

## RESEARCH

# Examining Preparatory Testing and Other Factors Associated With Performance on the Multistate Pharmacy Jurisprudence Examination

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Submitted June 15, 2021; accepted October 15, 2021; published September 2022.

**Objective.** To evaluate whether the score on the Pre-Multistate Pharmacy Jurisprudence Examination (Pre-MPJE) predicts pharmacy students' performance on the MPJE, and to determine whether demographics, pre-pharmacy school factors, or pharmacy school factors affect MPJE outcomes.

**Methods.** We performed a retrospective review of pharmacy school graduates' (N = 156) MPJE scores, Pre-MPJE scores, demographics, pre-pharmacy school academic performance factors, and pharmacy school academic performance factors. Bivariate and correlational analyses were conducted along with multiple linear regression models to determine the influence of variables on the MPJE total scaled score.

**Results.** A total of 136 pharmacy school graduates were included, with most being female (59%) and non-Hispanic White students (75%). The score on the Pre-MPJE was not significantly correlated with students' first-attempt MPJE pass-fail outcome or total scaled score. Factors that were correlated with passing the MPJE were a younger age at graduation, a higher pharmacy law course grade, Pharmacy Curriculum Outcomes Assessment (PCOA) examination scores, specifically scaled total scores and scaled scores for content areas 1-4 and final pharmacy school grade point average (GPA). The MPJE total scaled score was correlated with a higher pre-pharmacy school GPA, pharmacy law course grade, PCOA total and content area 1-4 scaled scores, and final pharmacy school GPA. However, regression models found that the greatest variance in MPJE total scaled score was contributed by the pharmacy law course grade. The total scaled score on the PCOA contributed to some variance for all MPJE takers, but only the pharmacy law course grade significantly influenced the in-state MPJE total scaled score.

**Conclusion.** The findings did not show that the Pre-MPJE score was a predictor for passing the MPJE or for the MPJE total scaled score. The most important determinant of the MPJE total scaled score was a student's performance in the pharmacy law course.

**Keywords:** MPJE, Pre-MPJE, student characteristics

## INTRODUCTION

First-time pass rates for board examinations are key quality metrics for Doctor of Pharmacy (PharmD) programs in the United States. The Accreditation Council for Pharmacy Education (ACPE) requires accredited programs to publish pass rates on the North American Pharmacist Licensure Examination (NAPLEX) for the recent graduating class.<sup>1</sup> However, becoming a licensed pharmacist often also requires passing the Multistate Pharmacy Jurisprudence Examination (MPJE) specific to the jurisdiction the graduate plans to practice in.

In 2020, the National Association of Boards of Pharmacy (NABP), which administers the MPJE with state boards of pharmacy, offered a Pre-MPJE for the first time. The Pre-MPJE is a state-specific practice exam for a candidate to become familiar with the MPJE question format and testing process. The Pre-MPJE consists of 40 questions from prior MPJE exams to be completed within 50 minutes. The candidate receives a scaled score ranging from zero to 100.<sup>2</sup> Comparatively, the MPJE is a 2.5-hour adaptive exam with 120 questions, of which 100 questions are used to calculate the graduate's results. Before 2021, the minimum passing scaled score was 75 for the MPJE, with a range from zero to 100.<sup>3</sup>

The NABP similarly offers the Pre-NAPLEX for self-assessment and familiarization with the NAPLEX exam format. In 2006, Peak and colleagues surveyed graduates regarding tools they used to prepare for the NAPLEX and

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MPJE. The authors found the Pre-NAPLEX was the most recommended and representative preparatory tool, used by 26.7% of graduates.<sup>4</sup> Chisholm-Burns and colleagues examined the relationship between the Pre-NAPLEX and NAPLEX. Results indicated Pre-NAPLEX scores along with a student's final pharmacy GPA predicted a positive correlation with NAPLEX total scaled scores.<sup>5</sup> No prior studies have evaluated whether the Pre-MPJE predicts MPJE total scaled scores. Therefore, we aimed to evaluate whether Pre-MPJE scores were correlated with Tennessee MPJE or out-of-state MPJE scores or pass rates and whether certain factors, such as demographics, pre-pharmacy school factors, and pharmacy school factors, influenced MPJE outcomes.

## METHODS

This was a retrospective study of the graduating PharmD class of 2020 (N=156) at the University of Tennessee Health Science Center College of Pharmacy. The Pre-MPJE was administered within a licensure preparatory course, whereby the College of Pharmacy provided all graduates a voucher code to take the Tennessee Pre-MPJE during April 17-21, 2020. No Pre-MPJE minimum score was established to pass the preparatory course, and graduates submitted a screenshot of their score. This Pre-MPJE testing period occurred approximately one week before the required half-day College of Pharmacy-sponsored Tennessee law review and was intended as a self-assessment for the MPJE.

Students were asked to sign a release allowing the NABP to provide the College of Pharmacy with their MPJE score. First-time pass rates and total scaled scores for the MPJE were collected for students who took the MPJE between May and December 2020. Data retrieved from student records included demographics (age at graduation, gender, race/ethnicity); composite score on the Pharmacy College Admission Test (PCAT); pre-pharmacy school GPA; pharmacy law course final grade (presented on a grade point average [GPA]-based scale: A=4.0, A- =3.67, B+ =3.33, B=3.0, B- =2.67, C+ =2.33, C=2.0, C- =1.67, D=1.0 and F=0); final GPA at graduation (final pharmacy GPA); Pharmacy Curriculum Outcomes Assessment (PCOA) total scaled score and scaled scores of its four content areas (area 1: basic biomedical sciences; area 2: pharmaceutical sciences; area 3: social/behavioral/administrative sciences; and area 4: clinical sciences)<sup>6</sup> and history of academic difficulty during the PharmD program. Academic difficulty was defined as earning at least one grade below a C- or a "no pass" in any course. Students who did not take the MPJE during the study period or did not consent to release their MPJE scores to the

College of Pharmacy were excluded. The University of Tennessee Health Science Center Institutional Review Board approved this study.

Data analyses were conducted using SPSS Statistics version 26.0 (IBM Corp). Descriptive statistics and frequency counts were performed for demographic variables. The independent samples *t* test (or Mann-Whitney test, when data were not normally distributed) and chi-square analyses were conducted to compare class of 2020 graduates who took the MPJE to those who did not take the MPJE or were excluded. Comparisons included the following variables: age, gender, race/ethnicity, PCAT composite score, pre-pharmacy school GPA, final pharmacy law grade, PCOA total scaled score, PCOA content area scaled scores, history of academic difficulty, final pharmacy GPA, and Pre-MPJE score.

Among graduates who took the MPJE, a chi-square analysis was conducted to determine differences in the proportion of students passing the MPJE on their first attempt based on gender, race/ethnicity, and history of academic difficulty. An independent samples *t* test was conducted to assess differences in Pre-MPJE score based on whether students passed the MPJE. Chi-square analysis was conducted to determine differences in the proportion of students passing the MPJE on their first attempt based on subgroups of those who took the Tennessee MPJE compared to those who took an out-of-state MPJE. Correlational analyses (Spearman rho and point biserial) were conducted to assess relationships among the PCAT composite score, pre-pharmacy school GPA, final pharmacy law grade, final pharmacy GPA, PCOA total scaled score, PCOA content area scaled scores, Pre-MPJE score, MPJE total scaled score, and MPJE pass-fail outcome. Cohen conventions were used to interpret the strength of correlations, with .1 indicating a small effect, at least .3 suggesting a medium effect, and at least .5 implying a large effect.<sup>7</sup>

In the primary analysis, a multiple linear regression was conducted to determine the influence of the following 10 variables on MPJE scaled score in the total sample: age, gender, race/ethnicity, PCAT composite score, pre-pharmacy school GPA, final pharmacy law grade, PCOA total scaled score, history of academic difficulty, final pharmacy GPA, and Pre-MPJE score. Multiple logistic regression analysis was likewise conducted to determine the influence of the same aforementioned 10 variables on first-attempt MPJE pass-fail outcome in the total sample. Variables were entered in one block simultaneously in the linear regression and logistic regression analyses. To determine the final model (regression equation), nonsignificant variables were removed from the model, and the analysis was repeated. An a priori alpha level of .05 was set for the regression model.

In a secondary analysis, the multiple linear regression described above was replicated, with the exception that the PCOA total scaled score was replaced in the model by the PCOA content area scaled scores. In the secondary analyses, separate multiple linear regression models were tested for two subgroups: those who took the Tennessee MPJE and those who took an out-of-state MPJE. The same variables were included in each model as in the primary analysis. Variables were entered in the model in one block simultaneously. An a priori alpha level was set at

.05. A sample size calculation was conducted for the primary analysis, namely the multiple linear regression with 10 predictor variables. Power was set at 80% and significance at .05, with a medium effect type. The sample size needed to achieve power of 80% was 117.

## RESULTS

Student characteristics are presented in Table 1. Most were female (59%) and non-Hispanic White (75%)

Table 1. Demographics and Performance Indicators for Pharmacy Schools Graduates Who Had or Had Not Taken the Multi-state Pharmacy Jurisprudence Examination<sup>a</sup>

	Total class N=156	Had taken MPJE N=136	No MPJE score <sup>b</sup> N=20	p value
Age at graduation, mean (SD)	28.1 (3.45)	28 (3.45)	28.7 (3.51)	.22
Gender, No. (%)				.56
Female	92 (59)	79 (58.1)	13 (65)	
Male	64 (41)	57 (41.9)	7 (35)	
Race/ethnicity, No. (%)				.27
Non-Hispanic White	117 (75)	104 (76.5)	13 (65)	
Minority	39 (25)	32 (23.5)	7 (35)	
PCAT composite score, mean (SD)	68.6 (21.14)	69.5 (20.62)	62.5 (24.12)	.22
Pre-pharmacy school GPA, mean (SD)	3.38 (0.4)	3.41 (0.4)	3.21 (0.4)	.06
Academic difficulty during PharmD, No. (%)				.38
No	128 (82.1)	113 (83.1)	15 (75)	
Yes <sup>c</sup>	28 (17.9)	23 (16.9)	5 (25)	
Pharmacy law course final grade <sup>d</sup> , mean (SD)	2.96 (0.7)	3.02 (0.7)	2.52 (0.56)	.002
PCOA total scaled score, mean (SD)	374.1 (43.3)	376.3 (43.5)	359.7 (40.4)	.11
PCOA content area 1 <sup>e</sup> scaled score, mean (SD)	355.1 (72.9)	353.44 (72.2)	366.5 (78.3)	.46
PCOA content area 2 <sup>e</sup> scaled score, mean (SD)	371.8 (48.9)	373.3 (49.8)	361.4 (42.3)	.31
PCOA content area 3 <sup>e</sup> scaled score, mean (SD)	370 (53.7)	373.8 (51.4)	344.3 (62.8)	.02
PCOA content area 4 <sup>e</sup> scaled score, mean (SD)	387.3 (55.5)	390.2 (55.9)	367.7 (49.8)	.09
Final pharmacy GPA, mean (SD)	3.41 (0.31)	3.44 (0.3)	3.19 (0.28)	.001
Pre-MPJE score, mean (SD)	73.4 (5.09)	73.8 (4.81)	70.6 (6.18)	.01
MPJE total scaled score, mean (SD)		80 (3.78)		
MPJE first-attempt outcome, No. (%)				
Pass		124 (91.2)		
Did not pass		12 (8.8)		

Abbreviations: GPA=grade point average; MPJE=Multistate Pharmacy Jurisprudence Examination; PCAT=Pharmacy College Admission Test; PharmD=Doctor of Pharmacy degree; PCOA=Pharmacy Curriculum Outcomes Assessment.

<sup>a</sup> All graduates were part of the 2020 graduating class.

<sup>b</sup> This group consists of 13 students who had not taken the MPJE and seven students who did not consent to release their scores to the college of pharmacy

<sup>c</sup> *Academic difficulty* refers to being placed on academic probation or having to appear before the Academic Standing and Promotion Review Committee at any point during the PharmD program

<sup>d</sup> The pharmacy law course final grade was presented on a GPA scale, where A=4.0, A- =3.67, B+ =3.33, B=3.0, B- =2.67, C+ =2.33, C=2.0, C- =1.67, D=1.0, and F=0

<sup>e</sup> The four PCOA content areas are basic biomedical sciences (area 1), pharmaceutical sciences (area 2), social/behavioral/administrative sciences (area 3), and clinical sciences (area 4)

students. Of 156 graduates, 136 (87.2%) took the MPJE during the study period; of the remaining 20 graduates, 13 did not take the MPJE and seven did not consent to release their scores. Among those 136 graduates, 124 (91.2%) passed the MPJE on the first attempt. Additionally, 101 of the 136 took the Tennessee MPJE, while the remaining 35 took an out-of-state MPJE. In comparing the study population of those who took the MPJE and those excluded, the latter group had a significantly lower pharmacy law course final grade ( $p = .002$ ) and final pharmacy GPA ( $p = .001$ ).

In the chi-square analysis, there were no significant differences in the proportion of students who passed the MPJE on the first attempt based on gender ( $p = .99$ ), race/ethnicity ( $p = .12$ ), or history of academic difficulty ( $p = .11$ ). There was also no difference in the pass rates between those who took the Tennessee MPJE (90.1%) and the out-of-state MPJE (94.3%;  $p = .45$ ). In the correlational analysis (Table 2), passing the MPJE was significantly associated ( $p < .05$ ) with age at graduation, pharmacy law course grade, PCOA total scaled score, PCOA content area 1-4 scaled scores, final pharmacy GPA, and MPJE score. The MPJE total scaled score was significantly associated ( $p < .05$ ) with pre-pharmacy school GPA, pharmacy law course grade, PCOA total scaled score, PCOA content area 1-4 scaled scores, and final pharmacy GPA. The Pre-MPJE score was not significantly correlated with the MPJE total scaled score or passing the MPJE, nor did the Pre-MPJE score significantly differ in an independent sample  $t$  test based on whether students passed the MPJE ( $M = 73.99$ ,  $SD = 4.74$  vs  $M = 72.33$ ,  $SD = 5.47$ , respectively;  $p = .26$ ).

In the primary multiple linear regression analysis, pharmacy law course grade and PCOA total scaled score were significantly associated with MPJE score (Table 3). The final model, which included only pharmacy law course grade and PCOA total scaled score, explained 30.3% (adjusted  $R^2 = 0.303$ ) of the total variance in MPJE total scaled score; specifically, the pharmacy law course grade explained 27.3% (adjusted  $R^2 = 0.273$ ) of the variance, and PCOA total scaled score explained the remaining 2.5% (adjusted  $R^2 = 0.025$ ). The final linear regression equation was as follows:

$$\begin{aligned} \text{MPJE total scaled score} &= 66.12 + 2.38 \\ &(\text{pharmacy law course final grade}) + 0.02 \\ &(\text{PCOA total scaled score}) \end{aligned}$$

In the multiple logistic regression analysis, none of the variables entered into the model was a significant predictor of first-attempt passing or failing of the MPJE.

In the secondary multiple linear regression analysis in which PCOA total scaled score was replaced by PCOA content area scaled scores as independent variables, the

pharmacy law course grade and PCOA content area 4 scaled score were significantly associated with MPJE score (Table 4). The final model, which included only pharmacy law course grade and PCOA content area 4 scaled score, explained 31.3% (adjusted  $R^2 = 0.313$ ) of the total variance in MPJE total scaled score; specifically, the pharmacy law course grade explained 27.3% (adjusted  $R^2 = 0.273$ ) of the variance, and PCOA content area 4 scaled score explained the remaining 4% (adjusted  $R^2 = 0.04$ ). The final linear regression equation was as follows:

$$\begin{aligned} \text{MPJE total scaled score} &= 66.9 + 2.27 \\ &(\text{Pharmacy law course final grade}) + 0.02 \\ &(\text{PCOA content area 4 scaled score}) \end{aligned}$$

In the secondary multiple linear regression analysis of the Tennessee MPJE subgroup ( $n = 136$ ), only pharmacy law course grade was significantly associated with MPJE total scaled score (Table 5). The final model, which included only pharmacy law course grade, explained 33.4% (adjusted  $R^2 = 0.334$ ) of the total variance in MPJE score. The final linear regression equation for the Tennessee MPJE subgroup was as follows:

$$\begin{aligned} \text{MPJE total scaled score} &= 70.83 + 2.96 \\ &(\text{Pharmacy law course final grade}) \end{aligned}$$

In the secondary multiple linear regression analysis of the out-of-state MPJE subgroup, pharmacy law course grade and PCOA total scaled score were significantly associated with MPJE total scaled score (Table 5). The final model, which included pharmacy law course grade and PCOA total scaled score, explained 30.9% (adjusted  $R^2 = 0.309$ ) of the total variance in MPJE total scaled score; specifically, the pharmacy law course grade explained 24% (adjusted  $R^2 = 0.24$ ) of the variance, and PCOA total scaled score explained the remaining 6.9% (adjusted  $R^2 = 0.069$ ). The final linear regression equation for the out-of-state MPJE subgroup was as follows:

$$\begin{aligned} \text{MPJE total scaled score} &= 55.03 + 2.07 \\ &(\text{Pharmacy law course final grade}) + 0.05 \\ &(\text{PCOA total scaled score}) \end{aligned}$$

## DISCUSSION

This is the first study to examine the relationship between the Pre-MPJE score and MPJE performance. Previous research found the Pre-NAPLEX score was a predictor of NAPLEX score, but our analysis did not observe this relationship between the Pre-MPJE and MPJE performance.<sup>5</sup> The factors that had a significant correlation to passing the MPJE and to the MPJE total scaled score were higher final pharmacy GPA, PCOA total scaled scores and scaled scores for content areas 1-4, and pharmacy law

Table 2. Pre-Pharmacy School Performance Indicators, Pharmacy School Performance Indicators, and First-Attempt Multistate Pharmacy Jurisprudence Examination Outcome (N=136)

	PCAT composite score	Pre-pharmacy school GPA	Pharmacy law course final grade	PCOA total scaled score	PCOA area 1 scaled score <sup>a</sup>	PCOA area 2 scaled score <sup>a</sup>	PCOA area 3 scaled score <sup>a</sup>	PCOA area 4 scaled score <sup>a</sup>	Final pharmacy GPA	Pre-MPJE score	MPJE scaled score	MPJE total pass-fail <sup>b</sup>
Age at Graduation	-0.05	-0.37	-0.33	-0.13	-0.05	0.01	-0.03	-0.26	-0.33	-0.09	-0.16	-0.2
<i>p</i> value	.57	<.001	<.001	.12	.56	.87	.72	.001	<.001	.25	.07	.02
PCAT composite score	-	0.22	0.13	0.58	0.4	0.57	0.47	0.39	0.22	0.14	0.13	0.05
<i>p</i> value	-	.006	.11	<.001	<.001	<.001	<.001	<.001	.005	.09	.15	.54
Pre-pharmacy school GPA	-	-	0.47	0.3	0.22	0.19	0.15	0.34	0.6	0.14	0.18	0.16
<i>p</i> value	-	-	<.001	<.001	.007	.02	.07	<.001	<.001	.09	.04	.07
Pharmacy law course final grade	-	-	-	0.39	0.15	0.28	0.32	0.44	0.8	0.28	0.54	0.28
<i>p</i> value	-	-	-	<.001	.06	<.001	<.001	<.001	<.001	<.001	<.001	.001
PCOA total scaled score	-	-	-	-	0.62	0.89	0.66	0.86	0.5	0.27	0.38	0.28
<i>p</i> value	-	-	-	-	<.001	<.001	<.001	<.001	<.001	.001	<.001	.001
PCOA content area 1 scaled score <sup>a</sup>	-	-	-	-	-	0.49	0.28	0.42	0.25	0.13	0.28	0.25
<i>p</i> value	-	-	-	-	-	<.001	<.001	<.001	.002	.11	.001	.003
PCOA content area 2 scaled score <sup>a</sup>	-	-	-	-	-	-	0.52	0.67	0.39	0.25	0.274	0.17
<i>p</i> value	-	-	-	-	-	-	<.001	<.001	<.001	<.002	.001	.045
PCOA content area 3 scaled score <sup>a</sup>	-	-	-	-	-	-	-	0.42	0.29	0.26	0.24	0.18
<i>p</i> value	-	-	-	-	-	-	-	<.001	<.001	.001	.005	.04
PCOA content area 4 scaled score <sup>a</sup>	-	-	-	-	-	-	-	-	0.54	0.24	0.39	0.28
<i>p</i> value	-	-	-	-	-	-	-	-	<.001	.003	<.001	.001
Final pharmacy GPA	-	-	-	-	-	-	-	-	-	0.23	0.43	0.26
<i>p</i> value	-	-	-	-	-	-	-	-	-	.004	<.001	.002
Pre-MPJE score	-	-	-	-	-	-	-	-	-	-	0.13	0.1
<i>p</i> value	-	-	-	-	-	-	-	-	-	-	.14	.26
MPJE total scaled score	-	-	-	-	-	-	-	-	-	-	-	0.56
<i>p</i> value	-	-	-	-	-	-	-	-	-	-	-	<.001

Abbreviations: GPA=grade point average; MPJE=Multistate Pharmacy Jurisprudence Examination; PCAT=Pharmacy College Admission Test; PCOA=Pharmacy Curriculum Outcomes Assessment.

<sup>a</sup> The four PCOA content areas are basic biomedical sciences (area 1), pharmaceutical sciences (area 2), social/behavioral/administrative sciences (area 3), and clinical sciences (area 4).

<sup>b</sup> MPJE pass-fail coded as 0=fail, 1=pass; for MPJE pass-fail, the correlation is point biserial.

Table 3. Multiple Linear Regression Model to Determine Value of Demographics, Pre-Pharmacy School Performance Indicators, and Pharmacy School Performance Indicators (Including PCOA Total Scaled Score) as Predictors of MPJE Total Scaled Score in the Class of 2020 (N=136)

	B	Standard error	Standardized beta	t	p value	Zero-order correlation	Partial correlation	Part correlation	Tolerance <sup>a</sup>	VIF <sup>a</sup>
Constant	72.8	7.56		9.63	<.001					
Age at graduation	-0.09	0.08	-0.09	-1.11	.27	-0.18	-0.1	-0.08	0.91	1.1
Gender <sup>b</sup>	-0.58	0.62	-0.08	-0.94	.35	-0.02	-0.09	-0.07	0.83	1.21
Race/ethnicity <sup>b</sup>	-0.21	0.7	-0.02	-0.31	.76	-0.16	-0.03	-0.02	0.89	1.12
PCAT composite score	-0.02	0.02	-0.08	-0.9	.74	0.12	-0.08	-0.07	0.66	1.52
Pre-pharmacy school GPA	-1.06	0.88	-0.1	-1.2	.23	0.2	-0.12	-0.09	0.63	1.58
Pharmacy law course final grade	2.81	0.72	0.51	3.93	<.001	0.53	0.34	0.29	0.33	3.07
Academic difficulty during PharmD <sup>b</sup>	0.16	0.99	0.02	0.16	.88	-0.21	0.01	0.01	0.57	1.75
Final pharmacy GPA	-0.59	2.11	-0.05	-0.28	.78	0.43	-0.03	-0.02	0.19	5.2
PCOA total scaled score	0.03	0.01	0.29	2.61	.01	0.4	0.23	0.19	0.45	2.22
Pre-MPJE score	0.03	0.06	-0.02	-0.2	.84	0.17	-0.02	-0.02	0.83	1.21

Abbreviations: B=unstandardized coefficient (or parameter estimate for the regression equation); GPA=grade point average; MPJE=Multistate Pharmacy Jurisprudence Examination; PCAT=Pharmacy College Admission Test; PCOA=Pharmacy Curriculum Outcomes Assessment; PharmD=Doctor of Pharmacy degree program; VIF=variance inflation factor.

<sup>a</sup> Tolerance less than 0.1 and VIF greater than 10 indicate multicollinearity.

<sup>b</sup> Gender is coded as 0=male, 1=female; race/ethnicity is coded as 0=non-Hispanic White, 1=minority; and academic difficulty is coded as 0=no academic difficulty, 1=academic probation and/or appearance before the Academic Standing and Promotion Review Committee.

course grade; having a younger age at graduation was also significantly correlated with passing the MPJE. In regression models, pharmacy law course grade accounted for much of the variance of the MPJE total scaled score, signaling it was the most important determinant of MPJE score. The PCOA total and content area 4 scaled scores were also found to influence MPJE outcomes, but not as much as the pharmacy law course grade.

The MPJE assesses pharmacy law core competencies involving both federal and state laws and regulations.<sup>8</sup> In contrast to the NAPLEX, few courses in PharmD curricula comprehensively prepare graduates for the MPJE beyond the program's pharmacy law course. The Pre-MPJE is state specific and includes questions from previous MPJE exams.<sup>2</sup> Theoretically, it could become a popular preparatory tool for the MPJE, similar to the Pre-NAPLEX.<sup>4</sup> A significant relationship was not found between Pre-MPJE score and MPJE total scaled score or the first-attempt MPJE pass-fail outcome in our analysis. An explanation for the lack of a significant relationship between the Pre-MPJE and MPJE may be the sampling and number of questions on the Pre-MPJE. The Pre-MPJE contains 40 questions, or 33% of the questions on the MPJE, whereas the Pre-NAPLEX contains 100 questions.<sup>2,3,9</sup> More questions may be needed on the Pre-MPJE for a better pre-assessment. Additionally, some students may not have taken the self-assessment as intended without incentives nor a specific score requirement. Finally, there is a lack of transparency regarding how questions are chosen for the Pre-MPJE. Using prior questions or testing new questions may not represent current MPJE content. Further analysis of the relationship, or lack thereof, between the Pre-MPJE and MPJE is needed given the cost of taking the Pre-MPJE.

Research remains limited on predictors of MPJE performance. This study found that the pharmacy law course grade was the best indicator of passing the MPJE and the MPJE score. When we examined the impact of the pharmacy law grade on the Tennessee MPJE compared to out-of-state MPJE total scaled scores, the course grade remained significantly associated. Similarly, Mospan and colleagues identified significant correlations between the North Carolina MPJE scores and undergraduate GPA, academic performance (including the pharmacy law course grade), and PCOA performance.<sup>10</sup> However, overall GPA was the strongest correlate, whereas we found that the pharmacy law course grade was a better predictor. While final pharmacy GPA was associated with MPJE score, final pharmacy GPA was not a significant factor in regression models when controlling for other independent factors. Additionally, three published conference abstracts found an association between final pharmacy GPA and

Table 4. Multiple Linear Regression Model to Determine the Value of Demographics, Pre-Pharmacy School Performance Indicators, and Pharmacy School Performance Indicators (Including PCOA Content Area Scores) as Predictors of MPJE Total Scaled Score in the Class of 2020 (N=136)

	B	Standard error	Standardized beta	t	p value	Zero-order correlation	Partial correlation	Part correlation	Tolerance <sup>a</sup>	VIF <sup>a</sup>
Constant	71.65	7.74		9.25	<.001					
Age at graduation	-0.06	0.09	-0.05	-0.63	.53	-0.18	-0.06	-0.05	0.91	1.1
Gender <sup>b</sup>	-0.32	0.67	-0.04	-0.48	.64	-0.02	-0.04	-0.04	0.83	1.21
Race/ethnicity <sup>b</sup>	-0.22	0.7	-0.02	-0.31	.76	-0.16	-0.03	-0.02	0.89	1.12
PCAT composite score	-0.01	0.02	-0.05	-0.47	.64	0.12	-0.04	-0.04	0.66	1.52
Pre-pharmacy school GPA	-1.09	0.9	-0.11	-1.22	.23	0.2	-0.11	-0.09	0.63	1.58
Pharmacy law course final grade	2.77	0.73	0.5	3.81	<.001	0.53	0.33	0.28	0.33	3.07
Academic difficulty during PharmD <sup>b</sup>	0.48	1.02	0.05	0.47	.64	-0.21	0.04	0.04	0.57	1.75
Final pharmacy GPA	-0.56	2.16	-0.04	-0.26	.8	0.43	-0.02	-0.02	0.19	5.2
PCOA content area 1 scaled score <sup>c</sup>	0.01	0.01	0.12	1.19	.24	0.29	0.11	0.09	0.54	1.84
PCOA content area 2 scaled score <sup>c</sup>	-0.003	0.01	-0.04	-0.31	.76	0.26	-0.03	-0.02	0.36	2.78
PCOA content area 3 scaled score <sup>c</sup>	0.002	0.01	0.03	0.33	.74	0.23	0.03	0.02	0.63	1.6
PCOA content area 4 scaled score <sup>c</sup>	0.02	0.01	0.24	2.03	.045	0.44	0.18	0.15	0.39	2.55
Pre-MPJE score	-0.01	0.07	-0.01	-0.07	.94	0.17	-0.01	-0.01	0.81	1.23

Abbreviations: B=unstandardized coefficient (or parameter estimate for the regression equation); GPA=grade point average; MPJE=Multistate Pharmacy Jurisprudence Examination; PCAT =Pharmacy College Admission Test; PCOA=Pharmacy Curriculum Outcomes Assessment; PharmD=Doctor of Pharmacy degree program; VIF=variance inflation factor.

<sup>a</sup> Tolerance less than 0.1 and VIF greater than 10 indicate multicollinearity.

<sup>b</sup> Gender is coded as 0= male, 1= female; race/ethnicity is coded as 0=non-Hispanic White, 1=minority; and academic difficulty is coded as 0=no academic difficulty, 1=academic probation and/or appearance before the Academic Standing and Promotion Review Committee.

<sup>c</sup> The four PCOA content areas are basic biomedical sciences (area 1), pharmaceutical sciences (area 2), social/behavioral/administrative sciences (area 3), and clinical sciences (area 4).

Table 5. Value of Predictors of Total Scaled Score in Two Subgroups of Pharmacy Students From the Class of 2020 Who Took Either the Tennessee Multistate Pharmacy Jurisprudence Examination (N=101) or an Out-of-State Multistate Pharmacy Jurisprudence Examination (n=35)

	<b>B</b>	<b>Standard error</b>	<b>Standardized beta</b>	<b>t</b>	<b>p value</b>	<b>Zero-order correlation</b>	<b>Partial correlation</b>	<b>Part correlation</b>	<b>Tolerance<sup>a</sup></b>	<b>VIF<sup>a</sup></b>
<b>Tennessee (in-state) MPJE</b>										
Constant	70.2	8.39		8.37	<.001					
Age at graduation	-0.11	0.09	-0.11	-1.21	.23	-0.24	-0.13	-0.1	0.9	1.11
Gender <sup>b</sup>	-0.2	0.72	-0.03	-0.28	.78	0.09	-0.03	-0.02	0.76	1.32
Race/ethnicity <sup>b</sup>	-0.46	0.82	-0.05	-0.56	.58	-0.19	-0.06	-0.05	0.84	1.19
PCAT composite score	-0.01	0.02	-0.06	-0.58	.57	0.09	-0.06	-0.05	0.64	1.56
Pre-pharmacy school GPA	-0.83	0.96	-0.09	-0.87	.39	0.23	-0.09	-0.07	0.63	1.59
Pharmacy law course final grade	2.45	0.82	0.46	2.99	.004	0.58	0.3	0.25	0.3	3.4
Academic difficulty during PharmD <sup>b</sup>	0.3	1.18	0.03	0.26	.8	-0.27	0.03	0.02	0.48	2.08
Final pharmacy GPA	1.35	2.44	0.12	0.56	.58	0.51	0.06	0.05	0.16	6.14
PCOA total scaled score	0.01	0.01	0.12	0.94	.35	0.37	0.1	0.08	0.41	2.42
Pre-MPJE score	0.01	0.08	0.01	0.11	.92	0.18	0.01	0.01	0.81	1.24
<b>Out-of-state MPJE</b>										
Constant	82.74	19.28		4.29	<.001					
Age at graduation	-0.15	0.31	-0.09	-0.48	.64	0.02	-0.1	-0.07	0.55	1.84
Gender <sup>b</sup>	-1.6	1.53	-0.19	-1.05	.31	-0.27	-0.21	-0.15	0.6	1.66
Race/ethnicity <sup>b</sup>	0.27	1.56	0.03	0.18	.86	-0.1	0.04	0.03	0.69	1.46
PCAT composite score	-0.02	0.04	-0.09	-0.48	.63	0.19	-0.1	-0.07	0.58	1.72
Pre-pharmacy school GPA	-2.54	2.42	-0.23	-1.05	.31	0.09	-0.21	-0.15	0.44	2.26
Pharmacy law course final grade	4.81	1.76	0.71	2.74	.01	0.42	0.5	0.39	0.31	3.25
Academic difficulty during PharmD <sup>b</sup>	-0.19	2.6	-0.02	-0.07	.94	-0.06	-0.02	-0.01	0.44	2.43
Final pharmacy GPA	-6.91	5.05	-0.43	-1.37	.18	0.2	-0.28	-0.2	0.21	4.72
PCOA total scaled score	0.07	0.03	0.62	2.71	.01	0.53	0.49	0.39	0.4	2.5
Pre-MPJE score	-0.08	0.16	-0.1	-0.49	.63	0.17	-0.1	-0.07	0.54	1.85

Abbreviations: B=unstandardized coefficient (or parameter estimate for the regression equation); GPA=grade point average; MPJE=Multistate Pharmacy Jurisprudence Examination; PCAT=Pharmacy College Admission Test; PCOA=Pharmacy Curriculum Outcomes Assessment; PharmD=Doctor of Pharmacy degree program; VIF=variance inflation factor.

<sup>a</sup> Tolerance less than 0.1 and VIF greater than 10 indicate multicollinearity.

<sup>b</sup> Gender is coded as 0= male, 1= female; race/ethnicity is coded as 0=non-Hispanic White, 1=minority; and academic difficulty is coded as 0=no academic difficulty, 1=academic probation and/or appearance before the Academic Standing and Promotion Review Committee.



MPJE score; however, pharmacy law course performance was not evaluated.<sup>11-13</sup> Mospan and colleagues noted that their two-credit-hour pharmacy law course was delivered in fall of the second professional year and predominantly taught by a practicing pharmacist.<sup>10,14</sup> At the University of Tennessee Health Science Center College of Pharmacy, the pharmacy law course is three credit hours, delivered in fall of the third professional year, and taught by an attorney. The course covers federal and state law and aligns with the MPJE Core Competencies.<sup>8</sup> It is unknown whether the timing, content, delivery, or instructor of the pharmacy law course impacts MPJE pass rates. A recent review by Rosenberg and colleagues found heterogeneity in law content of 49 PharmD programs, including timing within the curriculum, credit hours, and type of instructor, but they did not evaluate MPJE pass rates.<sup>15</sup> Differences in pharmacy law courses may account for variations between the studies.

The PCOA overall scaled score contributed to some of the variance for the overall MPJE scaled score and out-of-state MPJE scaled score but not for the MPJE Tennessee score. Mospan and colleagues found a positive correlation between MPJE score and PCOA overall score, but they did not examine differences between their state versus out-of-state MPJE performance.<sup>10</sup> Various studies have found PCOA total scores and content area scores to be correlated with the NAPLEX total scaled score, but this is the first study to discover their association with the MPJE total scaled score in regression models.<sup>16-19</sup> A positive correlation was found for MPJE total scaled score and pass-fail outcome with the PCOA content area 1-4 scaled scores; however, only the content area 4 (clinical sciences) score was found to significantly contribute to the variance in the overall MPJE score in the regression model. Mospan and colleagues found significant correlations for the North Carolina MPJE score with PCOA content area 3 and the PCOA law score.<sup>10</sup> We did not examine the PCOA law score because it comprises only five questions of the exam. The PCOA content area 4 comprises 35% of the exam and includes the application of clinical sciences, which may be more similar to the MPJE question format.<sup>6</sup>

In our regression analysis, PCOA total scaled score did not significantly influence Tennessee MPJE scores, but it was significant in the out-of-state MPJE scores model. The lack of significance for the PCOA total scaled score on the Tennessee MPJE score highlights the importance of the pharmacy law course in the PharmD curriculum, particularly for students planning to be licensed in the same state. For students testing outside of the state of their PharmD program, both their pharmacy law course and overall PCOA performance influenced MPJE performance, demonstrating the effects of a specialized law

course and the ability of students to apply and recall material taught throughout the curriculum.

Unlike past evaluations that assessed predictors of MPJE scores, we also examined predictors of passing the MPJE. In January 2021, the NABP announced that NAPLEX and MPJE results would be reported as pass or fail only, with total scaled score no longer being provided.<sup>20</sup> As a result, schools and colleges of pharmacy will no longer be able to evaluate program-specific predictors related to scaled scores and will need to focus on pass-fail outcomes. Our study found a correlation with passing the MPJE to final pharmacy GPA, pharmacy law course grade, and PCOA total and content area 1-4 scaled scores. However, no significant findings were found in logistic regression analysis.

This study is not without limitations. First, generalizability may be limited, as only students at one state public college of pharmacy were included. Most students took the Tennessee MPJE. Given that the MPJE varies per jurisdiction, programs should examine benefits of the Pre-MPJE for their state. Second, only one year of data was available to evaluate the Pre-MPJE, which limits the sample size. However, the Pre-MPJE was first available in 2020, and MPJE total scaled scores will not be available to programs beginning January 2021. Third, MPJE results were not available for 20 graduates. Lastly, the Pre-MPJE and MPJE were taken during a pandemic, and it is unclear how that may have influenced the findings.

Future directions for research include analyzing factors that predict MPJE pass-fail outcomes, given the change in how MPJE results are reported, and investigating how the timing and instructor credentials of pharmacy law courses affect MPJE outcomes.

## CONCLUSION

Based on the experience at one public college of pharmacy, the Pre-MPJE score does not predict performance or passing of the MPJE. Pharmacy law course performance was the most significant contributor to predicting MPJE performance, both for the in-state and out-of-state MPJEs. Given the impact of the pharmacy law course grade on MPJE total scaled score, targeting students who had academic difficulty in the pharmacy law course for MPJE preparation may improve student performance.

## ACKNOWLEDGEMENTS

Marie Chisholm-Burns serves on the board of directors for the Accreditation Council of Pharmacy Education (ACPE). This manuscript does not represent ACPE or the boards' opinions or views.

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