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Exploring the Impact of Academic Resilience on Pharmacy Math Performance in First-Year PharmD Students

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Abstract

This study sought to assess the link between academic resilience and success in academic performance among first-year Doctor of Pharmacy (PharmD) students. A cross-sectional survey utilizing the Academic Pharmacy Resilience Scale (APRS-16) was administered to two groups of first-year pharmacy students (P1) during their fall orientations in 2019 and 2020, with a total of 374 participants. In addition, student records were reviewed to collect information on demographics, pre-pharmacy GPA, and Pharmacy Math outcomes (pass or fail), along with final numerical grades in the course. Academic success was defined as passing the Pharmacy Math course. The data were analyzed using correlational analysis, multiple logistic regression, and multiple linear regression. The survey yielded a 98.1% response rate, and nearly 95% of students passed Pharmacy Math. However, there were no significant correlations between the final pass/fail results or numerical grades in Pharmacy Math and the overall or subscale scores of the APRS-16. Furthermore, in the multiple logistic regression model, neither pre-pharmacy GPA nor the resilience scores (overall or subscale) from the APRS-16 were significantly associated with passing or failing Pharmacy Math. The multiple linear regression analysis revealed that while pre-pharmacy GPA was significantly related to final Pharmacy Math grades, the APRS-16 scores had no significant impact. The study found no evidence that academic resilience influenced first-year pharmacy students' success in the Pharmacy Math course. The relationship between resilience and academic performance in pharmacy education is underexplored, and further research is needed to determine if resilience affects performance in other courses and within the broader PharmD curriculum.

Keywords: Academic resilience, Academic performance, Pre-pharmacy grade point average, Pharmacy math

Introduction

The high cost of pharmacy education, combined with the potential risks of delayed graduation or student attrition, underscores the need for a deeper understanding of factors that promote student success following academic challenges. Pharmacy students face various personal and academic hurdles that can impede their progress, potentially threatening their ability to complete the Doctor of Pharmacy (PharmD) program. To address these challenges, Tomlinson [1] emphasized the importance of resilience as a critical skill for the modern era. Academic resilience refers to the capacity to overcome significant obstacles that might otherwise derail students' educational goals [2]. Sanderson and Brewer [3] describe resilience as "a dynamic process" that can be nurtured or strengthened over time [4, 5]. It is partly rooted in how individuals cope with adversity, and research suggests that resilience can help students maintain or even enhance their academic performance and perseverance.

However, literature on the connection between resilience and academic achievement in pharmacy students is extremely limited. Stoffel and Cain [6] conducted a systematic review of resilience and grit in health

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professions education, including 27 articles that focused on medical and nursing students but did not address pharmacy students. Among these studies, the relationship between resilience and academic success was not consistently found. For example, Elizondo-Omaña and colleagues [7] reported no significant correlation between resilience scores and performance in gross anatomy among 113 medical students. Similarly, Taylor and Reyes [8] found no strong link between resilience and test scores across multiple courses in a sample of 136 nursing students. On the other hand, some studies, such as those by Beauvais *et al*. [9] and Pitt *et al*. [10], found that higher resilience was associated with better academic outcomes, such as higher GPAs, in nursing students.

Chisholm-Burns *et al*. [11] also conducted a systematic review that examined the relationship between noncognitive factors like resilience and academic performance in health professions students. Similar to Stoffel and Cain [6], they observed that a number of studies demonstrated a positive relationship between resilience and academic success in nursing and medical students. [11] However, no research involving pharmacy students was found. In light of this gap in the literature, this study seeks to explore the potential link between resilience and academic performance among first-year pharmacy students (P1), with academic success defined as achieving a passing grade in the Pharmacy Math course by the end of the first-year fall semester.

Materials and Methods

A cross-sectional study was performed involving two successive incoming classes of first-year pharmacy students (P1) at the University of Tennessee Health Science Center (UTHSC) College of Pharmacy, specifically those starting in fall 2019 and fall 2020. Every student admitted in fall 2019 (n = 204) and fall 2020 (n = 177) qualified for inclusion. Data collection occurred through surveys distributed at the mandatory orientation sessions held at the beginning of each fall term. The project obtained ethical approval from the UTHSC Institutional Review Board.

High rates of dropout and academic underperformance tend to appear during the initial stages of the PharmD program's classroom-based curriculum, most notably in the first professional year [12-15]. At this institution, the Pharmacy Math course delivered in the fall semester of the P1 year has proven especially demanding, primarily because of a recently updated curriculum that stresses immediate practical integration of material (leading to a yearly failure rate around 3%). Accordingly, the research centered on factors influencing success in this foundational Pharmacy Math course, which is a standard component in PharmD programs nationwide.

At UTHSC College of Pharmacy, Pharmacy Math is a single-credit-hour course aimed at building core competency in pharmaceutical calculations—skills essential for safe preparation and distribution of medications. Instruction followed a flipped-classroom model combined with collaborative learning: students prepared by reading designated chapters beforehand, allowing classroom sessions to concentrate on interactive exercises. Key content areas encompassed prescription interpretation, accurate measurement and weighing, concentration expressions, dose determination, and nutrition support via enteral or parenteral routes. Exams were proctored electronically under time constraints and featured predominantly multiple-choice and brief open-ended questions. Beginning with the fall 2020 cohort, optional in-class tutoring sessions (one-on-one or small-group) were introduced to aid students experiencing difficulty. Course grades derived solely from performance on exams and quizzes, and successful completion required at least a 75% overall average (equivalent to a C grade).

To evaluate academic resilience in these first-year students, investigators employed the Academic Pharmacy Resilience Scale-16 (APRS-16). This instrument is the sole validated tool created expressly for assessing academic resilience within pharmacy education and has demonstrated strong reliability.[16] Participants respond to 16 statements after reading a hypothetical scenario in which a student, already struggling with two low exam scores, fails a third test in a pharmacy course and becomes worried about their standing. Answers are provided on a 5-point Likert scale (1 = unlikely to 5 = likely). Seven reverse-scored items are adjusted so that elevated scores across all items reflect healthier, more resilient coping strategies. Overall APRS-16 scores can vary between 16 and 80, where higher values denote stronger resilience. The measure includes four distinct domains **(Table 1)**: Negative Affect and Emotional Response (5 items), Reflecting and Adaptive Help-Seeking (5 items), Adaptive Thought Processes (3 items), and Perseverance (3 items).[16] The first two domains yield subscale scores from 5 to 25, while the latter two range from 3 to 15. In the initial validation work by

Chisholm-Burns *et al*. [16], internal consistency was high, with a Cronbach's alpha of .84 for the total scale and values between .61 and .82 for the individual subscales.

Table 1. Academic pharmacy resilience scale items and subscales [16][a].

Item Number	Subscale	Item
1	**Subscale 1: Negative Emotional Response**	I would start questioning my likelihood of succeeding in the PharmD program.
2		I would likely feel depressed.
3		I would feel deeply disappointed.
4		I would begin to believe my prospects for obtaining the desired job or residency were low.
5		I would feel as though everything was falling apart and going wrong.
6	**Subscale 2: Reflective and Adaptive Help-Seeking**	I would attempt to come up with new approaches or solutions.
7		I would draw motivation from my previous accomplishments.
8		I would establish personal targets for what I want to achieve.
9		I would look for support and encouragement from family and friends.
10		I would reflect on my strengths and weaknesses to improve my performance.
11	**Subscale 3: Adaptive Thinking Patterns**	I would view the situation as an opportunity or challenge.
12		I would make an effort to suppress or redirect negative thoughts.
13		I would regard the situation as temporary rather than permanent.
14	**Subscale 4: Perseverance**	I would simply give up.
15		I would alter my career aspirations.
16		I would maintain my long-term goals and ambitions without change.

[a] Each item's score ranges from 1 to 5, where a higher score signifies greater resilience.
[b] Items that are reverse-scored are marked accordingly.

The following data were extracted from student records: demographics (including gender, age, and ethnicity/race, with students categorized as either non-Hispanic White or minority based on racial or ethnic identity), pre-pharmacy GPA (calculated from prior undergraduate courses and prerequisites), Pharmacy Math outcomes (pass/fail) at midterm and at the conclusion of the semester, as well as the final numerical grade in Pharmacy Math (converted to the GPA scale where A- = 3.67, A = 4.0, B = 3.0, B+ = 3.33, B- = 2.67, C = 2.0, C+ = 2.33, and F = 0). To ensure data accuracy, a random sample of entries in the study database was cross-checked, revealing no errors. Given the established connection between past academic performance and future success, as shown in various studies of pharmacy students, pre-pharmacy GPA was included as an independent variable to account for its potential influence on academic success in the first-year Pharmacy students [14, 17-21].

Statistical methods

Analyses were carried out with IBM SPSS Statistics version 26.0. Summary statistics were generated, reporting means, medians, and standard deviations for numeric variables, along with counts and percentages for categorical ones. In light of earlier investigations[13, 14, 19, 20, 22-24] linking gender, age, and race/ethnicity to academic achievement in pharmacy education, this study explored connections between these demographics, APRS-16 overall and domain-specific scores, end-of-term Pharmacy Math pass/fail status, and the course's final numeric grade. Associations were quantified through Spearman rank-order correlations for ordinal or non-normal data and point-biserial correlations for dichotomous outcomes, involving variables such as age, APRS-16 scores (total and subscales), pre-pharmacy GPA, pass/fail result, and final grade. Effect sizes followed Cohen's[25] criteria: .1 for small, ≥.3 for

medium, and ≥.5 for large.[26] Group differences by gender and race/ethnicity were tested using chi-square tests for categorical outcomes and Mann-Whitney U tests for continuous or ordinal measures across pre-pharmacy GPA, APRS-16 scores, pass/fail status, and final grade. The nominal significance threshold was .05 for correlations and chi-square tests. Given the 16 Mann-Whitney U comparisons, a Bonferroni correction was applied, yielding a adjusted threshold of .003 (.05/16).

The core analyses consisted of four multiple logistic regression models examining how pre-pharmacy GPA and academic resilience (via APRS-16) predicted passing Pharmacy Math at term end. Models were run separately for the total APRS-16 score and for its four subscale scores to distinguish overall resilience effects from those of specific components. Sample size planning adhered to Bujang *et al*.[27] recommendations for observational logistic regression, targeting 50 events per predictor variable with the formula n = 100 + 50i (i = predictors).[28] This produced a required minimum of 350 participants for models with five predictors. Two models used the complete dataset—one with the APRS-16 total score, the other with all subscale scores. The remaining two focused on students failing at midterm (a high-risk subgroup facing a direct academic setback), again separating total-score and subscale models to assess resilience's role under threat. Model equations were:

(a) Pass/Fail Outcome = Intercept + β (pre-pharmacy GPA) + β (APRS-16 total)

(b) Pass/Fail Outcome = Intercept + β (pre-pharmacy GPA) + β (Negative Affect and Emotional Response) + β (Reflecting and Adaptive Help-Seeking) + β(Adaptive Thought Processes) + β(Perseverance)

These specifications were applied to both the full cohort and the midterm-failing subset, for a total of four logistic regressions. Predictors were entered simultaneously in a single step.

Exploratory secondary analyses used multiple linear regression to predict the continuous final numeric grade in Pharmacy Math from pre-pharmacy GPA and APRS-16 measures. Equations mirrored the logistic models:

(a) Final Numeric Grade = Intercept + β (pre-pharmacy GPA) + β (APRS-16 total)

(b) Final Numeric Grade = Intercept + β (pre-pharmacy GPA) + β (Negative Affect and Emotional Response) + β (Reflecting and Adaptive Help-Seeking) + β (Adaptive Thought Processes) + β (Perseverance)

These were likewise executed on the full sample and the midterm-failing subgroup, producing four linear regressions total, with simultaneous entry of predictors.

Additional sensitivity analyses substituted pre-pharmacy math/science GPA (restricted to prerequisite mathematics and science coursework) for the broader pre-pharmacy GPA. All previously outlined logistic and linear regressions were repeated with this alternative predictor in both the full and subgroup samples. Significance for regression models was evaluated at α = .05.

Results and Discussion

From the combined entering cohorts of 2019 and 2020, which totaled 381 students, seven individuals (four in the 2019 group and three in the 2020 group) left the program before finishing the first professional year's fall term and were thus not included in the analysis. Of the remaining 374, 367 students (representing 98.1%) agreed to take part. Participants averaged 23.3 years of age (SD = 3.7), with the majority being women (n = 238, 64.9%) and of non-Hispanic White background (n = 214, 58.3%). The average GPA from pre-pharmacy coursework stood at 3.37 (SD = 0.4), while the average final numeric score in Pharmacy Math was 3.35 (SD = 1.0) **(Table 2)**. That table also displays the average and median values for the APRS-16 total score and its individual subscales, along with their internal consistency estimates (Cronbach's alpha).

Out of the 367 study participants, 49 (13.4%) had failing marks in Pharmacy Math at the midpoint evaluation, and 19 (5.2%) did not pass the course by the end. Among those 49 at risk at midterm, 31 managed to pass by the final assessment, but 18 still failed; additionally, one student who had been on track to pass at midterm ultimately did not succeed. Comparative averages and medians for the APRS-16 total and subscale scores between those who passed and those who failed are shown for the overall participant group as well as the midterm-at-risk subset **(Table 3).**

Table 2. Overview of participant characteristics, pre-pharmacy grade point average, academic pharmacy resilience scale-16 (APRS-16) total and domain scores, and pharmacy math pass/fail results plus final numeric scores for the 2019 and 2020 entering cohorts

Variable	Value
Gender	
Male, n (%)	126 (34.3)
Female, n (%)	238 (64.9)
Other, n (%)	3 (0.8)
Age	
Mean (SD)	23.3 (3.7)
Pre-Pharmacy GPA	
Median (IQR)	3.37 (0.6)
Mean (SD)	3.37 (0.4)
Race/Ethnicity	
Minority, n (%)	151 (41.1)
Non-Hispanic White, n (%)	214 (58.3)
Missing, n (%)	2 (0.5)
APRS-16 Total Score[a]	
Cronbach's α	0.8
Mean (SD)	61.3 (8.3)
Median (IQR)	62 (11)
APRS-16 Subscale 1: Negative Affect and Emotional Response[a]	
Cronbach's α	0.8
Mean (SD)	13.8 (4.4)
Median (IQR)	13 (6)
APRS-16 Subscale 3: Adaptive Thought Processes[a]	
Cronbach's α	0.6
Mean (SD)	12.2 (2.1)
Median (IQR)	12 (3)
APRS-16 Subscale 4: Perseverance[a]	
Cronbach's α	0.7
Mean (SD)	13.1 (2.2)
Median (IQR)	14 (3)
Pharmacy Math Midterm Status, n (%)	
Fail	49 (13.4)
Pass	318 (86.6)
APRS-16 Subscale 2: Reflecting and Adaptive Help-Seeking[a]	
Cronbach's α	0.7
Mean (SD)	22.2 (2.8)
Median (IQR)	23 (5)
Pharmacy Math Final Numerical Grade[b]	
Median (IQR)	3.67 (1)
Mean (SD)	3.35 (1)
Pharmacy Math Final Outcome, n (%)	
Fail	19 (5.2)
Pass	348 (94.8)

Abbreviations: GPA = Grade Point Average; IQR = Interquartile Range.

*a The APRS-16 total score can range from 16 to 80, with higher numbers signifying stronger academic resilience. The Negative Affect and Emotional Response, and Reflecting and Adaptive Help-Seeking subscales can score between 5 and 25, while the Adaptive Thought Processes and Perseverance subscales range from 3 to 15.
b Pharmacy Math final grades are provided using the GPA scale: A = 4.0, A- = 3.67, B+ = 3.33, B = 3.0, B- = 2.67, C+ = 2.33, C = 2.0, and F = 0.

Table 3. A comparison of final course grades and APRS-16 scores among first-year pharmacy students in the required pharmacy math course.

Category	Subgroup[b] (n=49)	Total Sample[b] (n=376)
Failed Pharmacy Math		
Median (IQR)	60 (12)	61 (14)
Mean (SD)	61.3 (7.6)	61.1 (8)
APRS-16 Overall Score		
Passed Pharmacy Math		
Mean (SD)	60.9 (8.3)	61.3 (8.4)
Median (IQR)	61 (15)	62 (11)
Failed Pharmacy Math		
Median (IQR)	13 (6)	14 (7)
Mean (SD)	13.7 (4.6)	14 (4.5)
APRS-16 Subscale 1: Negative Affect and Emotional Response Score		
Passed Pharmacy Math		
Median (IQR)	15 (8)	13 (6)
Mean (SD)	14.2 (4.6)	13.7 (4.4)
Failed Pharmacy Math		
Median (IQR)	23 (5)	23 (5)
Mean (SD)	22.1 (3)	22.3 (2.8)
APRS-16 Subscale 2: Reflecting and Adaptive Help-Seeking Score		
Passed Pharmacy Math		
Median (IQR)	23 (5)	23 (5)
Mean (SD)	22.4 (2.7)	21.9 (2.8)
Failed Pharmacy Math		
Median (IQR)	13 (4)	12 (4)
Mean (SD)	12.1 (2.1)	11.8 (2)
APRS-16 Subscale 3: Adaptive Thought Processes Score		
Passed Pharmacy Math		
Median (IQR)	11 (3)	13 (3)
Mean (SD)	11.7 (1.9)	12.2 (2.1)
Failed Pharmacy Math		
Median (IQR)	13 (3)	14 (4)
Mean (SD)	13.3 (2)	12.9 (2.4)
APRS-16 Subscale 4: Perseverance Score		
Passed Pharmacy Math		
Median (IQR)	14 (5)	14 (3)
Mean (SD)	12.7 (2.6)	13.2 (2.2)

Abbreviations: IQR = interquartile range.
[a] The APRS-16 total scores can range from 16 to 80, where elevated scores denote stronger academic resilience. Each of the Negative Affect and Emotional Response subscale and the Reflecting and Adaptive Help-Seeking subscale has possible scores from 5 to 25, whereas the Adaptive Thought Processes subscale and the Perseverance subscale each range from 3 to 15.

[b] APRS-16 total and subscale scores showed no statistically significant differences (p > .05) between students who passed and those who failed Pharmacy Math, whether in the entire cohort or among those at risk of failing (i.e., failing at midterm).

Using Mann-Whitney U tests, no gender-related differences emerged for pre-pharmacy GPA, final Pharmacy Math numerical grade, or any APRS-16 scores. In contrast, marked differences (p < .001) appeared between non-Hispanic White and minority students for pre-pharmacy GPA (M = 3.42, SD = 0.4, Median = 3.46 versus M = 3.29, SD = 0.4, Median = 3.29) and final Pharmacy Math numerical grade (M = 3.49, SD = 0.8, Median = 4.0 versus M = 3.13, SD = 1.1, Median = 3.67). Race/ethnicity did not influence APRS-16 total or subscale scores significantly. Chi-square tests indicated no gender effect (p = .08) on Pharmacy Math failure rates. Across the full cohort, minority students had a higher failure rate in Pharmacy Math (7.9%) than non-Hispanic White students (3.3%; p = .05). However, within the midterm-failing subgroup, ultimate failure rates did not differ significantly by race/ethnicity (p > .05).

A moderate correlation existed between pre-pharmacy GPA and final Pharmacy Math numerical grade (Spearman rho = .34, p < .001). No meaningful correlations were identified between Pharmacy Math pass/fail status or numerical grade and variables such as age, pre-pharmacy GPA (beyond the noted correlation), or APRS-16 total/subscale scores.

Primary multiple logistic regression models revealed that neither pre-pharmacy GPA nor APRS-16 total score predicted Pharmacy Math pass/fail outcome in the full cohort or the midterm-failing subgroup (p > .05). The same non-significant pattern held when examining APRS-16 subscales or when substituting pre-pharmacy math/science GPA for overall pre-pharmacy GPA (p > .05).

Secondary multiple linear regression models showed that, in the full cohort, pre-pharmacy GPA predicted final Pharmacy Math numerical grade (p < .001), but APRS-16 total and subscale scores did not (Models 1 and 2 in **Table 4**). The model with only pre-pharmacy GPA accounted for 6.6% of variance (adjusted $R^2 = 0.066$). Replacing pre-pharmacy GPA with pre-pharmacy math/science GPA produced similar results, with significant prediction (p < .001) and 4.9% explained variance (adjusted $R^2 = 0.049$), while APRS-16 measures remained non-predictive. In the midterm-failing subgroup, no variable—pre-pharmacy GPA, pre-pharmacy math/science GPA, or any APRS-16 score—predicted final numerical grade (p > .05).

Table 4. Multiple linear regression models identifying factors influencing final numerical grade in pharmacy math for students entering in 2019 and 2020 (n = 367)

Predictor	B	Standardized Beta	Standard Error	t	p-value	Partial Correlation	Zero-order Correlation	Tolerance[a]	Part Correlation	VIF[a]
Model 1										
Constant	0.777		0.56	1.35	.2					
APRS-16 Overall Score	0.005	0.04	0.01	0.83	.4	0.044	0.038	1	0.042	1
Pre-pharmacy GPA	0.672	0.26	0.13	5.21	<.001	0.264	0.263	1	0.263	1
Model 2										
Pre-pharmacy GPA	0.661	0.26	0.13	5.06	<.001	0.258	0.263	0.98	0.257	1.02
Constant	0.598		0.61	0.98	.3					
APRS-16-RAH Score	0.008	0.02	0.02	0.39	.7	0.020	0.069	0.76	0.020	1.31
APRS-16-NAER Score	-0.01	-0.03	0.01	-0.48	.6	-0.025	-0.014	0.79	-0.024	1.27

APRS-16-P Score	0.011	0.03	0.03	0.44	.7	0.023	0.033	0.78	0.022	1.29
APRS-16-ATP Score	0.023	0.05	0.03	0.82	.4	0.043	0.054	0.74	0.041	1.36

Abbreviations: ATP = Adaptive Thought Processes; GPA = grade point average; NAER = Negative Affect and Emotional Response; P = Perseverance; RAH = Reflective and Adaptive Help-Seeking; VIF = variance inflation factor.

[a] Tolerance values below 0.1 and VIF values above 10 are indicative of multicollinearity.

The goal of this study was to investigate the effect of academic resilience on the performance of first-year pharmacy students in Pharmacy Math. Previous research has suggested that students with higher resilience tend to perform better academically in health professions programs [9, 10, 29-31]. The American Psychological Association [32] has recommended various strategies to boost resilience, including fostering supportive relationships (e.g., joining groups for peer support), prioritizing physical and emotional health through activities such as exercise, balanced nutrition, sufficient sleep, mindfulness, and focusing on positive attitudes (e.g., cultivating hope and accepting change). Additionally, setting personal goals and engaging in meaningful activities like volunteer work are recommended. However, other studies did not find a clear connection between resilience and academic success among health profession students [7, 8, 33]. In line with these studies, our results showed that academic resilience did not significantly impact the final pass/fail outcome or numerical grades in Pharmacy Math, either in the overall sample or among those failing the course midterm.

One possible reason for this could be that failing Pharmacy Math, a one-credit course, may not be seen as a significant setback, especially when considering the demanding transition into pharmacy school and the workload during the first fall semester. Another explanation could be that the APRS-16 may not be precise enough to detect resilience's impact on academic outcomes, particularly since approximately 95% of students passed the course. Future research should explore what qualifies as a major academic challenge for pharmacy students, the role resilience plays in overcoming such challenges, and whether interventions that enhance resilience—such as those suggested by the American Psychological Association [32]—can be effective. Additionally, studies should examine the most effective use of the APRS-16, whether for individual courses or over longer academic periods like a semester or entire academic year.

Similar to the APRS-16 scores, pre-pharmacy GPA did not predict pass/fail outcomes in Pharmacy Math, but it did correlate with the final numerical grade, accounting for 6.6% of the grade variance. This aligns with previous research showing a relationship between pre-pharmacy performance and success in pharmacy school [14, 17-21]. However, the small amount of variance explained suggests other factors not addressed in this study might influence Pharmacy Math outcomes. Future research should explore additional factors such as self-efficacy, study habits, and the role of tutoring to better understand what affects performance in the course.

There were no significant differences between male and female students in pre-pharmacy GPA, APRS-16 scores, Pharmacy Math pass/fail status, or final grades. However, minority students had lower pre-pharmacy GPAs, lower final grades in Pharmacy Math, and a higher rate of failure compared to non-Hispanic White students, even though their APRS-16 scores were similar. Given the findings and the inconsistent results of prior research regarding the relationship between race/ethnicity, pre-pharmacy GPA, and academic performance, further investigation should examine the factors affecting minority students' performance in Pharmacy Math. Research should also explore potential interventions to help these students succeed in the course [22, 23]. It's important to note that while differences in GPA and final grades were statistically significant, they may not represent substantial academic discrepancies in a practical sense.

This study has a few limitations. One is the potential for response bias, as students might have answered the APRS-16 items in a socially desirable way. To reduce this bias, students were assured of the confidentiality of their responses, and the APRS-16 included reverse-scored items to encourage more thoughtful and less biased answers. Another limitation is that the study focused solely on the relationship between resilience and performance in Pharmacy Math. While this course is particularly challenging, other first-year courses in the PharmD program may also present significant academic

challenges requiring resilience. Broader studies including additional courses could provide a clearer picture of the role resilience plays in academic success.

Conclusion

The performance of first-year pharmacy students in Pharmacy Math was not influenced by academic resilience, though pre-pharmacy GPA did have an impact on final numerical grades. While resilience did not appear to play a significant role in success within this course, further research is needed to determine if resilience impacts academic outcomes in other courses, over multiple semesters, or throughout the entire pharmacy curriculum.

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