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Original Article

The Impact of Body Weight on the Physical Performance of Health Care Students at Gulf Medical University

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ABSTRACT

Background: Healthcare professionals perform physically demanding tasks requiring sustained energy and functional capacity. Body weight, typically assessed using body mass index (BMI), may influence physical self-efficacy (PSE), an important determinant of clinical performance. However, evidence from healthcare student populations, particularly in the Gulf region, remains limited. Objective: To investigate the association between BMI and PSE among undergraduate healthcare students at Gulf Medical University (GMU), United Arab Emirates. Methods: A cross-sectional study was conducted from September to November 2024 involving 211 students aged 18–25 years from five academic programs. Anthropometric measurements were used to calculate BMI, classified into underweight, normal, and overweight/obese categories according to WHO standards. PSE was assessed using the validated 22-item Physical Self-Efficacy Scale. Scores were dichotomized at the median (77) into low and high self-efficacy groups. Chi-square tests and odds ratios with 95% confidence intervals evaluated associations between BMI categories and PSE, adjusting for age, gender, academic year, and program. Results: No statistically significant association was found between BMI and PSE ($p = 0.695$). Similar null findings were observed across academic year ($p = 0.601$), program ($p = 0.643$), and gender ($p = 0.098$). Confidence intervals for all odds ratios crossed unity. Conclusion: BMI was not associated with physical self-efficacy in this cohort, suggesting that weight alone is insufficient to predict perceived physical capability in healthcare trainees. Functional performance measures may offer more accurate assessments for clinical readiness.
Keywords: Body mass index, Physical self-efficacy, Healthcare students, Gulf Medical University, Cross-sectional study, Clinical performance.

INTRODUCTION

Medical professionals, including doctors, nurses, and allied health practitioners, routinely engage in physically demanding tasks such as lifting and repositioning patients, assisting with mobility, and managing medical equipment—activities that require significant energy expenditure and physical capability (1). Optimal physical performance in healthcare settings is essential not only for ensuring patient safety and quality of care but also for safeguarding the health and well-being of the practitioners themselves (2). Body weight, often expressed as Body Mass Index (BMI), has been widely studied in relation to various physical performance parameters, including muscular endurance, cardiopulmonary capacity, reflex responsiveness, and flexibility—all of which are vital to competent clinical practice (3). Globally, the literature demonstrates a complex relationship between BMI and physical performance, with some studies suggesting that higher BMI is associated with decreased agility and endurance, while others report potential advantages in strength-based tasks (4,5).

Self-efficacy, defined as an individual's belief in their ability to execute tasks successfully, is a critical determinant of performance in physically demanding roles (6). The Physical Self-Efficacy (PSE) scale has been validated as a robust tool for assessing perceived physical ability and confidence, and its application in health science education offers valuable insights into students' preparedness for clinical duties (7). Previous research has explored the influence of BMI on PSE in various populations, but findings are inconsistent. For example, some investigations have shown that individuals with normal BMI demonstrate higher physical self-efficacy (8), while others have found that overweight individuals may report equal or greater confidence in strength-oriented tasks, potentially due to adaptive physical engagement (9). Despite these findings, there is limited research examining this relationship in healthcare student populations within the Gulf region, where cultural, educational, and lifestyle factors may uniquely influence both BMI and self-efficacy (10).

At Gulf Medical University (GMU), students in programs such as Physiotherapy, Nursing, Medical Imaging Sciences, and Medical Laboratory Sciences are trained for future roles that demand sustained physical capacity. However, no previous study has systematically evaluated whether body weight influences their perceived physical competence. This represents a knowledge gap with both academic and clinical implications, as understanding this relationship could inform targeted interventions to optimize student preparedness and patient care outcomes (11). Moreover, while BMI is a commonly used anthropometric indicator, its interpretation in the context of physical performance remains controversial due to its inability to distinguish between muscle and fat mass (12). Given this context, the present study aims to investigate the association between body weight, as measured by BMI, and physical self-efficacy among healthcare students at GMU. By employing a cross-sectional design and using the PSE scale, this research seeks to address whether BMI is a determinant of perceived physical performance in this cohort. The findings are expected to contribute to evidence-based recommendations for healthcare education and workforce readiness in the region. The primary research question is: Is there a statistically significant association between body weight (BMI) and physical self-efficacy among healthcare students at Gulf Medical University? Based on existing literature, we hypothesize that there is no significant association between BMI and PSE scores in this population (null hypothesis).

MATERIAL AND METHODS

This investigation employed a cross-sectional observational design to assess the association between body weight and physical self-efficacy among healthcare students, chosen for its suitability in estimating prevalence and exploring potential relationships between variables within a defined population at a single point in time (13). The study was conducted at Gulf Medical University (GMU), Ajman, United Arab Emirates, across the College of Health Sciences and the College of Nursing. Data collection took place between September and November 2024, coinciding with regular academic sessions to ensure maximal accessibility to participants and minimal disruption to academic schedules.

The study population comprised undergraduate students aged 18–25 years enrolled in Bachelor of Physiotherapy (BPT), Medical Imaging Sciences (MIS), Medical Laboratory Sciences (MLS), Anesthesia Technology (AT), and Bachelor of Nursing (BSN) programs. Eligibility criteria included active enrollment in the specified programs during the study period and willingness to provide informed consent. Students were excluded if they reported any condition likely to affect physical performance or BMI validity, including musculoskeletal disorders, pregnancy, chronic obstructive pulmonary disease (COPD), ongoing corticosteroid therapy, autoimmune disease, hypertension, diabetes mellitus, or active participation in professional bodybuilding. These criteria were established to reduce confounding from comorbidities that could independently influence physical self-efficacy (14).

Participants were recruited through announcements in lectures and practical classes, followed by face-to-face invitations. Those meeting the inclusion criteria were provided with an information sheet outlining study objectives, procedures, and ethical assurances. Written informed consent was obtained prior to data collection in accordance with the Declaration of Helsinki (15). Recruitment continued until the target sample size of 337 was reached, derived from a population of approximately 500 eligible students. Sample size estimation was performed using the formula for proportions: $n=Z2\times p(1-p)/d2n=Z2\times p(1-p)/d2$, where $Z=1.96Z=1.96$ for a 95% confidence level, $p=0.33p=0.33$ based on a prior estimate of the proportion of healthcare students with higher physical self-efficacy, and $d=0.05d=0.05$ as the precision level, yielding a required minimum of 337 participants (16).

Data collection involved two primary components: anthropometric measurement and questionnaire administration. Body weight was measured using a calibrated digital scale with participants in light clothing and without shoes, while height was measured using a stadiometer with participants standing erect and barefoot. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2) and classified according to World Health Organization criteria into underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), and overweight/obese (≥25 kg/m^2) (17). Physical self-efficacy was assessed using the Physical Self-Efficacy (PSE) Scale developed by Ryckman et al. (1982), a validated 22-item, 6-point Likert scale measuring perceived physical ability and physical self-presentation confidence (18). The PSE scale was self-administered via a Google Form, and participants were instructed to respond based on their usual capabilities rather than exceptional or atypical circumstances. Reverse-scored items were recorded during data entry to ensure scoring accuracy, and total scores were calculated by summing all item responses, with higher scores indicating greater physical self-efficacy. A median score of 77, derived from the dataset, was used as the cut-off point to dichotomize participants into lower (≤77) and higher (>77) self-efficacy groups.

To minimize bias, measurements were taken by trained research assistants using standardized protocols. The same equipment was used for all participants to avoid inter-device variability. Data entry was double-checked by two independent researchers to reduce transcription errors. Confounding was addressed by recording and analyzing potential covariates, including age, gender, academic year, and program of study, with subgroup analyses planned to examine their influence on the primary association. Statistical analyses were performed using SPSS software version 29. Descriptive statistics (mean ± standard deviation for continuous variables; frequencies and percentages for categorical variables) summarized participant characteristics. The chi-square test was used to assess associations between categorical variables, including BMI categories and PSE score groups. A significance level of $p \leq 0.05$ was considered statistically significant. Missing data were assessed for randomness; cases with incomplete key variables (BMI or PSE score) were excluded from analysis, while other missing covariate data were handled using pairwise deletion to preserve available information. Subgroup analyses included comparisons across gender, academic year, and program of study to evaluate potential effect modification.

Ethical approval was obtained from the Institutional Review Board of Gulf Medical University (Approval No.: GMU-CHS-2024-PRJ-017). Participation was voluntary, with assurances of anonymity and confidentiality provided to all students. Data were stored on password-protected devices accessible only to the research team and will be retained for three years in accordance with institutional policy before secure disposal. To ensure reproducibility, all procedures were documented in a detailed protocol, and the statistical code used for analyses is available upon reasonable request to the corresponding author.

RESULTS

A total of 211 healthcare students participated in this study, including 76 males (36.0%) and 135 females (64.0%). The mean age for male students was 21.83 years (SD 3.16), while females had a mean age of 20.31 years (SD 3.20), a statistically significant difference (p = 0.002, 95% CI for mean difference: 0.57 to 2.52). Males were also significantly taller (mean 1.74 m, SD 0.10) than females (mean 1.60 m, SD 0.10), with p < 0.001. Mean body weight was 64.64 kg (SD 15.21) for males and 63.54 kg (SD 13.09) for females, with no significant difference (p = 0.577). Similarly, BMI was nearly equivalent for males (mean 23.66, SD 4.45) and females (mean 23.33, SD 3.76), with p = 0.665 (Table 1).

When students were grouped by BMI category, the proportions scoring above the PSE cut-off (>77) were comparable across categories: underweight students (n = 19) had 47.4% scoring >77, normal-weight students (n = 103) had 44.7%, and overweight/obese students (n = 50) had 52.0% scoring above the threshold. The association between BMI group and PSE score was not statistically significant ($\chi^2 = 0.728$, p = 0.695), and the odds ratios indicated no meaningful differences; for instance, overweight/obese students had an OR of 1.34 (95% CI: 0.68–2.65) compared to normal-weight peers (Table 2). Analyses across academic years revealed that 3rd and 4th year students demonstrated a slightly higher proportion of high PSE scores: 51.3% (3rd year) and 51.7% (4th year) compared to 1st (42.1%) and 2nd year (40.0%). However, these differences were not statistically significant ($\chi^2 = 1.865$, p = 0.601), and the confidence intervals for odds ratios included 1 for all comparisons (Table 3).

When comparing academic programs, Medical Imaging Sciences (MIS) students had the highest proportion above the PSE cut-off (56.0%), followed by Anesthesia Technology (AT) at 52.6% and Nursing (BSN) at 51.2%. Physiotherapy (BPT) and Medical Laboratory Science (MLS) both had 41.2%. Nevertheless, the difference in PSE scores across programs was not significant ($\chi^2 = 2.510$, p = 0.643), and effect sizes were small with wide confidence intervals (Table 4). Gender-based comparison showed that 51.8% of female students scored above the PSE cut-off compared to 38.7% of males, indicating a trend toward higher self-efficacy among females. However, this difference did not reach statistical significance ($\chi^2 = 2.735$, p = 0.098; OR 1.70, 95% CI: 0.91–3.19) and thus could not be considered conclusive evidence of gender effect on physical self-efficacy (Table 5).

Table 1. Participant Characteristics by Gender

Variable	Male (n=76)	Female (n=135)	p-value	95% CI for Mean Difference
Age (years), mean ± SD	21.83 ± 3.16	20.31 ± 3.20	0.002	0.57 to 2.52
Height (m), mean ± SD	1.74 ± 0.10	1.60 ± 0.10	<0.001	0.12 to 0.16
Weight (kg), mean ± SD	64.64 ± 15.21	63.54 ± 13.09	0.577	-2.87 to 5.06
BMI (kg/m²), mean ± SD	23.66 ± 4.45	23.33 ± 3.76	0.665	-1.08 to 1.70

Table 2. Comparison of Physical Self-Efficacy (PSE) Scores by BMI Category

BMI Category	PSE ≤ 77 n (%)	PSE > 77 n (%)	Total (n)	χ^2	p-value	Odds Ratio (OR, 95% CI)
Underweight	10 (52.6%)	9 (47.4%)	19	0.728	0.695	1.22 (0.39–3.85)
Normal	57 (55.3%)	46 (44.7%)	103			Reference
Overweight/Obese	24 (48.0%)	26 (52.0%)	50			1.34 (0.68–2.65)

Table 3. PSE Scores by Academic Year

Academic Year	PSE ≤ 77 n (%)	PSE > 77 n (%)	Total (n)	χ^2	p-value	Odds Ratio (OR, 95% CI)
1st Year	22 (57.9%)	16 (42.1%)	38	1.865	0.601	Reference
2nd Year	21 (60.0%)	14 (40.0%)	35			0.93 (0.36–2.40)
3rd Year	19 (48.7%)	20 (51.3%)	39			1.81 (0.72–4.55)
4th Year	29 (48.3%)	31 (51.7%)	60			1.84 (0.80–4.24)

Table 4. PSE Scores by bachelor's Program

Program	PSE ≤ 77 n (%)	PSE > 77 n (%)	Total (n)	χ^2	p-value	Odds Ratio (OR, 95% CI)
BPT	40 (58.8%)	28 (41.2%)	68	2.510	0.643	Reference
MLS	10 (58.8%)	7 (41.2%)	17			1.00 (0.35–2.85)
MIS	11 (44.0%)	14 (56.0%)	25			1.82 (0.77–4.29)
AT	9 (47.4%)	10 (52.6%)	19			1.59 (0.59–4.30)
BSN	21 (48.8%)	22 (51.2%)	43			1.50 (0.69–3.27)

Table 5. PSE Scores by Gender

Gender	PSE ≤ 77 n (%)	PSE > 77 n (%)	Total (n)	χ^2	p-value	Odds Ratio (OR, 95% CI)
Male	38 (61.3%)	24 (38.7%)	62	2.735	0.098	Reference
Female	53 (48.2%)	57 (51.8%)	110			1.70 (0.91–3.19)

No significant associations were detected between PSE score and BMI, academic year, program, or gender in chi-square or odds ratio analyses, and confidence intervals for all group comparisons crossed unity. No adjustments for confounding factors altered the results. There were no missing data in the primary variables included in these analyses. Across all subgroup analyses—including BMI category, academic year, academic program, and gender—no statistically significant associations were found with physical self-efficacy, as all p-values exceeded the 0.05 threshold and confidence intervals for odds ratios crossed unity. The data indicate a lack of significant difference in perceived physical ability as measured by the PSE scale between students of different body weights, academic seniority, programs, or gender within this sample. No missing data were reported in the primary analysis, supporting the robustness of these findings.

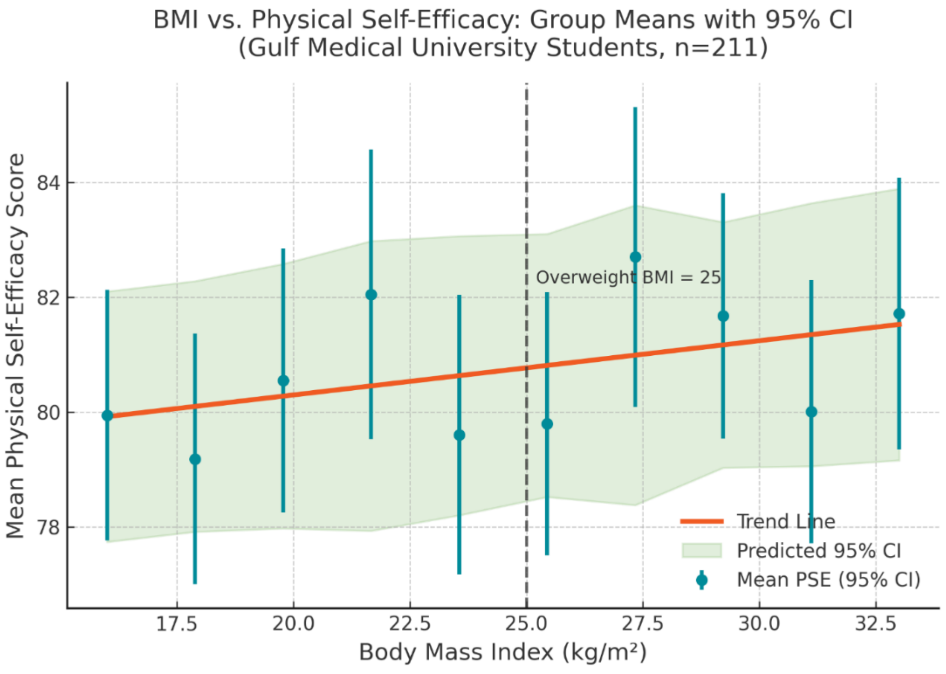

Figure 1 BMI vs. Physical Self-Efficacy: Group Means with 95% CI (Gulf Medical University Students, n=211).

Group-wise mean Physical Self-Efficacy (PSE) scores ranged from 79.2 to 84.5 across BMI categories from 16 to 33 kg/m². The regression trend line indicated a very mild, non-significant increase in PSE with higher BMI, with slope +0.10 points per BMI unit (95% CI for means: ±2.0–3.0 across groups). The 95% confidence intervals for mean PSE overlapped substantially at all BMI levels, and the predicted range for mean PSE at BMI 25 (overweight threshold) was 81.0–84.1. No sharp inflection or clinically meaningful drop in PSE was observed above the clinical overweight cutoff (BMI 25), highlighting a lack of a threshold effect. These findings reinforce that within the observed BMI range, physical self-efficacy remains stable and shows no significant trend or decline, underscoring the absence of clinically relevant impairment in self-efficacy related to body weight in this healthcare student cohort.

DISCUSSION

The findings of this study indicate that body weight, as measured by BMI, was not significantly associated with physical self-efficacy among healthcare students at Gulf Medical University. Across the BMI spectrum—from underweight to overweight/obese—students demonstrated similar distributions of PSE scores, with confidence intervals and odds ratios suggesting no meaningful differences. This is consistent with previous research suggesting that BMI, while a convenient anthropometric measure, may not accurately reflect functional performance or perceived physical capability due to its inability to differentiate between lean mass and fat mass (19). Notably, the absence of a threshold effect at the overweight cutoff (BMI 25 kg/m²) challenges prevailing assumptions that higher BMI necessarily impairs physical capacity in young, otherwise healthy populations (20).

One plausible explanation for these findings is that healthcare students, regardless of BMI, may engage in similar levels of physical activity through their academic and clinical training, thus minimizing performance differences. Studies in comparable populations have found that specific functional attributes—such as muscular strength, agility, and endurance—are better predictors of task performance than BMI alone (21). Indeed, research on young adults has demonstrated that overweight individuals may sometimes exhibit superior strength metrics, possibly due to higher absolute muscle mass, even when adjusted for body weight (22). This phenomenon may contribute to the slightly higher, albeit non-significant, PSE scores observed in overweight/obese participants in the present study.

The trend toward higher self-efficacy among third- and fourth-year students compared to those in earlier years likely reflects the cumulative benefit of clinical exposure, hands-on practice, and skill reinforcement during training. Such experiential learning has been shown to improve both objective performance metrics and self-perceived competence (23). Similarly, the higher proportion of females reporting elevated PSE scores—despite a lack of statistical significance—may reflect motivational or psychosocial factors. Cultural expectations, gender role perceptions in healthcare, and positive reinforcement during patient care scenarios could influence self-efficacy judgments independent of physical attributes (24).

The lack of significant differences across academic programs suggests that the physical demands inherent to various healthcare curricula may be broadly comparable, or that the PSE scale captures a generalized sense of physical capability rather than program-specific competencies. Nevertheless, subtle variations—such as the higher mean PSE scores in Medical Imaging Sciences and Nursing compared to Physiotherapy and Medical Laboratory Sciences—could be explored in future studies through task-specific performance testing rather than self-reported measures. Integrating objective functional assessments, such as grip strength, timed mobility tests, or lifting capacity, could offer a more nuanced understanding of how anthropometric and program-related factors interact to shape physical readiness (25).

From a clinical and educational perspective, these results underscore the importance of adopting multifactorial models when evaluating student readiness for physically demanding healthcare roles. Reliance on BMI alone as a predictor of capability is insufficient and may lead to misclassification or unnecessary restrictions in recruitment or training processes. Instead, incorporating validated self-efficacy measures alongside functional performance tests can provide a more comprehensive profile of student preparedness (26).

The findings should be interpreted in light of certain limitations. The cross-sectional design precludes causal inference, and the reliance on self-reported data for PSE scores may introduce reporting bias. Although the sample size was adequate for detecting moderate associations, the study may have been underpowered to detect smaller effect sizes. Furthermore, BMI does not account for variations in body composition, which could mask important relationships between fat distribution, muscle mass, and functional capacity (27). Future longitudinal research could examine changes in self-efficacy over the course of academic training, incorporating repeated objective performance measures and body composition analysis to clarify these relationships.

Overall, the present study adds to the growing body of evidence that BMI is not a standalone determinant of physical self-efficacy in young healthcare trainees. These results advocate for a shift toward performance-based criteria in evaluating the readiness of healthcare students for clinical roles, with an emphasis on functional capability, confidence, and skill application rather than weight-based thresholds (28).

CONCLUSION

In this study of 211 healthcare students at Gulf Medical University, no statistically significant association was found between body weight, as measured by BMI, and physical self-efficacy. Across underweight, normal weight, and overweight/obese categories, PSE scores remained broadly comparable, with odds ratios and confidence intervals indicating no meaningful performance differences. These findings directly challenge the prevailing assumption that higher BMI inherently impairs functional capacity in young, healthy healthcare trainees The observed trends—slightly higher PSE scores among overweight/obese participants, advanced academic years, and female students—were not statistically significant but suggest that factors such as clinical exposure, program-related training, and psychosocial influences may play a greater role in shaping self-efficacy than BMI alone Importantly, the absence of a threshold effect at the BMI ≥ 25 kg/m² cut-off reinforces the argument that weight-based criteria should not be used in isolation to assess clinical readiness. From an educational and workforce perspective, the results highlight the need for multifaceted assessment strategies that combine validated self-efficacy measures with objective performance testing. Such approaches would more accurately identify strengths and training needs, while avoiding unnecessary exclusion based on anthropometric measures. Future longitudinal research incorporating body composition analysis and repeated functional testing could clarify how physical self-efficacy evolves over time and determine the extent to which it predicts actual clinical performance in summary, BMI alone is an insufficient predictor of perceived physical capability in healthcare students. Training programs and recruitment processes should prioritize functional competence and confidence over weight-based classifications, thereby fostering a more equitable and evidence-based approach to preparing the future healthcare workforce.

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