Significant Factors for Predicting Academic Success of First-Year Pharmacy Students

Marie A. Chisholm[1], Henry H. Cobb III, and Jeffrey A. Kotzan
College of Pharmacy, The University of Georgia, Athens GA 30602

Identifying the most important factors for predicting academic performance of pharmacy students is of considerable interest to pharmacy educators. The purpose of this study was to identify significant factors that predicted academic performance of first year pharmacy students at the University of Georgia. Objectives of the study included: (*i*) evaluating factors that were believed to predict first year pharmacy students' academic performance; (*ii*) contrasting the value of the "new" Pharmacy College Admission Test (PCAT) to the "old" PCAT in predicting academic performance; and (*iii*) determining the most important factors for predicting academic performance for male and female students for the 1992 and 1993 classes. All students who entered the University of Georgia College of Pharmacy during 1992 and 1993 were evaluated for the study. A total of 234 pharmacy student records were audited from the entering professional classes of 1992 and 1993. Forward stepwise multiple regression analyses were performed to correlate first year pharmacy students' grade point average (GPA) with independent variables of each student's age, PCAT scores, prepharmacy GPA, prepharmacy math/science GPA, and the achievement of a four-year college degree prior to entering pharmacy school. The most important factors for predicting the academic performance of first year pharmacy students were prepharmacy math/science GPA and the achievement of a four-year college degree prior to entering pharmacy school ($P<0.01$). Pre-Pharmacy math/science GPA was the most significant factor for both male and female students ($P<0.01$). Other significant factors that varied in the different populations included the PCAT Composite score, PCAT Verbal score, age, and prior four-year college degree ($P<0.05$). Significance and implications of the results for pharmacy admission procedures are discussed.

INTRODUCTION

Selection of the most promising students for admission to schools of pharmacy has been a focus of concern for many years. In addition to the commitment to select the most qualified applicants, pharmacy educators are faced with many other challenges including the responsibility of maintaining quality educational programs, the need for a diversified student body, the desire to minimize student attrition, and the development and support of traditional and nontraditional educational programs. Since the development of the Pharmacy College Admission Test (PCAT) in 1974, many institutions have used this instrument in conjunction with other measures, such as prepharmacy GPA (grade point average) as the primary criteria for admission of students. It is essential that colleges of pharmacy determine the best pre-admission criteria to select the most qualified students and simultaneously satisfy other professional and institutional objectives.

All schools of pharmacy utilize some form of the prepharmacy GPA in evaluating prospective students for admission to their institutions. While required prepharmacy courses for schools of pharmacy may differ, most schools of pharmacy require several courses in general and organic chemistry, biology, physics, and mathematics. Other required prepharmacy classes vary according to the specific institution. In addition to GPA, approximately 40 percent of all AACP member schools utilize the PCAT in evaluating prospective students for admission. The overall purpose of

[1]Corresponding author and address: Medical College of Georgia, Clinical Pharmacy Program, FI-1087, Augusta GA 30912

Table I. "Old" PCAT and prepharmacy GPA validity studies to predict first-year pharmacy GPA

School	Independent variables studies	Significant variables	R^2
Georgia 1977 (2)	PGPA, PVerb, RRc, PBio PChem, PArith, and PMath	PChem + PRc + PGPA	0.417
Kentucky (3)	PGPA, PVerb, PRc, PChem, PBio, PQuant, PArith, and PMath		
Class of 1977		PRc + PBio + PGPA	0.568
Class of 1978		PQuant + PGPA	0.281
Class of 1979		PChem + PGPA	0.480
VCU/MCV (4)	PGPA, PVerb, PRc, PChem, PBio, PQuant, PArith, and PMath		
Class of 1978		PChem + PGPA	0.460
Class of 1979		PChem + PVerb + PGPA	0.440
Mississippi (5)	PGPA, PVerb, PRc, PChem PBio, PQuant, PArith, and PMath	PGPA + PRc + PBio	0.576

PGPA = Prepharmacy grade point average, PRc = PCAT reading comprehension score, PVerb = PCAT verbal score, PBio = PCAT biology score, PArith = PCAT Arithmetic Score, PMath = PCAT Mathematical Reasoning Score, PChem = PCAT chemistry score, and PQuant = PCAT quantitative score.

the PCAT is to assist schools of pharmacy in the selection of students(1). Prior to 1993, the PCAT ("old" PCAT) consisted of seven scoring sections: Verbal, Reading Comprehension, Quantitative Ability, Mathematical Reasoning, Arithmetic, Biology, and Chemistry. Candidates received scaled and percentile scores for each PCAT section. In 1993, the PCAT changed ("new" PCAT) and presently consists of five content areas: Verbal, Reading Comprehension, Quantitative Ability, Biology, and Chemistry. Currently, candidates receive separate scaled and percentile scores for each of the five sections of the PCAT and a scaled and percentile composite score. Several studies have examined the predictive power of the "old" PCAT and prepharmacy GPA to project students' academic performance as defined by first year pharmacy GPA (Table I). Published reports investigating the utility of the PCAT to predict students' academic performance are in conflict(2-4). Some studies have indicated that prepharmacy GPA is a better predictor of pharmacy students' academic performance than the PCAT(5,6), and others reported opposite results(4,7). Many studies found that various scores from the different sections of the PCAT (PCAT sub-scores) along with prepharmacy GPA can serve as reliable predictors of students' academic success; suggesting that certain portions of the PCAT predict academic performance of pharmacy students better than others (Table I). Similar to the PCAT, grades achieved in specific classes may serve as an indicator of academic success. In fact, studies suggest that prepharmacy math and science grades may serve as a strong predictor of academic success(6,8). Therefore, grades achieved in certain core classes in the prepharmacy curriculum may be a better indicator of success than overall prepharmacy GPA.

Schools of medicine and dentistry also utilize undergraduate GPA and standardized tests in selecting students for admission. Some reports have been published demonstrating the effectiveness of undergraduate GPA and Medical College Admission Test (MCAT) scores in predicting first year performance of medical students with correlations greater than 0.50(9,10). A study conducted by Jones *et al*. illustrates that undergraduate science GPA is the best single predictor of first- and second-year medical students' academic performance compared to undergraduate non-science GPA, total undergraduate GPA, or MCAT scores(10). Similar to the PCAT, many studies indicate that certain portions of the MCAT, particularly Chemistry and Biology, predict academic performance better than others(10,11). Several studies have been published reporting the effectiveness of GPA and Dental Admission Test (DAT) scores in predicting first year academic performance of dental students. Many studies indicate that GPA is a better indicator of academic performance than DAT scores(12,13). Furthermore, many investigators suggest that undergraduate science GPA is the best single predictor of first year dental students' academic performance compared to total undergraduate GPA or DAT scores(13).

Standardized test scores and GPA may be of limited use in predicting academic success or graduation rates in some populations(14-16). Unfortunately, there is limited literature describing the predictive ability of objective measures, other than GPA and standardized test scores, for predicting academic success in professional schools. Sedlacek *et al*. suggest that college grades and scores on the MCAT have modest correlations with medical school grades for minority students, and combining traditional and nontraditional variables is best in selecting minority students for medical school admission(14). Tracey and Sedlacek identified eight nontraditional variables that predict academic performance of minority students: the dimension of self concept or confidence, realistic self-appraisal, understanding and dealing with racism, preference of long-range goals over short-term satisfaction, having a strong support person, demonstrating leadership qualifications, having community involvement, and knowledge acquired in a field(15). Bandalos and Sedlacek reported that combining the eight nontraditional variables defined by Sedlacek with prepharmacy GPA and PCAT scores significantly increased the ability of predicting academic performance of first year minority pharmacy students ($P<0.01$)(16). A study conducted by Charupatanapong and colleagues indicated that the combination of prepharmacy GPA, age, number of hours involved in college and community activities, and the number of hours dedicated to studying are strong predictors of academic performance in certain populations(17). Several studies have shown that certain portions of the PCAT and MCAT

Table II. Population characteristics

	1992	1993
Number of students	119	115
Male	49(41%)	42(37%)
Female	70(59%)	73 (63%)
Average age in years	25.3 ± 3.95	24.5 ± 3.78
Number of students with prior 4-year college degrees	17(14.3%)	17 (14.8%)
PGPA	3.32 ± 0.36	3.36 ± 0.33
MS GPA	3.13 ± 0.46	3.28 ± 0.43
PVerb	58.83 ±21.76	71.27 ±19.10
PBio	54.40 ± 20.98	62.39 ± 22.2
PRc	64.23 + 20.16	73.55 + 20.32
PQuant	59.54 ±21.96	68.46 ± 20.32
PChem	59.98 ± 20.38	70.13 ± 19.51
PArith	62.68 ± 23.13	NA
PMath	62.68 ± 22.18	NA
PComp	NA	77.17 ±11.41
FYPGPA	3.08 ± 0.45	3.16 ±0.51

PGPA = Prepharmacy grade point average, MS GPA = prepharmacy math/ science grade point average, PVerb = PCAT verbal score. PBio = PCAT biology score, PRc = PCAT reading comprehension score, PQuant = PCAT quantitative ability score, PChem = PCAT chemistry score. PArith = PCAT arithmetic score, PMath = PCAT mathematical reasoning score, PComp = PCAT composite score, and FYPGPA = first-year pharmacy school grade point average.

predict academic success better than others across various population subsets as well(9,16). In light of the possible existence of different predictive factors across various segments of the populations, it is important to identify significant predictors of academic success among distinct groups.

No data have been published evaluating the predictive ability of the new PCAT or comparing the old PCAT to the new PCAT in predictive value. With the implementation of the new PCAT and the importance of defining the best indicators for predicting future academic performance, it is beneficial to identify significant factors that predict academic success. The purpose of this research was to identify significant factors that predict first year students academic performance for two consecutive classes at the University of Georgia College of Pharmacy. Objectives of this study were to: (*i*) evaluate factors that predicted first year pharmacy students academic performance for each class of 1992 and 1993; (*ii*) contrast the value of the new PCAT to the old PCAT in predicting first year pharmacy students academic performance; and (*iii*) determine the most important factors for predicting academic performance for male and female students who entered pharmacy school in 1992 and 1993.

METHODOLOGY

Sample

The study population consisted of 234 students who entered the University of Georgia College of Pharmacy in the Fall of 1992 and 1993 (Table II). Since the University of Georgia required that all students take the old or new PCAT as part of the 1993 admissions process, only students who took the new PCAT were included in the study. All PCAT scores in the entering fall class of 1992 (old PCAT) were incorporated in the study. Data were audited to provide the following information for students enrolled in the study: First-year pharmacy GPA for the period beginning Fall 1992 and ending Spring 1993; first-year pharmacy GPA for the period beginning Fall 1993 and ending Spring 1994; prepharmacy GPA and prepharmacy math/science GPA ending Summer 1992 for the entering class of Fall 1992, prepharmacy GPA and prepharmacy math/science GPA ending Summer 1993 for the entering class of Fall 1993; "old" PCAT percentile scores for each section (Verbal, Reading Comprehension, Quantitative Ability, Mathematical Reasoning, Arithmetic, Biology, and Chemistry) for students entering Fall 1992; new PCAT percentile scores; composite scores and individual section scores (Verbal. Reading Comprehension, Quantitative Ability, Biology, and Chemistry) for students entering Fall 1993; the achievement of a four-year college degree prior to entering pharmacy school; gender; and age. A total of fourteen variables were used. These variables were: (*i*) prepharmacy grade point average; (*ii*) prepharmacy math/science grade point average; (*iii*) prior four-year degree; (*iv*) age; (*v*) gender; (*vi*) PCAT reading comprehension score; (*vii*) PCAT verbal score; (*viii*) PCAT biology score: (*ix*) PCAT chemistry score; (*x*) PCAT quantitative ability score; (*xi*) PCAT mathematical reasoning score; (*xii*) PCAT arithmetic score; (*xiii*) PCAT composite score; and (*xiv*) first-year pharmacy school grade point average (refer to Table III). Only PCAT percentile scores were used in the analyses because it provided better normalization of the data than standard scaled scores.

Defining Academic Performance

Academic performance was defined as the grade point average in required pharmacy courses at the end of the students first year in pharmacy school (Spring 1993 or Spring 1994). The required pharmacy courses at the University of Georgia College of Pharmacy and their respective credit hours are displayed in Table IV and first year pharmacy school GPA was determined by grades achieved in these classes. Since the University of Georgia uses a four-point grading system, all grades incorporated in the study were based on a four-point grading structure. Students who did not complete the first year of pharmacy school due to academic failure or withdrawal were included in the study and their grade point averages earned by the end of the students first year in pharmacy school were included in the analysis.

Forward stepwise multiple regression analysis with a selected significance level of α=0.05 using SAS System, release 6.08, was applied to each data base for the 1992 and 1993 classes to determine the significant predictive factors of first-year pharmacy school success and prediction equations for first-year pharmacy school GPA. The model used first year pharmacy school grade point average as the dependent variable. The independent factors for the model were as described in the methodology section. Dummy variables were used and lack of a four-year college degree and male students were coded 0 and achievement of a prior four-year college degree and female students were coded 1. Regression analyses were performed using the raw data and the standardized data for both classes. A correlation matrix for each class was prepared to investigate covariance among the independent variables.

RESULTS

Regression analyses were performed using both the raw and the standardized data with the same regression results. The results of the 1992 and 1993 analyses are summarized in Table V. The 1992 analysis indicated that prepharmacy math/science GPA and achievement of a four-year college

Table III. Independent variables evaluated

1992 Class	1993 Class
Prepharmacy GPA	Prepharmacy GPA
prepharmacy math/science GPA	Prepharmacy math/science GPA
PCAT verbal Score	PCAT verbal score
PCAT reading Comprehension score	PCAT reading comprehension score
PCAT quantitative Ability score	PCAT quantitative ability score
PCAT mathematical reasoning score	PCAT biology score
PCAT arithmetic score	PCAT chemistry score
PCAT biology score	PCAT composite score
PCAT chemistry score	Achievement of 4-year college degree prior to pharmacy school
Achievement of 4-year college degree prior to pharmacy school	Gender
Gender	Age
Age	

Table IV. First professional year required courses at the University of Georgia College of Pharmacy

Course title	Credit hours
Anatomical Basis for Medical Physiology	5
Pharmacy Calculations	3
Introductory Medicinal Chemistry	5
Medicinal Chemistry Laboratory	1
Biopharmacy I & II	7
Medical Physiology and Pathophysiology I & II	8
Pharmacy Law	4
Administrative Pharmacy	3
Pharmaceutics I & II	10

Table V. Forward stepwise multiple regression with first-year pharmacy GPA

Year	Variables	Parameter estimates	Partial R^2	*P*
1992	Intercept	1.5079	—	0.0001
	MS GPA	0.4830	0.2231	0.0001
	Degree	0.4475	0.1208	0.0001
1993	Intercept	1.2619	—	0.0001
	MS GPA	0.5623	0.2062	0.0001
	Degree	.3896	0.0742	0.0009

MSGPA=Prepharmacy math/science grade point average, Degree = Prior four-year college degree.

degree prior to pharmacy school were the most significant factors associated with first year pharmacy school GPA ($P<0.01$. $R^2=0.34$). Similar to the 1992 analysis, the 1993 analysis indicated that prepharmacy math/science GPA and achievement of a four-year college degree prior to pharmacy school had the strongest association with first year pharmacy school GPA ($P<0.01$, $R^2=0.28$). Other factors that had a modest correlation, although not statistically significant at the $\alpha<0.05$ level, with first year pharmacy GPA were PCAT Chemistry and Reading Comprehension scores in the 1993 entering class and PCAT Biology scores in the 1992 entering class ($P<0.15$).

Separate analysis of male and female students in the1993 population was performed to determine the independent factors that predicted academic performance in each subgroup. Results of the variables that correlated with first year students academic performance according to gender is summarized in Table VI. The prepharmacy math/science GPA appeared as a significant predictive factor ($P<0.05$) in each subgroup and the achievement of a prior four-year college degree was a significant factor ($P<0.05$) in 50 percent of the subgroups. Other significant ($P<0.05$) factors that appeared in a subgroup included PCAT Composite score, PCAT Verbal score, and age.

DISCUSSION

In this study, forward stepwise multiple regressions indicated that the best overall predictors of academic perfor

Table VI. Forward stepwise multiple regression with first-year pharmacy GPA according to gender

Year	Gender	Variables	Parameter estimates	Partial R^2	*P*
1992	Female	Intercept	1.3335	—	0.0001
		MS GPA	0.4761	0.2591	0.0001
		Degree	0.4636	0.1418	0.0006
		PVerb	0.0041	0.0364	0.0426
1992	Male	Intercept	0.2404	—	0.0659
		Age	0.0607	0.2283	0.0001
		MS GPA	0.3937	0.1321	0.0031
1993	Female	Intercept	1.0710	—	0.0257
		MS GPA	0.3953	0.1648	0.0005
		PComp	0.0113	0.0735	0.0108
1993	Male	Intercept	0.5544	—	0.0357
		MS GPA	0.7473	0.2370	0.0002
		Degree	0.4878	0.1131	0.0129

MS GPA = Prepharmacy math/science grade point average, Degree = Prior four-year college degree, PComp = PCAT composite score; and PVerb=PCAT verbal score

Table VII. Regression analysis of study variables with first-year pharmacy GPA

Variable	Partial r^2	Model R^2	*P*
1992 Class			
MS GPA	0.2231	0.2231	0.0001
Degree	0.1208	0.3438	0.0001
PBio	0.0124	0.3754	0.1341
PArith	0.0051	0.3806	0.3333
PRc	0.0044	0.3850	0.3686
Age	0.0040	0.3890	0.3958
PGPA	0.0014	0.3904	0.6084
PVerb	0.0017	0.3921	0.5571
PChem	0.0004	0.3925	0.7921
PMath	0.0005	0.3930	0.7755
PQuant	0.0000	0.3930	0.9716
1993 Class			
MS GPA	0.2062	0.2062	0.0001
Degree	0.0742	0.2803	0.0009
PChem	0.0210	0.3013	0.0695
PRc	0.0145	0.3158	0.1275
PVerb	0.0075	0.3233	0.2715
Age	0.0038	0.3271	0.4348
PComp	0.0035	0.3306	0.4541
PGPA	0.0037	0.3344	0.4408
PQuant	0.0015	0.3358	0.6307
PBio	0.0027	0.3385	0.5127

MS GPA = prepharmacy math/science GPA; Degree= Prior 4-year degree; PBio= PCAT biology score; PArith =PC AT arithmetic score; PRc= PCAT reading comprehension score; PGPA=prepharmacy GPA; PVerb= PCAT verbal score; PChem=PCAT chemistry score; PMath=PCAT mathematical reasoning score; PQuant=PCAT quantitative ability score; PComp=PCAT composite score.

mance in both classes were prepharmacy math/science GPA and the achievement of a four-year college degree prior to entering pharmacy school ($P<0.01$). To our surprise, prepharmacy GPA did not significantly correlate with first year pharmacy academic performance ($P<0.05$). The prepharmacy math/science GPA and achievement of a previous four-year college degree were both significant and consistent factors in both classes; thus, increasing its predictive worth. Torosain and others demonstrated that prepharmacy math/science GPA was a strong predictor of pharmacy students academic performance and suggested its use in their student selection process(6).Similar to Torosain's study, our results indicate the strong predictive power of prepharmacy math/science GPA.

Traditionally, most pharmacy students do not have a four-year college degree prior to entering pharmacy school. Therefore, there is limited literature describing the predictive power of the achievement of a prior four-year college degree before entering pharmacy school. This study demonstrated the significant positive predictive value of the achievement of a prior four-year college degree with first year pharmacy students academic performance. Unfortunately, our sample size was too small to draw specific conclusions about the predictive value of the different types of college degrees; although, most students in this subset population had a Bachelor of Science degree. Furthermore, the achievement of a prior degree was a significant and consistent factor among both classes. With the increasing trend of the entry level degree of pharmacy leaning toward the Doctor of Pharmacy Degree, some pharmacy educators may consider placing emphasis on students having a four-year college degree prior to entering pharmacy school.

The admissions committee at our school uses the PCAT percentile scores to assess candidates admission to the College of Pharmacy. Similar to many studies, we found certain PCAT scores to be significant factors of predicting academic performance in certain populations (Table VI). However, in the analyses from the 1992 and 1993 classes (total and not separated by gender) the PCAT scores were not found to be significant ($P>0.05$). It is our belief that because most of our students had high percentile scores, this may have disabled us from demonstrating significance and thus contrasting the value of the new and old PCAT. Table VII illustrates the r^2 values of all the study factors in the 1992 and 1993 classes, and can be used to demonstrate the predictive worth of the selected variables in our population. In reference to the new and old PCAT, the results generated from this study support the new PCATs combining of the Quantitative Ability, Mathematical Reasoning, and Arithmetic sections into one category. The correlation matrix (Table VIII) of the predictive factors for the 1992 class demonstrates Pearson Correlation Coefficients of 0.8563 between the PCAT Quantitative Ability and PCAT Arithmetic, and 0.9054 between the PCAT Quantitative Ability and PCAT Mathematical Reasoning ($P<0.01$). In addition, the Pearson Correlation Coefficients in Tables VIII and IX confirm the separate predictive identities of the prepharmacy math/science GPA and the achievement of a prior four-year college degree as predictors of academic performance of first year pharmacy students in the study population.

Table VIII. 1992 Class correlation matrix of study variables[a]

	Age	Gender	PGPA	PVerb	PBio	PRc	PQuant	PChem	PArith	PMath	Degree	MSGPA
Age	1.0000	-0.0229	-0.1472	0.2876	0.1928	-0.0298	0.1608	0.1838	-0.0957	-0.1880	0.5118	-0.1269
	0.0000	0.8040	0.1086	0.0014	0.0349	0.7470	0.0793	0.0445	0.2987	0.0398	0.0001	0.1672
Gender	-0.0229	1.0000	0.2485	0.0759	-0.0356	0.0730	-0.1777	-0.1048	-0.1022	-0.1644	-0.0929	0.2602
	0.8040	0.0000	0.0062	0.4103	0.6995	0.4284	0.0521	0.2547	0.2667	0.0728	0.3128	0.0041
PGPA	-0.1472	0.2485	1.0000	0.1401	-0.0212	0.1672	0.1096	0.2032	0.0620	0.1102	-0.1278	0.8183
	0.1086	0.0062	0.0000	0.1270	0.8180	0.0679	0.2334	0.0260	0.5009	0.2309	0.1640	0.0001
PVerb	0.2876	0.0759	0.1400	1.0000	0.1723	0.2909	-0.0795	0.1986	-0.1141	-0.0308	0.1819	0.0427
	0.0014	0.4103	0.1270	0.0000	0.0599	0.0013	0.3882	0.0297	0.2147	0.7388	0.0467	0.6436
PBio	0.1928	-0.0356	-0.0212	0.1723	1.0000	0.3093	-0.1335	0.2610	-0.0881	-0.1845	0.1638	0.0813
	0.0349	0.6995	0.8180	0.0599	0.0000	0.0006	0.1462	0.0040	0.3387	0.0436	0.0738	0.3773

Table VIII. 1992 Class correlation matrix of study variables[a] (continued)

	Age	Gender	PGPA	PVerb	PBio	PRc	PQuant	PChem	PArith	PMath	Degree	MSGPA
PRc	-0.0298	0.0730	0.1672	0.2909	0.3093	1.0000	-0.0854	0.0635	-0.0834	-0.0590	0.0631	0.1932
	0.7470	0.4284	0.0679	0.0013	0.0006	0.0000	0.3535	0.4911	0.3651	0.5224	0.4934	0.0345
PQuant	-0.1608	-0.1777	0.1096	-0.0795	-0.1334	-0.0854	1.0000	0.1828	0.8563	0.9054	-0.0189	0.0395
	0.0793	0.0521	0.2334	0.3882	0.1462	0.3535	0.0000	0.0456	0.0001	0.0001	0.8385	0.6684
PChem	0.1838	-0.1048	0.2032	0.1986	0.2610	0.0635	0.1828	1.0000	0.0965	0.1452	0.1039	0.3111
	0.0445	0.2547	0.0260	0.0297	0.0040	0.4911	0.0456	0.0000	0.2943	0.1137	0.2586	0.0005
PArith	-0.0957	-0.1022	0.0620	-0.1141	-0.0881	-0.0834	0.8563	0.0965	1.0000	0.6140	-0.0327	-0.0445
	0.2987	0.2667	0.5009	0.2147	0.3387	0.3651	0.0001	0.2943	0.0000	0.0001	0.7232	0.6291
PMath	-0.1880	-0.1644	0.1102	-0.0308	-0.1845	-0.0590	0.9054	0.1452	0.6140	1.0000	-0.0147	0.0572
	0.0398	0.0728	0.2309	0.7388	0.0436	0.5224	0.0001	0.1137	0.0001	0.0000	0.8731	0.5351
Degree	0.5118	-0.0929	-0.1279	0.1819	0.1638	0.0631	-0.0188	0.1039	-0.0327	-0.0147	1.0000	-0.0572
	0.0001	0.3128	0.1640	0.0467	0.0738	0.4934	0.8385	0.2586	0.7232	0.8731	0.0000	0.5332
MSGPA	-0.1269	0.2602	0.8183	0.0427	0.0813	0.1932	0.0395	0.3111	-0.0445	0.0572	-0.0574	1.0000
	0.1672	0.0041	0.0001	0.6436	0.3773	0.0345	0.6684	0.0005	0.6291	0.5351	0.5332	0.0000

[a]Pearson correlation Coefficients/Prob > |R| under H_o:Rho = 0

MS GPA = prepharmacy math/science GPA; Degree = Prior 4-year degree; PChem = PCAT Chemistry score; PRc = PCAT Reading Comprehension score; PVerb = PCAT Verbal Score; PComp = PCAT Composite score; PGPA=prepharmacy GPA; PQuant = PCAT Quantitative Ability score; PBio = PCAT Biology score.

Table IX. 1993 Class correlation Matrix of Study Variables

	Age	Gender	GPA	PVerb	PBio	PRc	PQuant	PChem	PComp	Degree	MSGPA
Age	1.0000	-0.1288	-0.2359	0.2665	0.1944	0.0553	-0.3000	-0.0021	0.1167	0.5480	-0.1878
	0.0000	0.1681	0.0108	0.0038	0.0365	0.5553	0.0011	0.9824	0.2122	0.0001	0.0435
Gender	0.1288	1.0000	0.1276	-0.0253	-0.1572	0.0578	0.0481	-0.1880	-0.0707	0.0079	0.1926
	0.1681	0.0000	0.1722	0.7879	0.0920	0.5378	0.6086	0.0433	0.4508	0.9332	0.0383
GPA	-0.2359	0.1276	1.0000	-0.0919	-0.0507	0.0432	0.0798	0.0540	0.0095	-0.1886	0.8165
	0.0108	0.1722	0.0000	0.3263	0.5887	0.6447	0.3945	0.5644	0.9193	0.0426	0.0001
PVerb	0.2665	-0.0252	-0.0919	1.0000	0.1117	0.3171	-0.0543	-0.0597	0.6250	0.2556	0.0064
	0.0038	0.7879	0.3263	0.0000	0.2325	0.0005	0.5627	0.5247	0.0001	0.0056	0.9455
PBio	0.1944	-0.1572	-0.0507	0.1117	1.0000	-0.1266	-0.1248	0.4509	0.4925	0.2210	-0.0004
	0.0365	0.0920	0.5887	0.2325	0.0000	0.1757	0.1819	0.0001	0.0001	0.0171	0.9967
PRc	0.0553	0.0578	0.0433	0.3171	-0.1266	1.0000	-0.0616	-0.1330	0.4119	0.1080	0.0336
	0.5553	0.5378	0.6447	0.0005	0.1757	0.0000	0.5114	0.1546	0.0001	0.2485	0.7204
PQuant	-0.3000	0.0480	0.0798	-0.0543	-0.1248	-0.0616	1.0000	0.1017	0.2915	-0.0937	0.1098
	0.0011	0.6086	0.3945	0.5627	0.1819	0.5114	0.0000	0.2775	0.0015	0.3171	0.2408
PChem	-0.0021	-0.1880	0.0541	-0.0597	0.4509	-0.1330	0.1017	1.0000	0.4281	0.0023	0.0933
	0.9824	0.0433	0.5644	0.5247	0.0001	0.1546	0.2775	0.0000	0.0001	0.9808	0.3193
PComp	0.1167	-0.0707	0.0095	0.6250	0.4925	0.4119	0.2915	0.4281	1.0000	0.2062	0.0999
	0.2122	0.4508	0.9193	0.0001	0.0001	0.0001	0.0015	0.0001	0.0000	0.0264	0.2859
Degree	0.5480	0.0079	-0.1886	0.2556	0.2210	0.1080	-0.0937	0.0023	0.2062	1.0000	-0.1090
	0.0001	0.9332	0.0426	0.0056	0.0171	0.2485	0.3171	0.9808	0.0264	0.0000	0.2442
MSGPA	-0.1878	0.1926	0.8165	0.0064	-0.0004	0.0336	0.1098	0.0933	0.0992	-0.1090	1.0000
	0.0435	0.0383	0.0001	0.9455	0.9967	0.7204	0.2408	0.3193	0.2859	0.2442	0.0000

[a]Pearson Correlation Coefficients/Prob > |R| under H_o; Rho = 0.

MS GPA = prepharmacy math/science GPA; Degree = Prior 4-year degree; PChem = PCAT chemistry score; PRc = PCAT reading comprehension score; PVerb = PCAT verbal score; PComp = PCAT composite score: PGPA-prepharmacy GPA; PQuant = PCAT quantitative ability score; PBio = PCAT biology score.

Table X. First-year pharmacy school GPA prediction actuations

1992 Class	FYPGPA = 0.4830 (MS GPA) + 0.4475 (Degree) + 1.5079
1993 Class	FYPGPA = 0.5623 (MS GPA) + 0.3896 (Degree) + 1.2619

PA = First-year pharmacy school GPA: MS GPA = prepharmacy math/ science GPA.

MS GPA: Range = 0.0-4.0.

Degree: Place 0 in the equation for students without a prior 4-year college degree: place 1 in the equation for students with a prior 4-year college degree.

In order to recommend that different admission factors be weighted for their predictive value, the quantification of factors was a major interest of this undertaking. Table X contains the predictive first year pharmacy school GPA equations for our 1992 and 1993 study population. These performance (GPA) prediction formulas may be of great value in selecting students for admission to our pharmacy school since they are derived from the most current tested past performance predictive factors from our population.

CONCLUSION

Identification of factors that are positively correlated with pharmacy school academic performance is an important task. The results of this study identified two significant, separate, and consistent admission criteria in predicting first year pharmacy students academic performance in our student population, prepharmacy math/science GPA and the achievement of a four-year college degree prior to entering pharmacy school ($P<0.01$). Since the new or old PCAT was not found as a significant predictive factor of first year academic success, we were unable to draw any concrete conclusions in contrasting the new and old PCAT significant predictive value in our population. However, we do concur with the coalescing of the Mathematical Reasoning, Quantitative Ability, and Arithmetic section of the PCAT into one category. Although the new or old PCAT was not found to be a significant factor in predicting academic performance in our total class population, certain sections of the PCAT (PCAT Verbal and PCAT Composite Score) were found to be significant in predicting academic success according to gender; thus, supporting the concept of varying significant factors among population subgroups. Prepharmacy math/science GPA was a significant factor for all populations ($P<0.01$) and was the dominating predictive factor in this study. It is important to note that the results generated from this analysis were applicable only to the study institution. Due to the implementation of the new PCAT, the increasing interest of the entry level Doctor of Pharmacy degree, and the many challenges facing the pharmacy profession, future studies investigating significant factors in predicting academic success are warranted.

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