

ORIGINAL ARTICLE

Do Professional Attitudes Align with Academic Performance? A Cluster Analysis of Physical Therapy Students

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ABSTRACT

Objective: To identify professional attitudes among physical therapy graduates and to find patterns of professional attitudes in relation to academic performance using cluster analysis.

Study Design: An analytical cross-sectional study.

Place and Duration of Study: Department of Physical Therapy, Faculty of Medicine, Prince of Songkla University, Thailand between March 01, 2025 to September 30, 2025.

Materials and Methods: The study included 65 physical therapy graduates. Participants completed an adapted questionnaire assessing professional attitudes across four domains. Grade point averages (GPAs) were obtained from official academic records. K-means cluster analysis was used to identify clusters based on GPA and professional attitude scores. Cluster characteristics were summarized descriptively, followed by exploratory comparisons using the Kruskal–Wallis test with post-hoc Mann–Whitney U tests.

Results: Overall, participants reported favourable attitudes toward the physical therapy profession. Three distinct profiles emerged. The profiles were characterized by lower relative GPA with high attitude scores, higher GPA with high attitude scores, and intermediate GPA with comparatively lower attitude scores. These profiles illustrate that academic performance, and professional attitudes do not necessarily align.

Conclusion: The findings indicate variation in professional attitudes across levels of academic performance among physical therapy graduates. These findings highlight the importance of considering professional attitudes alongside academic performance in physical therapy education.

Key Words *Academic Performance, Cluster Analysis, Physical Therapy Education, Professional Attitude, Professional Identity.*

Introduction

Rehabilitation has become a global health priority because of population ageing, the increasing prevalence of chronic diseases, and the growing burden of disability worldwide. The World Health Organization (WHO) recognizes rehabilitation as an essential health service and a key component of Universal Health Coverage. Timely access to rehabilitation improves functioning, independence, participation, and quality of life for people of all ages. Despite this growing need, the WHO reports a

substantial global shortage of rehabilitation professionals, particularly in low- and middle-income countries.¹

Physical therapy plays an essential role in restoring function, reducing disability, promoting health, and improving quality of life across diverse populations. Physical therapists increasingly work within complex healthcare systems that require not only sound clinical knowledge and technical competence but also ethical judgment, effective communication, interprofessional collaboration, adaptability, and commitment to lifelong learning.² Consequently, physical therapy education is expected to prepare graduates who are academically competent and able to demonstrate professional values and attitudes that support responsible and patient-centered practice.

Professional attitude refers to individuals' positive or negative perceptions of their profession, including interest, satisfaction, and commitment.³ Within health professions education (HPE), professional attitude is considered a key component of

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professionalism and professional identity formation.

^{4,5} Professional attitudes develop progressively through interactions between learners and their educational environment. Factors such as the formal curriculum, clinical education experiences, role modelling by faculty members and clinical mentors, reflective practice, and interactions with patients and healthcare teams all contribute to shaping students' professional values and attitudes. ⁴ A supportive learning environment that promotes professionalism, ethical practice, and reflective learning can further strengthen students' professional identity and commitment to the profession. ⁵ Positive attitudes have been associated with greater motivation, engagement in learning, commitment to professional standards, and resilience during academic and clinical training. ^{3,6} Conversely, negative attitudes may contribute to reduced motivation, disengagement from learning, and diminished persistence in professional development. ⁷

Academic achievement, commonly measured by grade point average (GPA), remains a standard indicator of student performance. ⁸ However, GPA primarily reflects cognitive achievement and may not adequately capture students' professional values, engagement, or attitudes. Previous studies examining the relationship between academic performance and professional attitudes have reported inconsistent findings, with some demonstrating positive associations and others reporting weak or no relationships. ^{9,10} These inconsistencies may be attributable to differences in measurement instruments used to assess professional attitudes, variations in sample characteristics and sample sizes, differences in educational curricula and clinical training experiences, and cultural or institutional contexts across countries. Such methodological and contextual heterogeneity may partly explain why the reported relationships have varied across studies. Consequently, academic performance alone may not fully explain students' professional orientation.

Most studies in physical therapy education have relied on descriptive or correlational approaches, which focus on average relationships and may overlook meaningful differences among students. ^{11,12} Students with similar academic performance may

differ substantially in motivation, professional commitment, and perceptions of the profession, while some lower-performing students may demonstrate strong professional values and engagement. ¹³⁻¹⁵ In contrast to conventional variable-centered methods such as correlation or regression, cluster analysis adopts a person-centered approach by identifying naturally occurring subgroups of individuals who share similar patterns of characteristics. This approach can reveal heterogeneity within a population that may be obscured when only average relationships are examined. The resulting profiles may provide educators with more meaningful information for designing targeted educational strategies, mentoring, and professional development initiatives tailored to the needs of different student groups. Person-centered approaches, such as cluster analysis, provide an alternative framework by identifying subgroups of students who share similar patterns of academic achievement and professional attitudes. ^{11,12} Although such approaches have gained attention in educational research, they remain underutilized in physical therapy education. ^{16,17}

In addition, evidence regarding physical therapy (PT) students' professional attitudes has been derived predominantly from Western and Middle Eastern settings, ^{18,19} whereas evidence from Southeast Asia, particularly Thailand, remains limited. Educational systems, cultural expectations, and societal perceptions of healthcare professions may influence both professional attitudes and their relationship with academic performance. Understanding these relationships within specific contexts is therefore important for developing targeted educational strategies and supporting professional identity formation.

Accordingly, this study examined PT students' attitudes toward their profession and explored their relationship with academic achievement using cluster analysis. By identifying distinct academic-attitudinal profiles, the study aimed to provide insights that may inform educational planning, student support, and professional development in physical therapy education. We hypothesized that distinct academic attitudinal profiles would emerge among PT students, reflecting heterogeneous patterns of academic achievement

and professional attitudes.

Materials and Methods

Analytical cross-sectional study examined PT students' professional attitudes and their relationship with academic performance. The study was conducted at the Department of Physical Therapy, Faculty of Medicine, Prince of Songkla University, Thailand. The university is a public university, and the study was conducted within a single institutional setting. Ethical approval was obtained from the institutional human research ethics committee (REC. 66-260-30-2; 28 July 2023). All procedures complied with the Declaration of Helsinki. Participation was voluntary, and informed consent was implied through completion of the online questionnaire.

No formal sample size calculation was performed because a total population sampling approach was used. All 100 eligible graduates were invited to participate; current final-year students were not included. Inclusion criteria were graduates who had successfully completed all academic requirements and mandatory clinical training of the physical therapy curriculum and graduated between 2023 and 2025. Of these, 65 completed the survey, resulting in a response rate of 65%. The remaining 35 graduates did not participate; no questionnaires were excluded because of incomplete responses, and there was no loss to follow-up. Specific reasons for non-participation were not collected.

Professional attitudes were assessed using a structured questionnaire adapted from a previously developed Thai-language instrument for PT students.⁷ Because the original instrument was in Thai, language translation and forward-backward translation were not required. Content validity of the adapted questionnaire was evaluated by three experts using the Index of Item-Objective Congruence (IOC). IOC values for the retained items ranged from 0.67 to 1.00, indicating acceptable content congruence. Any item with an initial IOC value of 0.33 was revised based on the experts' recommendations before administration of the final questionnaire. The final questionnaire demonstrated excellent internal consistency, with a Cronbach's alpha of 0.910.

The instrument consisted of two sections: (i) demographic information, including age, sex, and

year of graduation; and (ii) 27 attitude items covering four domains: social values (7 items), desirable characteristics of the profession (7 items), general professional practice (7 items), and relationships with colleagues, patients, and patients' relatives (6 items) (Table I).

Responses were rated on a 4-point Likert scale ranging from strongly disagree (1) to strongly agree (4). Negatively worded items were reverse scored so that higher scores indicated more positive attitudes. Although individual Likert items are ordinal, items within each domain were aggregated to form composite scores. Domain and overall attitude scores were calculated as the mean of their constituent items to preserve the original response metric and provide continuous composite measures for profile analysis.

Data were collected through an online questionnaire administered via Google Forms. The survey link and QR code were distributed through the official Facebook fan page of the Department of Physical Therapy and through LINE groups for each graduating cohort. Participants were informed of the study objectives, confidentiality procedures, and voluntary nature of participation before completing the survey. Cumulative GPA data were extracted from official academic records by authorized academic staff and provided to the research team in a de-identified form. Names, student identification numbers, and other directly identifying information were removed before the data were transferred to the researchers. Consequently, the researchers conducting the analysis were blinded to participants' identities and could not identify individual participants from the dataset.

Descriptive statistics were used to summarize participant characteristics, GPA, and attitude scores. Attitude scores were interpreted as very unfavourable (0.00–1.00), unfavourable (1.01–2.00), favourable (2.01–3.00), and very favourable (3.01–4.00).⁷ K-means cluster analysis was performed using standardized (z-score) GPA and overall professional attitude scores. Candidate solutions with two to six clusters were evaluated using the elbow method, average silhouette coefficient, cluster size, and interpretability. The three-cluster solution was retained because it yielded the highest silhouette coefficient (0.439) and

interpretable academic–attitudinal profiles. Cluster characteristics were summarized descriptively, with exploratory comparisons performed using the Kruskal–Wallis test, followed by pairwise comparisons were performed using Mann–Whitney U tests with Bonferroni correction for multiple comparisons. The $p \leq 0.05$ was considered statistical significant.

Results

Of the 100 eligible graduates, 65 completed the questionnaire (response rate: 65%), and all completed questionnaires were included in the final analysis. Participant characteristics are presented in Table II. Most respondents were female (72.3%), with a mean age of 22.26 ± 1.44 years. Nearly half graduated in 2025 (49%), and the mean cumulative GPA was 3.58 ± 0.18 (range 3.15–3.95).

The mean overall professional attitude score was 3.48 ± 0.24 , corresponding to the very favourable category based on the predefined scoring criteria. The highest ratings were observed for items related to clinical reasoning (3.91 ± 0.29), helping others (3.89 ± 0.31), patient care, including inquiry about patients' suffering (3.88 ± 0.33), responsibility (3.86 ± 0.34), and empathy (3.85 ± 0.36). Attitudes toward interpersonal relationships were also highly positive, including friendliness with patients and families (3.80 ± 0.40), collaboration with healthcare team members (3.75 ± 0.43), and friendliness with team members (3.74 ± 0.44) (Figure 1).

Within the social values domain, the highest-rated items were helping fellow humans (3.89 ± 0.31), responsibility (3.86 ± 0.34), being beneficial to self, family, and society (3.82 ± 0.39), and viewing physical therapy as an honourable profession (3.80 ± 0.40). In the desirable characteristic's domain, high scores were observed for empathy (3.85 ± 0.36), attention to detail (3.82 ± 0.39), creativity (3.78 ± 0.45), selflessness (3.74 ± 0.47), discipline and punctuality (3.73 ± 0.44), and enthusiasm (3.72 ± 0.48) (Figure 1). In the general professional practice domain, the highest scores were observed for clinical reasoning (3.91 ± 0.29), evaluation before and after each treatment session (3.88 ± 0.33), equitable treatment of patients (3.78 ± 0.41), and pride in helping others (3.78 ± 0.41). Lower scores were observed for items concerning work-related injury risk (1.25 ± 0.50), infection risk (1.40 ± 0.55), and potential monotony

of practice (2.37 ± 1.02). In the relationship's domain, scores were high for inquiring about patients' suffering (3.88 ± 0.33), friendliness with patients and families (3.80 ± 0.40), collaboration with healthcare team members (3.75 ± 0.43), friendliness with team members (3.74 ± 0.44), and cooperation from patients and families (3.69 ± 0.49) (Figure 1).

Candidate K-means solutions ranging from two to six clusters were evaluated. The average silhouette coefficients were 0.378, 0.439, 0.385, 0.390, and 0.391 for the two-, three-, four-, five-, and six-cluster solutions, respectively. The three-cluster solution yielded the highest silhouette coefficient (0.439) and produced distinct and interpretable academic–attitudinal profiles; therefore, it was retained for subsequent analysis (Table III).

Cluster 0 ($n = 25$) had a lower GPA (3.42 ± 0.11) than Cluster 1 (3.75 ± 0.10) but had the highest professional attitude score (3.60 ± 0.15). Cluster 1 ($n = 28$) had the highest GPA (3.75 ± 0.10) and a similarly high attitude score (3.58 ± 0.12). Cluster 2 ($n = 12$) had an intermediate GPA (3.56 ± 0.15) but the lowest professional attitude score (3.04 ± 0.19). As expected from the clustering procedure, the identified clusters differed in GPA and professional attitude scores. Exploratory statistical comparisons confirmed that these profiles were distinct (Kruskal–Wallis test, $p < 0.001$).

Pairwise Mann–Whitney U tests with Bonferroni correction showed significant differences in GPA between all cluster pairs (Cluster 0 vs 1, adjusted $p < 0.001$; Cluster 0 vs 2, adjusted $p = 0.007$; Cluster 1 vs 2, adjusted $p < 0.001$). For overall professional attitude scores, Cluster 2 differed significantly from both Cluster 0 and Cluster 1 (both adjusted $p < 0.001$), whereas no significant difference was observed between Clusters 0 and 1 (adjusted $p = 1.000$).

Figure 2 shows the differences in GPA and professional attitude scores across clusters, while Figure 3 demonstrates the distribution of individual participants according to cluster membership.

Discussion

This study examined professional attitudes among PT graduates and explored their relationship with academic achievement using a person-centered approach. Overall, participants reported favourable

Table I: Questionnaire Items Assessing Attitudes and Perceptions Toward the Physical Therapy Profession

Item
Social Values
1. PT is a profession beneficial to oneself, family, and society.
2. PT is an honourable profession.
3. PT offers welfare benefits comparable to those of other professions.
4. PT provides career advancement opportunities equal to other professions.
5. PT is a profession dedicated to helping others.
6. PT is a profession respected by society.
7. PT a profession in high demand.
Desirable Characteristics of the PT Profession
8. PT involves responsibility to oneself, the profession, and patients.
9. PT requires discipline and punctuality.
10. PT demands attention to detail.
11. PT encourages creativity.
12. PT fosters empathy toward others.
13. PT promotes selflessness.
14. PT inspires enthusiasm.
General Professional Practice
15. PT practice involves a risk of infection.*
16. PT practice may lead to work -related injury, e.g., back or leg pain from prolonged standing or walking.*
17. PT practice brings pride through helping others.
18. PT practice can lead to boredom.*
19. PT practice requires clinical reasoning and decision -making to provide appropriate care to each patient.
20. PT practice involves treating all patients equally.
21. PT practice requires evaluating patients before and after every treatment session.
Relationships with Colleagues, Patients, and Patients' Relatives
22. PT professionals maintain positive attitudes with interprofessional teams.
23. PT professionals collaborate with interprofessional teams.
24. PT is recognised as a valuable profession within the interprofessional team.
25. PT professionals maintain friendly relationships with patients and their families.
26. PT professionals inquire about patients' and families' concerns and well-being.
27. Most patients and families cooperate well during PT treatment.
Note: *For negatively worded items, the attitude score was assigned as follows: strongly agree = 1 point, agree = 2 points, disagree = 3 points, and strongly disagree = 4 points. PT: physical therapy.

Table II: Respondent characteristics (n = 65)

Variable	n (%) / Mean $\pm$ SD
Sex	
Male	18 (27.7)
Female	47 (72.3)
Age, years	22.26 $\pm$ 1.44 (range 21 – 24)
Year of graduation	
2023	16 (25)
2024	17 (26)
2025	32 (49)
Cumulative GPA	3.58 $\pm$ 0.18 (range 3.15–3.95)

Note: GPA: grade point average, SD: standard deviation.

Table III: Cluster-Specific Cumulative GPA And Professional Attitude Scores Derived Using K-Means Clustering (n = 65)

Cluster (n)	Cumulative GPA, Mean $\pm$ SD	95% CI	Overall professional attitude score, Mean $\pm$ SD	95% CI	Cluster characteristics
0 (25)	3.42 $\pm$ 0.11	3.37–3.46	3.60 $\pm$ 0.15	3.54–3.66	Lower GPA with a very favourable attitude score
1 (28)	3.75 $\pm$ 0.10	3.71–3.79	3.58 $\pm$ 0.12	3.53–3.63	Higher GPA with a very favourable attitude score
2 (12)	3.56 $\pm$ 0.15	3.47–3.66	3.04 $\pm$ 0.19	2.92–3.16	Intermediate GPA with a comparatively lower, but still very favourable, attitude score

GPA: grade point average, SD: standard deviation, CI: confident interval

Pairwise comparisons were performed using Mann–Whitney U tests with Bonferroni correction for three comparisons (adjusted significance threshold, $p < 0.0167$). For cumulative GPA, all pairwise comparisons were significant (Cluster 0 vs 1, adjusted $p < 0.001$; Cluster 0 vs 2, adjusted $p = 0.007$; Cluster 1 vs 2, adjusted $p < 0.001$). For overall professional attitude scores, Cluster 2 differed significantly from Clusters 0 and 1 (both adjusted $p < 0.001$), whereas Clusters 0 and 1 did not differ significantly (adjusted $p = 1.000$).

attitudes toward the profession. Cluster analysis identified three academic–attitudinal profiles based on different combinations of GPA and professional attitude scores. These profiles provide an exploratory description of heterogeneity within the sample rather than independent evidence of an

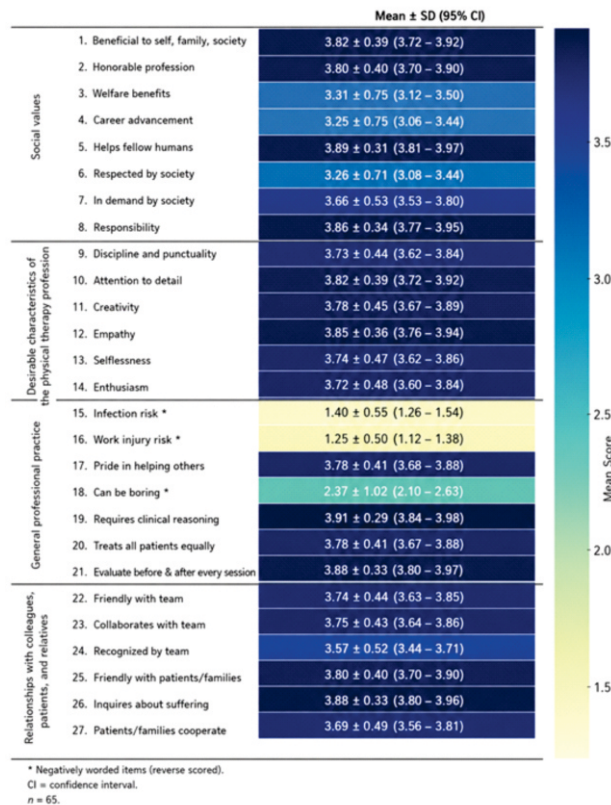


Figure 1: Heatmap Showing the Mean ± SD Of Scores for Attitude Toward the PT Profession by Questionnaire Item.

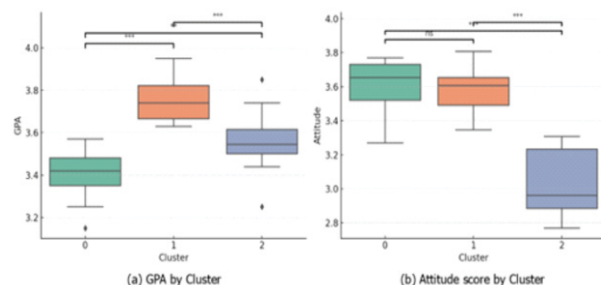


Figure 2: Comparison Of (A) GPA And (B) Professional Attitude Scores Across Clusters Based on K-Means Analysis

Note: Pairwise comparisons were performed using Mann–Whitney U tests with Bonferroni correction. For three pairwise comparisons, the adjusted significance threshold was set at $p < 0.0167$. *** $p < 0.001$, ** $p < 0.01$, ns = not significant.

association between academic performance and professional attitudes.

Graduates demonstrated particularly positive attitudes toward the social and ethical dimensions of physical therapy, including helping others, responsibility, empathy, and clinical reasoning.

These findings are consistent with previous studies reporting favourable professional attitudes among PT students in Thailand and other countries.^{7,18,19}

Participants also highly valued clinical reasoning, individualized patient management, and equitable treatment, reflecting positive attitudes toward key aspects of professional practice.

Despite these positive perceptions, graduates reported concerns regarding work-related injury and infection risks, reflected by low original scores on these negatively worded items (1.25 ± 0.50 and 1.40 ± 0.55 , respectively). These items were reverse scored for the calculation of composite attitude scores. Similar occupational concerns have been reported among practicing physical therapists.^{20,21}

Attitudes toward communication and collaboration with patients, families, and healthcare teams remained favourable.²²

The principal finding of this study was the identification of three distinct academic–attitudinal profiles among PT graduates. Cluster 1 was characterized by the highest GPA and a high professional attitude score. This profile represents the co-occurrence of relatively high academic performance and positive professional attitudes within this subgroup; however, the cluster analysis does not provide evidence regarding educational engagement, professional commitment, or other characteristics that were not directly measured.

Comparison of Clusters 0 and 2 illustrates heterogeneity in academic–attitudinal profiles. Cluster 0 had a lower GPA but higher professional attitude scores, whereas Cluster 2 had an intermediate GPA but lower attitude scores. Consistent with person-centered approaches, these profiles demonstrate that individuals can exhibit different combinations of academic and attitudinal characteristics that may not be apparent from average group-level relationships.^{11,12} Professional identity formation may provide a theoretical context for understanding such variation because professional identity develops through interactions among personal values, educational experiences, and professional contexts.^{4,5} However, professional identity, motivation, and educational experiences were not directly assessed in this study. Therefore, the identified clusters should be interpreted as exploratory academic–attitudinal profiles rather

than evidence of underlying professional commitment or identity development.

The identification of graduates with different combinations of academic performance and professional attitudes may have implications for educational planning. Professional attitudes have been associated with career perceptions, learning engagement, and responses to academic and clinical experiences,^{3,6} whereas less favourable attitudes have been linked to adverse educational experiences and reduced professional engagement.²² Evidence from medical and nursing education likewise suggests that professional attitudes, career motivation, and professional commitment may not correspond directly with academic performance.^{3,9,10}

Although these factors were not directly assessed in the present study, the identified profiles highlight the value of considering professional attitudes alongside academic indicators. Recognizing such heterogeneity may help educators develop more individualized approaches to student support and professional development.

These findings have several implications for PT education. Academic and professional attitude indicators may provide complementary perspectives on student development, as GPA alone may not capture differences in professional attitudes. However, the exploratory cluster profiles should not be used to classify or label individual students and further validation in larger and more diverse samples is needed before individual-level educational applications can be recommended. Educational approaches such as reflective learning, mentorship, role modelling, career guidance, and meaningful clinical experiences may support professional attitude and identity development, although these strategies were not directly evaluated in the present study. The present study illustrates the potential of person-centered analytical approaches for exploring heterogeneity in HPE. Cluster analysis identified subgroups with different combinations of academic performance and professional attitude scores that may not be apparent from group-level analyses. However, these profiles are exploratory and require external validation in larger and more diverse samples before their practical usefulness or application to educational interventions can be established.

Several limitations should be considered. First, the cross-sectional design precludes causal inferences regarding academic performance and professional attitudes. Second, professional attitudes were assessed using a self-report questionnaire with limited evidence of construct validity in the present population, and possible ceiling effects in attitude scores may have reduced discrimination between participants. Third, the 65% response rate raises the possibility of non-response bias, and the absence of information on non-participants prevented assessment of its potential influence. Fourth, the single-institution setting and relatively small sample limit generalizability. The cluster analysis should be considered exploratory given the modest sample size and the small number of participants in one cluster. Although the number of clusters was evaluated using the elbow method and silhouette coefficient, cluster stability and external validation were not assessed. Furthermore, because GPA and professional attitude scores were used both to construct and subsequently compare the clusters, between-cluster differences in these variables are expected by construction and should not be interpreted as independent validation of the cluster solution. The relatively narrow GPA range and possible ceiling effects in attitude scores may also have limited differentiation among participants. Finally, potentially relevant factors, including personality traits, clinical experiences, career expectations, and social support, were not assessed and may contribute to variations in professional attitudes. The identified profiles therefore require validation in larger and more diverse samples.

Despite these limitations, this study provides exploratory evidence on academic–attitudinal profiles among PT graduates in Thailand. The cluster analysis identified different combinations of GPA and professional attitude scores within the sample, although these profiles require validation before their educational relevance can be established. Future longitudinal and multi-institutional studies with larger samples are needed to examine changes in professional attitudes over time and their relationships with academic and professional outcomes. Further research should also investigate contextual and psychosocial factors that may contribute to variations in professional attitudes.

Conclusion

PT graduates generally demonstrated favourable attitudes toward their profession. Cluster analysis identified distinct exploratory academic–attitudinal profiles, demonstrating heterogeneity in the combinations of academic achievement and professional attitude scores within the study population.

These results support the assessment of professional attitudes alongside academic performance and highlight the value of person-centered approaches for understanding student diversity. Educational strategies that foster professional identity formation and positive professional attitudes may support holistic student development and preparation for professional practice. These findings may also inform curriculum development.

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CONFLICT OF INTEREST

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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