

Gender and Racial Differences in Select Determinants of Student Success

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Student populations in schools of pharmacy are becoming increasingly diverse. At the same time, little is known about determinants of student success (*i.e.*, admission scores, the use of self-regulated learning strategies and motivation) in diverse student populations. This study investigates variations in professional pharmacy students' admission criteria, perceived self-regulation, motivation and academic achievement by gender and race. Results were obtained using a 2 x 2 factorial ANOVA and MANOVA design. Findings reveal gender differences in admission scores but no differences in self-regulated learning strategies or motivation. Non-Caucasian students score lower on the verbal and reading comprehension sections of the Pharmacy College Admission Test (PCAT) but report greater intrinsic and extrinsic motivation as well as task value. Interestingly, however, no differences in student success were observed across groups.

INTRODUCTION

The demographics of the pharmacy student population have changed over time. Between 1981 and 2000, the percentage of female students enrolled in the first professional degree program increased from 49.7 percent to 65.9 percent(1). In addition, the percentage of non-Caucasian students has increased over time. In 2000, the percentage increase in enrollment from the prior year was 16 percent for African Americans, 15.6 percent for Hispanic or Latinos and 15.2 percent for Asian, Native Hawaiian, or other Pacific Islanders(1). This one-year increase was the largest increase ever recorded for African American and Hispanic students(1). Although the increase in demographic diversity in the pharmacy student population is very exciting, the fundamental education questions remain such as: (i) what are the implications of these changes for the classroom, and (ii) will these demographic changes impact changes in student success?

Several factors may influence student success within professional pharmacy curriculums. Of particular interest to this investigation are the relationships between student achievement and factors such as aptitude as measured by admission criteria, student motivation and the students' ability to effectively use various learning strategies. Investigations of these variables may be important for several reasons. First, understanding the relationship between admission criteria and academic achievement enhance the probability that only students with aptitude sufficient to complete the pharmacy curriculum are enrolled. Second, educators may wish to understand variations in students' motivation and use of learning strategies to enhance student success once enrolled. This awareness may lead to the development of proactive approaches to addressing learning and motivational weaknesses thereby increasing student success early in the professional curriculum. In addition, understanding variations in the use of alternative learning strategies and motivation may assist educators in retaining stu-

dents within pharmacy programs and graduating high quality professionals.

Examples of variations in students' learning strategies, motivation, and aptitude across different ethnic groups and gender classes are documented in both the pharmacy and general education literature. With respect to non-pharmacy related studies, differences between males and females have been observed in the use of various learning strategies. Two studies report that female students use self-regulated learning strategies more frequently than male counterparts(2,3). Females report a higher use of environmental restructuring and reduced reliance on external regulation than males. However, in other studies involving the solution of mathematics problems, males have been found to use more complex learning strategies, such as retrieval of conceptual relations, more frequently than females(4,5). Therefore, prior research indicates gender differences in learning strategy. However, no investigations have examined gender differences in self-regulated learning in professional degree pharmacy students.

Purdie and Hattie(6) found variations in self-regulated learning strategies across races, reporting both cross-racial similarities and differences in three cohorts of students (6). In their study, Japanese and Australian students used a similar range of strategies, but the patterns of strategy use differed. Japanese students used memory strategies significantly more while the Australian students focused on understanding to a greater degree. Other researchers have found differences between racial groups on the emphasis placed on effort versus ability(7). For example, one finding suggests that Japanese students place an emphasis on effort, while ability is discounted(8).

When consideration is given to research within the pharmacy environment, Kelley and colleagues(9) found statistical-

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Table I. Conceptual definitions of subscale domains

Self-efficacy for Self-regulated Learning subscales	
1.	General organizing and planning strategies — students' ability to manage their time, organize their work, and meet deadlines. Also, measured with this subscale is the frequency with which students engage these strategies.
2.	External regulation — also referred to as other-directed regulation, this subscale measures the degree to which the student depends on external sources to manage learning, such as instructor goals/objectives and outlines of material prepared by others.
3.	Typical study strategies — the ability to take effective notes and use them for study purposes.
4.	Environmental restructuring — the extent to which the student controls or modifies the learning environment to reduce distractions and increase concentration.
5.	Recall ability — how well the student remembers information presented in class and in other course materials.
Motivated Strategies for Learning Questionnaire (selected) subscales	
1.	Intrinsic goal orientation (Motivation) — the degree to which the student participates because he/she is interested in the task as an end in itself, as opposed to a means to an end. For example, a student completes a research project because of an interest in the subject matter, not just to earn a good grade.
2.	Extrinsic goal orientation (Motivation) — the degree to which the student participates in order to achieve a goal through the completion of the activity, such as earning a good grade by completing an assignment or receiving praise by doing good work.
3.	Task value — the appeal, importance, and usefulness of the task in the student's opinion

ly significant differences in the mean composite percentile Pharmacy College Admission Test (PCAT) scores on the variables of gender and race. Kawahara and Ethington(10) observed gender differences in admission scores with males consistently outscoring females on the PCAT with a difference of four to eight percentage points depending on subsection.

The primary purpose of the present study was to evaluate differences in self-regulated learning and motivation across gender and race through the use of a validated survey instrument, while controlling for competing explanations, such as preexisting differences in aptitude. Although the theoretical foundation of, and motivation for the study of, self-regulated learning and motivation has been described in-depth elsewhere(11), definitions of the major constructs used in this study are presented in Table I.

METHODS

Participants

The participants were 147 full-time students enrolled at a school of pharmacy in the Midwest. In the study population there were significantly more female (65 percent) and Caucasians (73 percent) than males and non-Caucasians, which reflects the student population in most professional pharmacy degree programs. Non-Caucasian respondents were primarily Asian, African, African-American, Hispanic, Middle-Eastern, and Native American. The average age of female students was 23, while the average age for male students was 26. Males reported working more hours than females. Twenty-five percent of males worked more than 20 hours per week as compared to seven percent of females.

Instruments

Respondents were required to complete a consent form for inclusion in the study. In addition, demographic information (*e.g.*, age, gender, race) was solicited. A survey measuring self-regulated learning and motivation was also completed. A copy of the survey instrument is provided in the Appendix. The items included in the survey instrument were derived from prior research(12-16).

Self-Regulated Learning. The Self-efficacy for Self-regulated Learning (SESRL) Scale developed by Gredler and Garavalia(12) measures students' perception of their use of various learning strategies. The items in the SESRL were derived from prior research(13,14) and the instrument has been

validated for use with college students(12,15). Five factors emerged in an exploratory factor analysis. These factors include: General Organization/Planning Strategies, External Regulation, Typical Study Strategies, Environmental Restructuring and Recall Ability(12). Responses reflect students' beliefs about their effectiveness and frequency of strategy use with one indicating "not well" or "not at all" and five indicating "very well" or "very often." Cronbach alphas of 0.87, 0.68, 0.74, 0.74, and 0.73 are reported for the five factors, respectively(12).

Motivation. Intrinsic motivation, extrinsic motivation and task value were measured by three subscales of the Motivated Strategies for Learning Questionnaire (MSLQ) that specifically measure the variables under investigation in the present study. The MSLQ is an 81-item instrument developed at the University of Michigan by Pintrich, Smith, Garcia, and McKeachie(16). Over the past decade, results from numerous studies support the factor structure of the instrument and the stability of its 15 subscales(16). Because of the documented stability of these subscales, they are frequently used independently of the larger instrument. For the three subscales measured, response options ranged from one (not at true of me) to seven (very true of me).

Admission Criteria and Achievement. PCAT scores were used to operationally define admission criteria. Included were scores on the Verbal, Biology, Reading Comprehension, Quantitative, and Chemistry sections of the test. The Science/Math GPA, is unique to the institution in which the data were collected. The Science/Math GPA is calculated by dividing the cumulative Science/Math GPA for all science and math courses by the total number of science and math hours completed by the student prior to admission into the Pharmacy School program. Student achievement was defined as the final course grade and was obtained from university records at the end of the semester with the students' permission.

Procedures

Students enrolled in pharmacy management and marketing or pharmacology were invited to participate on a voluntary basis in the study. Course instructors administered the questionnaires over three consecutive semesters, either on-line or in class, after midterm so that students would have sufficient knowledge of the learning environment to comment on their learning strategies.

Table II. Mean and standard deviation for admission criteria and final grade by gender

Admission criteria	Mean(SD)		F (P value)
	Female n = 108	Male n = 39	
Science Math GPA	3.13(0.51)	3.00 (0.49)	1.79(0.1834)
Verbal PCAT Score	48 (27)	58 (26)	0.35 (0.5555)
Biology PCAT Score	47 (26)	59 (29)	1.48(0.2265)
Reading Comprehension PCAT Score	53 (27)	59 (26)	0.00(0.9619)
Quantitative PCAT Score	56 (26)	70 (26)	3.28 (0.0725)
Chemistry PCAT Score ^a	46 (27)	67 (25)	8.92 (0.0034)
Final Grade	3.12(0.83)	3.26(0.71)	0.81 (0.3691)

^aStatistically significant difference based on post-hoc analysis, Wilk's Lambda = 0.86, F(7,123)=2.26, P < 0.0336.

Table III. Mean and standard deviation of admission criteria and final grade by race

Admission criteria	Mean(SD)		F (P value)
	Caucasian n = 108	Non-Caucasian n = 108	
Science Math GPA	3.12(0.49)	3.00 (0.53)	1.61 (0.2074)
Verbal PCAT Score ^a	58 (23)	32 (26)	32.75 (0.0001)
Biology PCAT Score	51 (28)	51 (28)	0.23 (0.6302)
Reading Comprehension PCAT Score ^a	62 (25)	38 (27)	24.18(0.0001)
Quantitative PCAT Score	63 (26)	55 (29)	2.75 (0.0998)
Chemistry PCAT Score	53 (28)	56 (29)	0.12(0.7341)
Final Grade	3.20 (0.72)	3.06 (0.97)	0.47 (0.4920)

^aStatistically significant based on post-hoc analysis, Wilk's Lambda = 0.73, F(7,123) = 6.50, P < 0.0001.

Statistics

Data were analyzed using version 8.1 of the SAS software developed by SAS Institute Inc., Cary, NC. A priori significance levels for all analyses were set at $\alpha < 0.05$. Descriptive statistics were used to characterize demographics of study participants and group means and standard deviations of subscale scores. Inferential statistics were used to examine group differences on the dependent variables(17,18). When comparisons were made that involved multiple, related dependent variables, MANOVA was used to control for the potential increase in Type I error that can occur when multiple t-tests are performed.

RESULTS

In order to determine whether the course in which students were enrolled (Management and Marketing or Pharmacology) was a confounding variable, a three-way (course X gender X race) factorial MANOVA was performed. The results of this analysis revealed no significant differences based on course (Wilk's lambda = 0.93, F(5, 134)=1.86, P<0.1048) or the interaction between course, race and gender [Wilk's lambda = 0.82, F(20, 445)- 1.40, P<0.1161]. Therefore, differences in the course in which students were enrolled are not believed to be problematic. In addition, potential differences in gender and race within the two courses were investigated by comparing the achievement of students by course, race, and gender. A three-way factorial ANOVA was performed. The results indicated differences in final grades by course only [F(7, 138)=56.17, P<0.0001], with no significant differences or interaction for gender and race. Therefore, we concluded that there were no differences in the way students performed in the

two courses with regard to gender and race. Further, factorial ANOVA indicated no significant differences in prior degree attainment for gender [F(1, 143)=2.75, P<0.0993], race [F(1, 143)=3.80, P<0.0533], or the interaction of the two variables [F(1, 143)=0.00, P<0.9816].

Group means and standard deviations for admission criteria by gender and race are reported in Tables II and III, respectively. Group means and standard deviations for the SESRL and MSLQ subscales by gender and race are presented in Tables IV and V, respectively. The mean admission scores are the averages of respondents' scores. For the SESRL and MSLQ, mean subscale scores were calculated by adding ratings for each item in the subscale and dividing by the number of items in the subscale.

In order to examine main effects and the interaction for gender and race, a 2 X 2 factorial MANOVA design was used to compare students on admission criteria. A separate analysis was conducted to compare students on the SESRL and MSLQ subscales. F-statistics associated with Type III error were evaluated to control for differences in cell sizes between groups.

Influence of Gender

Statistically significant differences in admission criteria was observed for gender, Wilk's lambda = 0.86, F (7,123) = 2.26, P< 0.0336. A statistically significant effect was indicated for only one of the criteria, the Chemistry PCAT scores, with males earning higher scores than females (see Table II). Interestingly, this difference did not translate into significantly greater levels of achievement, as defined by grades, for males.

With regard to the relative ranking of learning strategies across gender, interesting results were observed. Males most frequently reported use of recall ability, followed by general

Table IV. SESRL and MSLQ subscale means and standard deviations by gender^a

	Mean(SD)		
		Female n = 108	Male n = 39
			F (P value)
SESRL Scale			
General Organizing/Planning	4.02 (0.54)		0.64(0.4255)
External Regulation	2.50 (0.50)		0.02(0.8876)
Typical Study Strategies	3.31 (0.37)		1.00(0.3194)
Environmental Restructuring	3.57 (0.73)		0.09(0.7585)
Recall Ability	3.62(0.64)		3.68(0.0571)
MSLQ Scale			
Intrinsic Motivation	4.92 (1.07)		0.09(0.7692)
Extrinsic Motivation	5.06 (1.27)		0.16(0.6862)
Task Value	5.55(1.22)		0.39(0.5346)

^aNot statistically significant difference based on post-hoc analysis, Wilk's Lambda = .94, F(8,136) = 1.16, P < 0.3263.

Table V. Group means and standard deviations for SESRL and MSLQ subscales by race

	Mean(SD)		
		Caucasian n = 108	Non-Caucasian n = 108
			F (P value)
SESRL Scale			
General Organizing/Planning	3.98 (0.53)		0.01 (0.9211)
External Regulation	2.50 (0.48)		0.25 (0.6197)
Typical Study Strategies	3.29 (0.37)		3.72 (0.0557)
Environmental Restructuring	3.50 (0.72)		1.65(0.2008)
Recall Ability	3.72 (0.65)		0.12(0.7283)
MSLQ Scale			
Intrinsic Motivation ^a	4.76(1.04)		7.08 (0.0087)
Extrinsic Motivation ^a	4.93 (1.27)		4.56 (0.0344)
Task Value ^a	5.41 (1.16)		7.16(0.0083)

^aStatistically significant based on post-hoc analysis, Wilk's Lambda = 0.89, F(8,136) = 2.19, P < 0.0317.

organization and planning and then environmental restructuring; whereas females reported greater reliance on general organizing and planning followed by recall ability and environmental restructuring. Post-hoc analyses revealed no statistically significant differences in students' beliefs about how effectively or often they used various self-regulated learning strategies or their level of motivation, Wilk's lambda = 0.94, F (8, 136) - 1.16; P < 0.3263 (Table IV).

Influence of Race

Statistically significant differences in admission criteria was observed for race, Wilk's lambda - 0.73, F (7, 123) - 6.50, P < 0.0001. Differences observed for verbal and reading comprehension scores on the PCAT with non-Caucasian students scoring lower in each of these domains than Caucasian students (Table III).

In relation to the use of self-regulated learning strategies, no significant differences were observed between the two groups. Both Caucasian and non-Caucasian students reported using general organizing and planning strategies most frequently, followed by recall ability and environmental restructuring. In contrast, differences were observed in all three motivation subscales. A multivariate effect was indicated for race, Wilk's lambda - 0.89, F (8, 136) - 0.2.19, P < 0.0317. Non-Caucasian students reported statistically significantly greater intrinsic motivation and extrinsic motivation as well as higher task value. These differences, however, did not translate into differences in achievement (Table V).

DISCUSSION AND CONCLUSION

This study was motivated by prior research findings in non-pharmacy and pharmacy student populations. Based on prior research, it was hypothesized that professional pharmacy students would vary across gender and race with regard to motivation, use of learning strategies, and academic achievement. The intent was to provide empirical evidence regarding these variables in a large sample of professional pharmacy students.

In contrast to prior findings, statistically significant differences between males and females were observed only on the Chemistry section of the PCAT exam. This difference, however, did not translate into significantly greater levels of achievement by males as compared to their female counterparts. With respect to variations in race, non-Caucasian students scored lower on verbal and reading comprehension sections of the PCAT exam and reported higher levels of intrinsic motivation, extrinsic motivation and task value. Again, these differences did not translate into achievement differences. Further, even though differences were found in admission criteria and motivation, variations in use of learning strategies were not observed across gender or race.

These results are important to pharmacy educators and professional pharmacy students for the following reasons:

1. The demographics of pharmacy students continue to change and educators must understand what these changes may mean in the ramifications, if any, of these changes on

the ability of diverse populations to succeed within the professional pharmacy curriculum.

2. Although the student population appears more diverse, our findings indicate that students are more similar than different with regard to important aspects of learning. The "academic homogeneity" of the professional pharmacy student population may be the result of ongoing measures to maintain high admission standards.
3. Although motivation was higher in non-Caucasian students, achievement levels were the same across groups. One plausible explanation is that the higher motivation levels of non-Caucasian students may compensate for lower verbal and reading comprehension skills, allowing students to enjoy equivalent success in the classroom.

In conclusion, although student populations may appear to be more demographically diverse, this investigation suggests that professional pharmacy students may continue to be fairly homogenous with respect to key determinants of student success. This homogeneity is most likely due to the rigorous academic standards required for admission into professional pharmacy programs. The results of this investigation provide preliminary evidence and further investigation into the issues studied above are certainly warranted.

We recommend that future research continue to evaluate diverse student populations, considering the role of motivation, learning strategies, and selection criteria in student achievement. Limitations of the present study include the use of non-equivalent groups (random assignment was not possible), volunteer/convenience sampling, the potential for participants to respond in a socially desirable manner, a single site investigation and the lack of analyses examining the relation of these factors to student retention. Another limitation was the lack of socio-economic (SES) data for participants. Future research should seek to minimize these limitations where possible.

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APPENDIX. SURVEY INSTRUMENT

SESRL Subscales (12)

General Organizing and Planning Strategies

- How well can you finish assignments by deadlines?
- How well can you prepare for courses when there are other interesting things to do?
- How well can you concentrate on school subjects?
- How well can you use appropriate resources to get information for class assignments?
- How well can you plan your class work?
- How well can you organize your class work?
- How well can you motivate yourself to do your assignments?
- How well can you set and honor priorities?
- How well can you prioritize your time to complete your work for your classes?
- How often do you re-read the textbook when preparing for a test?
- How often do you fail to plan what you are going to do before beginning a class project?

External Regulation

- How often do you consider the instructor's introductions, objectives, and instructions as essential for your studies?
- How often do you decide you have a command of the subject matter based on completion of all course assignments?
- How often do you study all the subject matter in the same order as addressed in class?
- How often do you study according to the instructor's instructions?
- How often do you rely on the learning goals set by instructors?

Typical Study Strategies

- How well can you summarize course content in your own words?
- How often do you reread your summaries of course material when preparing for a test?
- How often do you reread the notes you took in class when preparing for a test?

Environmental Restructuring

- How well can you arrange a place to study without distractions?
- How often do you fail to turn off the TV/Radio so you can concentrate on what you are doing?
- How often do you fail to isolate yourself from anything that distracts you?
- How often do you study for your courses in a quiet room or area?

Recall Ability

- How well can you remember information presented in class?
- How well can you remember information presented in text books?
- How often do you remember the facts and ideas presented in your courses?
- How often do you remember the facts and ideas presented in your courses after the course is completed?

MSLQ Subscales (16)

Intrinsic motivation

- In a class like this, I prefer course material that really challenges me so I can learn new things.
- In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
- The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
- When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

Extrinsic motivation

- Getting a good grade in this class is the most satisfying thing for me right now.
- The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
- If I can, I want to get better grades in this class than most of the other students.
- I want to do well in this class because it is important to show my ability to my family, friends, employer, or other.

Task value

- I think I will be able to use what I learn in this course in other courses.
- It is important for me to learn the course material in this class.
- I am very interested in the content area of this course.
- I think the course material in this class is useful for me to learn.
- I like the subject matter of this course.
- Understanding the subject matter of this course is very important to me.