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Comparative Assessment of Morphological, Functional, and Fitness Profiles Among Vietnamese Undergraduates Relative to National MOET Standards

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Abstract

Background: Standardized fitness benchmarks by Vietnam's Ministry of Education and Training (MOET) prescribe pass criteria across five domains—handgrip strength, standing long jump, 30 m sprint, 30 s sit-ups, and 5-minute run—for 18-year-olds. However, comparative data across academic disciplines are scarce. Purpose: To evaluate and compare morphological, functional, and physical fitness characteristics of first-year students at Ho Chi Minh City University of Technology (UTP) and University of Social Sciences and Humanities (USSH), and to determine compliance rates with MOET standards. Methods: Eighty-three UTP (59 M, 24 F) and 81 USSH (26 M, 55 F) students underwent anthropometry (height, weight, BMI), baseline cardiorespiratory assessments (vital capacity, resting heart rate), and fitness tests: handgrip strength, standing long jump, 30 m sprint, sit-ups/30 s, and 5-minute run. Results: Anthropometric and baseline cardiorespiratory profiles were similar across cohorts. UTP students exhibited marginally superior handgrip strength (male: 37.4 ± 6.4 kg vs. 34.1 ± 5.3 kg; female: 25.1 ± 4.4 kg vs. 23.7 ± 3.6 kg) and aerobic capacity (male: 889.2 ± 117.3 m vs. 720.2 ± 121.1 m; female: 782.3 ± 70.7 m vs. 630.6 ± 94.8 m). Universal pass rates were observed in standing long jump (>100 %) while 4×10 m shuttle runs yielded the lowest compliance (12.5 %–87.5 %). Overall MOET pass rates were higher in USSH (male: 96.2 %; female: 98.2 %) than in UTP (male: 66.1 %; female: 87.5 %). Conclusions: Despite comparable baseline profiles, UTP and USSH undergraduates display domain-specific strengths and deficits relative to MOET standards, notably in agility and endurance. These findings underscore the need for tailored physical education interventions to enhance student fitness.

Keywords: *Anthropometry; Cardiorespiratory Function; Muscular Power; Agility; Endurance.*

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Introduction

Physical fitness among university students has garnered increasing attention due to its profound implications for long-term health and academic performance. Globally, sedentary lifestyles and declining physical activity levels in young adults have been linked to adverse cardiometabolic outcomes and reduced psychosocial well-being (Nguyen et al., 2024; Duyen & Ha, 2025). In Vietnam, the Ministry of Education and Training (MOET) prescribes

standardized benchmarks for 18-year-olds across five fitness domains—handgrip strength, standing long jump, 30 m sprint, 30 s sit-ups, and 5-minute run distance—to classify performance into "Excellent" and "Pass" categories (Decision No. 53/2008/QĐ-BGDĐT). However, empirical data evaluating Vietnamese undergraduates against these national criteria remain limited, particularly across different academic disciplines and gender cohorts. Previous investigations have demonstrated that tailored high-intensity interval training (HIIT) protocols can significantly enhance VO_2max and muscular strength among adolescents and adults, highlighting the potential for school-based interventions to elevate baseline fitness (Bauer et al., 2022; Costigan et al., 2022) . Similarly, comparative studies in Belgium and Vietnam have established normative values for walk tests that underscore regional differences in cardiorespiratory capacity (Nguyen et al., 2024). Yet, there remains a paucity of cross-institutional analyses within Vietnam that benchmark physical and functional characteristics—such as body composition, vital capacity, and resting heart rate—alongside dynamic fitness performance (Duyen & Ha, 2025). This study aims to fill these gaps by assessing and comparing the morphological, functional, and physical fitness profiles of first-year students at Ho Chi Minh City University of Technology (UTP) and the University of Social Sciences and Humanities (USSH), Vietnam National University, Ho Chi Minh City. Specifically, we evaluate anthropometric measures (height, weight, BMI), baseline cardiorespiratory function, and performance in strength (handgrip), power (standing long jump), speed (30 m sprint), muscular endurance (sit-ups/30 s), and aerobic capacity (5-minute run). We further determine compliance rates with MOET's fitness classification to identify domain-specific strengths and weaknesses across gender and institutional cohorts. By elucidating these profiles, our findings will inform targeted physical education curricula and health promotion strategies tailored to Vietnamese university populations.

Materials and Methods

Participants

A cross-sectional sample of 164 first-year undergraduates was recruited from Ho Chi Minh City University of Technology (UTP; n = 83, 59 M/24 F) and University of Social Sciences and Humanities (USSH; n 81, 26 M/55 F) during the 2024–2025 academic year. Inclusion criteria were: age 17–19 years, enrollment in full-time study, and absence of acute musculoskeletal injury or cardiopulmonary disease. Participants provided written informed consent, and the study protocol was approved by the Institutional Review Board of Vietnam National University, Ho Chi Minh City.

Anthropometric and Baseline Functional Assessments

Height was measured to the nearest 0.1 cm using a stadiometer (Seca 213), and body mass to the nearest 0.1 kg with a calibrated digital scale (Tanita BC-545). Body mass index (BMI; kg/m²) was computed. Vital capacity was assessed via a portable spirometer (MicroLab ML3500) following American Thoracic Society guidelines: three maximal inhalation–exhalation maneuvers were performed, with the highest value recorded. Resting heart rate (RHR) was measured after 10 minutes of seated rest, using an automated oscillometric monitor (Omron HEM-7120).

Physical Fitness Testing

All fitness tests adhered to MOET protocols and were conducted on university athletic tracks and in designated gymnasia between 7:00 and 11:00 AM to minimize circadian variability. Wearing standardized athletic attire and barefoot for jumping events, participants completed:

Handgrip Strength: Assessed with a digital dynamometer (Jamar Plus+), three trials per hand with 60 s rest; maximum dominant-hand value used.

Standing Long Jump: Two attempts from a standardized stance; greatest horizontal distance to nearest centimeter recorded.

30 m Sprint: Two maximal sprints on a marked track; electronic timing gates (BROWER TC-X) captured time to the nearest 0.01 s; fastest trial analyzed.

Sit-Ups (30 s): Number of correct repetitions in 30 s, performed on a thin mat with knees at 90° and feet stabilized by an assistant.

5-Minute Run: Continuous running on a 400 m track; total distance covered in 5 minutes recorded to the nearest meter.

MOET Benchmark Evaluation

Individual test results were classified as "Pass" or "Fail" based on age- and sex-specific cut-offs from Decision No. 53/2008/QĐ-BGDĐT. Overall compliance rates per cohort were computed as the proportion meeting "Pass" criteria in all five domains.

Statistical Analysis

Data were analyzed using SPSS v.26.0. Descriptive statistics are reported as mean ± standard deviation (SD) or percentage. Between-group comparisons (UTP vs. USSH; male vs. female) for continuous variables employed independent-samples t-tests or two-way ANOVA where appropriate; categorical compliance rates were compared via chi-square tests. Significance was set at $\alpha = 0.05$.

Results

Morphological and Functional Characteristics

A total of 83 students from the University of Technology (UTP; 59 males, 24 females) (table 1) and 81 students from the University of Social Sciences and Humanities (USSH; 26 males, 55 females) (table 2) were assessed. Male students at UTP exhibited a mean height of 168.0 ± 7.4 cm and body mass of 63.6 ± 11.3 kg, while their USSH counterparts averaged 168.3 ± 7.4 cm and 62.6 ± 10.5 kg. Female students at UTP measured 155.1 ± 5.1 cm and 51.0 ± 6.5 kg, compared with 157.5 ± 5.3 cm and 53.4 ± 8.4 kg at USSH. Vital capacity and resting heart-rate values were broadly similar across both institutions and genders, indicating comparable baseline cardiorespiratory profiles.

Physical Fitness Performance

In strength and power tests, UTP males produced a mean handgrip force of 37.4 ± 6.4 kg and a standing long jump of 1.91 ± 0.21 m; USSH males scored 34.1 ± 5.3 kg and 1.84 ± 0.33 m, respectively. UTP females achieved 25.1 ± 4.4 kg and 1.50 ± 0.15 m, versus 23.7 ± 3.6 kg and 1.46 ± 0.25 m at USSH. Sprint speed (30 m) averaged 5.42 ± 0.68 s for UTP males and 5.74 ± 0.71 s for USSH males; UTP females ran 6.26 ± 0.53 s compared to 6.48 ± 0.65 s at USSH. Core endurance (sit-ups/30 s) and aerobic capacity (5-minute run) followed similar patterns, with UTP participants generally outperforming their USSH peers by small margins.

Table 1. Physical and Functional Characteristics of Students at Ho Chi Minh City University of Technology

Test / Indicator	Mean ($\bar{x}$)	SD (σ)	CV (%)	Min	Max
MALE (n = 59)					
Morphology					
Height (cm)	168.04	7.37	4.38	148.5	183
Weight (kg)	63.56	11.27	17.73	46	95
Body Mass Index (kg/m²)	22.47	3.46	15.38	17.24	31.38
Function					
Vital capacity (L)	3.29	0.62	18.92	2.01	4.62
Heart-rate function (beats)	13.29	3.34	25.09	5.2	22
Physical fitness					
Handgrip strength (kg)	37.43	6.37	17.02	22.5	63.2
Standing long jump (m)	1.91	0.21	10.91	1.64	2.49
30 m sprint (s)	5.42	0.68	12.47	4.4	6.96
Sit-up count in 30 s (repetitions)	16.14	2.8	17.36	9	24
5-minute run distance (m)	889.17	117.26	13.19	700	1135
FEMALE (n = 24)					

Morphology					
Height (cm)	155.11	5.08	3.27	146	164
Weight (kg)	51.02	6.53	12.79	41	61.5
Body Mass Index (kg/m²)	21.2	2.5	11.8	16.96	26.06
Function					
Vital capacity (L)	2.33	0.43	18.42	1.64	3.45
Heart-rate function (beats)	14.12	3.67	25.98	8	19.6
Physical fitness					
Handgrip strength (kg)	25.08	4.4	17.56	19.2	36.7
Standing long jump (m)	1.5	0.15	10.12	1.35	1.9
30 m sprint (s)	6.26	0.53	8.39	5.44	7.09
Sit-up count in 30 s (repetitions)	15.04	1.99	13.22	12	20
5-minute run distance (m)	782.29	70.73	9.04	700	942

Table 2. Physical and Functional Characteristics of Students at the University of Social Sciences and Humanities, HCMC

Test / Indicator	**Mean (x̄)**	**SD (σ)**	**CV (%)**	**Min**	**Max**
MALE (n = 26)					
Morphology					
Height (cm)	168.34	7.4	4.4	154	189.2
Weight (kg)	62.62	10.48	16.74	48	84
Body Mass Index (kg/m²)	22.11	3.45	15.61	16.04	28.07
Function					
Vital capacity (L)	3.15	0.59	18.9	2.16	4.35
Heart-rate function (beats)	14.55	3.4	23.37	7.2	21.6
Physical fitness					
Handgrip strength (kg)	34.11	5.26	15.43	24	44.2
Standing long jump (m)	1.84	0.33	17.81	1.24	2.51
30 m sprint (s)	5.74	0.71	12.4	4.21	7.23
Sit-up count in 30 s (repetitions)	16.04	3.09	19.28	11	22
5-minute run distance (m)	720.15	121.14	16.82	530	957
FEMALE (n = 55)					
Morphology					
Height (cm)	157.51	5.31	3.37	148	171
Weight (kg)	53.38	8.37	15.68	41	75
Body Mass Index (kg/m²)	21.53	3.32	15.42	15.06	30.7
Function					
Vital capacity (L)	2.47	0.47	19.04	1.58	3.59
Heart-rate function (beats)	15	2.84	18.96	9.6	20.8
Physical fitness					
Handgrip strength (kg)	23.65	3.61	15.26	14.1	31.1
Standing long jump (m)	1.46	0.25	17.02	1.02	2.66
30 m sprint (s)	6.48	0.65	10.03	5.1	7.91

Sit-up count in 30 s (repetitions)	14.05	2.8	19.91	10	20
5-minute run distance (m)	630.62	94.76	15.03	417	857

Assessment of Physical Fitness According to MOET Standards

When evaluated against the MOET benchmarks for 18-year-olds, 66.1 % of UTP males and 87.5 % of UTP females met overall pass criteria, whereas USSH students exhibited higher compliance (96.2 % of males; 98.2 % of females). Across both institutions, standing long jump achieved the highest pass rates (>72.7 % in all groups), while shuttle run performance was the least compliant domain (as low as 12.5 % in UTP females). Table-based breakdowns highlight that USSH females excelled in the shuttle run (72.7 % pass) and aerobic run (63.6 % pass), whereas UTP males showed stronger performance in the 30 m sprint relative to their USSH counterparts (22.0 % vs. 7.7 % pass).

Table 3. MOET Fitness Standards for 18-Year-Old Students

Sex	Level	Handgrip (kg)	Long Jump (cm)	30 m Sprint (s)	Sit-ups/30 s (reps)	5-min Run (m)
Male	Excellent	> 47.2	> 222	< 4.80	> 21	> 1050
	Pass	≥ 40.7	≥ 205	≤ 5.80	≥ 16	≥ 940
Female	Excellent	> 31.5	> 168	< 5.80	> 18	> 930
	Pass	≥ 26.5	≥ 151	≤ 6.80	≥ 15	≥ 850

University of Technology (UTP)

Overall, **66.10 %** of male and **87.50 %** of female students met the composite MOET requirements. The cohort's strongest domain was standing long jump (100 % achieved ≥ 205 cm, "Pass" or better), whereas the shuttle run (4×10 m) yielded the lowest compliance (27.12 % of males; 12.50 % of females). Detailed breakdown is shown in Table 5.

Table 4. UTP Students' Fitness Ratings per MOET Standards

Sex (n)	Rating	30 m Sprint	Long Jump	4×10 m Shuttle	5-min Run	Overall Pass
Male (59)	Excellent	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)
	Pass	13 (22.03 %)	0 (0 %)	43 (72.88 %)	35 (59.32 %)	39 (66.10 %)
	Fail	46 (77.97 %)	59 (100 %)	16 (27.12 %)	24 (40.68 %)	20 (33.90 %)
Female (24)	Excellent	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)
	Pass	10 (41.67 %)	0 (0 %)	21 (87.50 %)	12 (50.00 %)	21 (87.50 %)
	Fail	14 (58.33 %)	24 (100 %)	3 (12.50 %)	12 (50.00 %)	3 (12.50 %)

University of Social Sciences and Humanities (USSH)

At USSH, **96.15 %** of male and **98.18 %** of female students satisfied the overall criteria. Female students performed especially well in the shuttle run (72.73 % "Pass") and 5-minute run (63.64 %), but fewer met the 30 m sprint threshold (23.64 %). See Table 6 for full metrics.

Table 5. USSH Students' Fitness Ratings per MOET Standards

Sex (n)	Rating	30 m Sprint	Long Jump	4×10 m Shuttle	5-min Run	Overall Pass
Male (26)	Excellent	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)
	Pass	2 (7.69 %)	0 (0 %)	15 (57.69 %)	12 (46.15 %)	25 (96.15 %)
	Fail	24 (92.31 %)	26 (100 %)	11 (42.31 %)	14 (53.85 %)	1 (3.85 %)
Female (55)	Excellent	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)
	Pass	13 (23.64 %)	0 (0 %)	40 (72.73 %)	20 (36.36 %)	54 (98.18 %)
	Fail	42 (76.36 %)	55 (100 %)	15 (27.27 %)	35 (63.64 %)	1 (1.82 %)

Discussion

The present study reveals that UTP and USSH students exhibit broadly comparable morphological and functional characteristics, yet distinct patterns emerge in specific fitness domains. Anthropometric data indicated minimal inter-institutional differences in mean height and body mass (UTP male height: 168.0 ± 7.4 cm vs. USSH male: 168.3 ± 7.4 cm; UTP female: 155.1 ± 5.1 cm vs. USSH female: 157.5 ± 5.3 cm). Resting heart rates and vital capacities were also similar, suggesting equivalent baseline cardiorespiratory status. This homogeneity aligns with prior reports of consistent morphological profiles among Vietnamese young adults (Lan et al., 2021). In strength and power assessments, UTP cohorts outperformed USSH peers in handgrip and standing long jump, albeit by modest margins (UTP male handgrip: 37.4 ± 6.4 kg vs. USSH male: 34.1 ± 5.3 kg; UTP female long jump: 1.50 ± 0.15 m vs. USSH female: 1.46 ± 0.25 m). These findings may reflect differential engagement in campus sports programs, as UTP's engineering curriculum often integrates structured physical activity modules, consistent with evidence that program-specific exercise regimens enhance musculoskeletal fitness (Hoang et al., 2024) . Conversely, USSH students exhibited marginally slower 30 m sprint times and sit-up counts, which may indicate lower anaerobic and core endurance capacities—domains shown to benefit from HIIT interventions in university settings (Costigan et al., 2022).

Aerobic capacity, measured via 5-minute run distance, revealed that UTP students ran farther on average (male: 889.2 ± 117.3 m; female: 782.3 ± 70.7 m) compared to their USSH counterparts (male: 720.2 ± 121.1 m; female: 630.6 ± 94.8 m). This disparity underscores the potential influence of habitual physical activity levels and campus infrastructure; UTP's sports center provides regular endurance training opportunities, which have been linked to improved VO_2max outcomes (Wen et al., 2020). When benchmarked against MOET standards, compliance rates diverged markedly by domain and cohort. Standing long jump achieved universal "Pass" rates across all groups, aligning with reports that explosive lower-limb power is generally well-developed among Vietnamese youth (Ministry of Education and Training, 2008). In contrast, 4×10 m shuttle performance was the weakest domain, with pass rates as low as 12.5 % in UTP females and 57.7 % in USSH males. These low compliance figures echo international observations that agility drills often require specialized training to attain proficiency (Demetriou et al., 2025) . Notably, USSH females outperformed UTP females in shuttle run (72.7 % vs. 87.5 % pass) and aerobic run (63.6 % vs. 50.0 %), suggesting that cross-training or extracurricular sports participation may mitigate lower-body endurance deficits in humanities students.

Implications and Recommendations

Our data advocate for institution-tailored interventions:

Agility Enhancement: Implement shuttle-run-focused drills within physical education curricula, leveraging evidence that repeated sprint training improves neuromuscular coordination (Bauer et al., 2022).

Endurance Programming: Introduce campus-wide aerobic challenges (e.g., weekly 5-minute run clubs) to elevate compliance with MOET endurance benchmarks, drawing on successful HIIT models (Costigan et al., 2020).

Strength Maintenance: Continue promoting upper-body conditioning, particularly in USSH cohorts, through accessible handgrip and core endurance sessions.

Limitations and Future Directions

This cross-sectional design precludes causal inference; longitudinal tracking of training interventions would elucidate temporal fitness adaptations. Additionally, self-reported physical activity levels were not assessed, limiting analysis of lifestyle factors. Future research should integrate wearable activity monitors and dietary assessments to more comprehensively model determinants of student fitness. Investigating psychological motivators and barriers to exercise could further optimize program engagement.

In conclusion, while UTP and USSH students share similar baseline profiles, targeted enhancements in agility and endurance are warranted to meet national fitness standards. Tailored, evidence-based interventions have the potential to foster sustainable improvements in Vietnamese university student health, with broader implications for preventive public health strategies.

Conclusions

UTP and USSH first-year students share similar anthropometric and cardiorespiratory baselines but differ in physical fitness performance. UTP cohorts outperform in handgrip strength and aerobic capacity, whereas USSH students exhibit higher overall MOET pass rates—especially in agility and endurance domains. Standing long jump is universally strong, while 4×10 m shuttle run remains the weakest. Targeted agility drills and structured endurance programming are recommended to align undergraduate fitness with national standards.

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