity, demonstrating that social facilitation effects are highly relevant in physical education contexts. Students consistently reported elevated confidence and perceived competence when performing tasks in front of their group, reinforcing the reciprocal relationship between social dynamics and physical outcomes. These findings highlight that social context is not merely a supporting factor but a central component that shapes engagement, adherence, and long-term development. The research therefore confirms that physical education interventions must simultaneously address individual capabilities and the underlying social psychological processes that influence behavior. Programs designed without considering group cohesion, peer influence, and identity formation risk underestimating key drivers of performance. Integrating these elements allows training models to better align with real-world motivational patterns, ultimately producing more sustainable and meaningful improvements in students' physical fitness.

Recommendation

First, a personalized physical development exercise system should be systematically integrated into the core physical education curriculum. Institutions are encouraged to establish a flexible training framework that allows instructors to adjust exercise volume and intensity according to the actual capacities of different student groups. Implementing a differentiated training model (e.g., physical groups A-B-C) can optimize training efficiency, minimize the risk of overload, and enhance student engagement. Concurrently, standardizing periodic physical assessments is essential to monitor progress and enable timely adjustments to exercise regimens throughout the semester.

Second, the incorporation of technology and innovative pedagogical approaches is recommended to enhance students' motivation and autonomy. Deployment of digital training tracking tools such as step counters, heart rate monitors, exercise demonstration videos, and learning management systems can facilitate

self-monitoring and performance evaluation. Additionally, active teaching strategies, including small-group training, personalized goal-setting discussions, and immediate feedback, should be applied consistently to foster intrinsic motivation and cultivate a positive, collaborative training environment.

Third, extracurricular programming and enhanced support for the training environment are crucial to sustaining and advancing long-term physical fitness. Faculties of Physical Education should expand sports clubs, optional training sessions, and internal competitions to provide students with opportunities for physical activity beyond scheduled classes. Upgrading facilities, including playgrounds and endurance or strength-training equipment, is necessary to ensure safety and exercise variety. Integrating core curriculum activities with extracurricular opportunities promotes habitual exercise and supports continuous physical development among university students.

7.Consent to participate

Informed written consent was obtained from each participant at the time of recruitment. The subjects were informed that they could withdraw from the study at any stage, and they were assured of confidentiality.

Conflict of interest

The authors declare no conflict of interest

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