



Test-optional admission policies and the value of quantitative measures

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Considering a recent trend toward test-optional and holistic admission policies in higher education, a reexamination of variables that recent research has shown to predict success in pharmacy school and on the *North American Pharmacist Licensure Examination* (NAPLEX) seems timely. While recent research studies have involved various qualitative variables, a consideration of quantitative measures, particularly the Pharmacy College Admission Test (PCAT), deserves particular attention.

This paper will review the trend in recent years toward test-optional admission practices in higher education generally and among pharmacy schools specifically. We will then review studies examining the value of PCAT scores for predicting performance in professional pharmacy programs and on the NAPLEX. Throughout this discussion, the PCAT subtests are referred to by generic content terms (biology, chemistry, reading, quantitative, and writing) rather than their older or current names, regardless of when the PCAT data for a study in question were collected.

Recent test-optional admissions trends in higher education

Even though the most common factors that colleges base decisions on for first-time freshmen continues to be high school grades, the strength of a high school curriculum, and admission test scores, recent studies conducted by the National Association for College Admission Counseling suggest that the number of colleges observing a test-optional admission policy “has dramatically expanded in recent years,”¹ with 18% of colleges considering a test-optional admission policy to be of “considerable importance.”² In fact, according to The National Center for Fair and Open Testing, as of the winter of 2019 over 1,000 accredited American colleges and universities observe either a test-optional or test-flexible admission policy, both of which de-emphasize the use of standardized tests in admission decisions, with over 220 schools adopting such policies since 2005.³

This trend is not limited to undergraduate admission but is increasingly being considered by graduate and professional schools as well, primarily out of concerns related to equity and predictive utility.⁴ A recent study conducted by the Council of Graduate Schools (CGS) describes the emerging practice of moving toward holistic methods of evaluating candidates for admission as de-emphasizing quantitative measures, such as standardized test scores and previous grade point averages (GPAs), and placing greater emphasis on qualitative “noncognitive and personal attributes.”⁵ Even though staff limitations often make such a move toward holistic admissions problematic for many institutions, only 35% of master’s degree programs responding to a CGS survey indicated that they are currently requiring a standardized test score other than a test of English language proficiency, admittedly doing so to maintain national rankings or to meet accreditation requirements.⁶

Factors affecting recent pharmacy school admission policies

A similar trend toward test-optional admissions is occurring in pharmacy schools, as an increasing number of programs are currently experiencing a drop in the overall applicant pool. Some study findings suggest that one factor involved in this decrease in applications could relate to the financial burdens faced by pharmacy school graduates relative to those faced by graduates considering other health professions. A study by Cain et al reported that debt among pharmacy students rose by 23% between 2008 and 2012, whereas the increase in debt for medical and dental students during the same period were 4.7% and 8.5%, respectively, with the potential return on investment for attending pharmacy school decreasing more than for attending either medical or dental school.⁷ A Pharmacy Graduating Student Survey conducted in 2018 by the American Association of Colleges of Pharmacy (AACCP) revealed that nearly 85% of graduates indicated that they took out loans to pay for their PharmD education, with an average loan amount of \$166,528.⁸ Financial considerations may not only deter individuals from considering pharmacy as a career choice, but also for pharmacy students considering academic careers. Sheaffer et al reported that the burden of having to supplement one's salary by obtaining grant money is a major deterrent for individuals considering a career in academic pharmacy.⁹

Evidence suggests that another factor affecting the number of students considering pharmacy school may relate to changing market conditions. The demand for pharmacists was moderate in 2008, but the demand has leveled off since then, with difficulties filling certain open positions and an overall decline in available jobs in the field.¹⁰ According to the December 2018 Pharmacist Demand Indicator (PDI) survey, respondents representing different organizations that employ pharmacists mostly agreed that the supply and demand for generalist/staff pharmacists was "balanced."¹¹ Even though a balanced supply and demand may be desirable, a continued increase in the number of pharmacy schools may saturate the market with graduates, and leave prospective applicants with the perception of fewer job prospects and mounting debt.¹²



For whatever reasons, many pharmacy schools are reconsidering their admission policies, with some schools seeing the PCAT as a possible barrier for candidates. Comparisons between pharmacy school admission policy data from 2013–14 and 2019–20 show about a 9% decrease in pharmacy schools that require the PCAT,^{13,14} suggesting the same trend toward test-optional admissions policies as seen with undergraduate and graduate schools. This trend is evident as some pharmacy programs move toward holistic admission practices by including nondidactic measures such as the multi-mini interview and considering candidates' demographic characteristics such as their socioeconomic status as a way to assess noncognitive characteristics.^{15,16,17}



Predictors of success in pharmacy school

Recent research involving predictors of subsequent performance in pharmacy school suggest that reasons for schools adopting test-optional admission policies are not necessarily about the predictive value of quantitative measures such as the PCAT.

In one recent study involving associations between various admission data and *Objective Structured Clinical Examination* (OSCE) scores and advanced pharmacy practice experience (APPE) scores, McLaughlin et al found the strongest association to be between final OSCE scores and APPE scores.¹⁸ Another more recent study involving selected demographic and quantitative variables (including entering GPAs and PCAT scores) and scores on the OSCE by Williams et al found only weak correlations between entering variables and OSCE scores, concluding that factors other than those measures accounted for most of the variation in OSCE scores.¹⁹

However, other studies have found these same and other quantitative variables to be effective predictors of pharmacy school performance. Although Steinberg and Morin found that in a three-year accelerated PharmD program, students who had earned a bachelor's degree from a single four-year school prior to matriculation were the most likely to graduate on time,²⁰ Allen et al found that having a bachelor's or higher degree prior to admission, no unsatisfactory grades in nonscience preadmission courses, and higher cumulative preadmission GPAs were all predictors of on-time graduation from a four-year PharmD program.²¹

Some evidence suggests that the effectiveness of quantitative indicators as predictors of performance may depend upon the nature of a school's curriculum. Muratov et al found undergraduate GPAs and composite PCAT scores to be among the best predictors of student academic performance in didactic-rich curriculums.²² Ferrante et al showed that student prerequisite GPAs and PCAT scores were the best predictors of pharmacy school success in the first year, with PCAT biology and chemistry scores predicting success in two key didactic courses directly related to biology and chemistry content.²³ In a similar study, Tejada et al showed that both prerequisite cumulative GPAs and PCAT scores were predictive of success in didactic coursework, especially the PCAT biology and chemistry scores with regard to P1 courses and the writing scores with regard to African American students' performance.²⁴ Likewise, another recent study by Eiland et al analyzed three years of pharmacy student data and found that of the predictor variables assessed, prepharmacy cumulative and science GPAs and PCAT chemistry and composite scores were most highly correlated with selected science and therapeutics course grades and final pharmacy GPAs.²⁵

Another quantitative variable sometimes included in the admission process in recent years is the *Health Sciences Reasoning Test* (HSRT), a multiple-choice test designed to assess critical thinking skills in students interested in studying in the health sciences. Gillette et al found that students with high scores on the HSRT, high PCAT composite scores, and high

cumulative GPAs were significantly more likely to score high on the *Pharmacy Curriculum Outcomes Assessment* (PCOA) in the P1 and P2 years.²⁶ In a 2013 study, Cox et al found that while the HSRT gives insight that is absent in standard cognitive admission tests, significant correlations found between PCAT reading and quantitative scores and HSRT scores suggest that the PCAT may also assess elements of critical thinking.²⁷ In a similar study, Kelsch and Friesner compared HSRT scores with other criteria often used in PharmD admissions and found that HSRT and PCAT scores were highly correlated, which suggests that PCAT scores may not only reflect what candidates have learned in core science courses but also their ability to think critically.²⁸

Another study by Schauner et al suggested the value of quantitative measures in predicting underperformance, reporting that for students in a traditional pathway, lower prerequisite GPAs, fewer course hours, and lower PCAT subtest scores were associated with poor grade attainment; and for PharmD students in a provisional pathway, lower prerequisite cumulative and science/math GPA, lower ACT English and composite scores, and lower PCAT chemistry and quantitative scores were associated with subpar academic performance.²⁹

Predictors of success on the NAPLEX

Assessing the overall success of a pharmacy school could reasonably include its graduates' performance on the NAPLEX.³⁰ In addition, prospective applicants' interest in a pharmacy program may also be influenced by its graduates' passing rates on the NAPLEX.³¹

According to data published by the National Association of Boards of Pharmacy (NABP), passing rates on the NAPLEX declined from 2015 and 2018 for all pharmacy school graduates, for all first-attempts, and for all graduates from Accreditation Council for Pharmacy Education (ACPE) accredited programs.^{32,33}

Studies conducted over recent years considering various predictor variables have found PCAT scores, pharmacy school GPAs, class standing, PCOA scores, some student demographic characteristics, and school characteristics to be moderately to strongly associated with performance on the NAPLEX. In one study conducted prior to the recent NAPLEX revisions, Madden et al reported that students who required remediation for poor pharmacy course grades exhibited a 70% first-time mean passing rate on the NAPLEX versus a 97% mean passing rate for those that did not require remediation.³⁴ In another such study of the value of various student preadmission and pharmacy school variables for predicting subsequent NAPLEX scores, Allen and Diaz found the most significant positive correlations to be preadmission GPAs and pharmacy school GPAs.³⁵ In one study conducted over the course of 10 years prior to the recent NAPLEX revisions, Alston et al reported that students performing in the bottom quartile for GPA at the end of their first semester in pharmacy school were five times more likely to remain in the bottom decile for GPA at the end of their pharmacy education, six times more likely not to graduate on time, and six times more likely not to pass the NAPLEX on their first attempt.³⁶ Welch and Karpen observed in a more recent study that although scaled



scores for both old and new versions of the NAPLEX were similar when controlling for student performance on the PCOA and P3 GPAs, NAPLEX passing rates dropped after implementation of the changes in the NAPLEX passing standard and test blueprint.³⁷

Some studies have focused specifically on relationships between PCOA and subsequent NAPLEX scores. Garavalia et al showed strong correlations between PCOA and NAPLEX scores ($r = 0.51$) but concluded that the variance in NAPLEX scores were explained more by pharmacy GPAs than by PCOA scores.³⁸ In another study, Hein et al analyzed four years of data at one pharmacy school and found identical correlations between both PCAT scores ($r = 0.60$) and third professional year GPAs ($r = 0.60$) and PCOA scores, as well as slightly higher correlations between PCOA scores and subsequent NAPLEX total scores ($r = 0.64$).³⁹

In a larger study, Rudolph et al analyzed data from the NABP for students from six pharmacy schools and found relatively strong correlations between PCOA and NAPLEX total scores ($r = 0.54$), with the strongest correlation (0.43) between PCOA total scores and NAPLEX total score bands for students earning NAPLEX scores under 75.⁴⁰

Regarding the relationship between various other predictor variables and NAPLEX scores, Ware examined the relationships between *Myers-Briggs Type Indicator* (MBTI) personality types and first-attempt NAPLEX scores, finding introversion and feeling types to be more highly correlated with NAPLEX scores than extroversion or thinking types.⁴¹ Two other recent national studies found similar results after examining relationships between pharmacy program characteristics and NAPLEX pass rates. In one study, Feemster et al found that location in a public institution, being a school more than 20 years old, and having high post-graduate year 1 residency match rates were highly correlated with passing rates on the NAPLEX.⁴² Another study by Williams et al obtained similar results, finding that schools founded prior to 2000, located at an academic health center, and part of a public institution had significantly higher first-attempt pass rates on the NAPLEX.⁴³ Chisholm-Burns et al found correlations between multiple prepharmacy and pharmacy

variables and subsequent NAPLEX scores, but regression analyses showed only pharmacy GPAs and Pre-NAPLEX scores to be predictors of NAPLEX total scores.⁴⁴

One study by McCall et al showed that for students admitted between 1996 and 2001, the PCAT composite score was the strongest predictor of scores on the NAPLEX, with prepharmacy GPAs, student age, and scores on the *California Critical Thinking Skills Test* (CCTST) representing relatively lower correlations.⁴⁵ In another recent study, Shaya et al reported that final cumulative pharmacy school GPA, age less than 25 years, and PCAT chemistry and reading (plus verbal, which is no longer part of the PCAT) scores were all associated with higher NAPLEX scores.⁴⁶ A related recent study by Lebovitz et al found significant positive correlations between race/ethnicity, undergraduate GPAs, PCAT scores, pharmacy GPAs, and Pre-NAPLEX scores and subsequent NAPLEX scores, with pharmacy GPAs representing the most significant predictor.³¹ Another recent study by Eiland et al found that prepharmacy science GPAs and PCAT biology scores predicted NAPLEX passing scores in 2014 and 2015, and that higher PCAT biology and team activity scores increased the likelihood of earning passing NAPLEX scores in 2016.²⁵

Conclusion

Regardless of recent market conditions and wider trends in higher education that may be influencing pharmacy schools to consider test-optional policies, recent research makes clear the value of both prerequisite GPAs and PCAT scores in assessing candidates' subsequent performance as measured in pharmacy school GPAs and PCOA scores. Research also suggests the value of these and other quantitative variables in predicting the performance of pharmacy program graduates on the NAPLEX. As employees of Pearson, the authors of this commentary have an obvious interest in the PCAT. However, the authors also have an obligation to express a view that reflects the years of work that Pearson assessment professionals and AACP PCAT Advisory Committee members have devoted to the continuing relevance of the PCAT in assessing content knowledge and cognitive abilities that candidates need to succeed in a pharmacy school. For all the pragmatic reasons a pharmacy school may have in considering or adopting a test-optional admission policy, a program must thoughtfully consider the objective precision

that quantitative measures, such as the PCAT, add to the more subjective qualitative information that together can make for a more complete picture of a candidate's likelihood of success.

Considering the current nationwide decline of pharmacy applications, a quantitative tool such as PCAT is unlikely to attract applicants. Furthermore, schools following holistic admission policies that wish to evaluate student attributes such as empathy, leadership, and social skills may not find the PCAT to be particularly useful in this effort. Nevertheless, PCAT scores continue to show predictive value, especially for the first year of pharmacy school, in combination with prerequisite GPAs, and for students entering a school with a didactic curriculum. While previously earned GPA may be more appropriate for evaluating an applicant's past performance than the PCAT, PCAT scores represent for many individuals an indication of current knowledge and ability in ways that other measures cannot, which suggests the value of retaining this option for such candidates.

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