The Accuracy of Predicting University Students' Academic Success

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Abstract: A great deal of controversy surrounds the recent use of the General Aptitude Test, the Achievement Test (AT), and the High School Grade Point Average in all Saudi Arabian universities as admission criteria. Although similar high-stakes tests (e.g., SAT and ACT) are used in the U.S. and elsewhere, using them may deter students from pursuing higher education (AlMehrej, 2009). It is therefore crucial to inspect the predictive validity of these tests to help admissions personnel accurately admit qualified students into their institutions. This study empirically examined the predictive validity of these admission tests at the University of Dammam in the eastern province of Saudi Arabia using a sample of 417 Saudi male and female students from three colleges. Multiple and logistic regression analyses were implemented to examine the predictive validity of the predictor variables. The results indicated that high school GPA significantly predicts students' college performance, whereas General Aptitude Test scores are not a significant predictor of college performance at the humanities colleges. However, weighted was a significant predictor of college success. For the non-humanity college, it was found that admission test scores and the weighted scores were significant predictors of students' college success.

INTRODUCTION

Although educators agree that increased focus on testing and standardized evaluation has resulted in a decline in pedagogical approaches, in Saudi Arabia there has been much focus on the General Aptitude Test (GAT) and Achievement Test (AT) as criteria for college admission (Alshehri, 1992). In the past three years, female high school graduates in Saudi Arabia started taking these admission tests instituted by the National Center for Assessment in Higher Education (NCAHE), while male students have been using them since 2004 (NCAHE, 2013).

In Saudi Arabia a new era of higher education is emerging, with the Saudi government's strategy for higher education having a significant domestic component. The education authorities are primarily attempting to satisfy the overflow in demand for post-secondary education by expanding the number of universities and colleges within the Kingdom (Ministry of Higher Education, 2010; Hamdan, 2013). This expansion involved finding a strategy that would restrict the admission criteria to students' caliber that reflected certain standards. The Saudi government explicitly stated in the Ninth National Development Plan that the higher education system must focus on preparing professional graduates who are able to support the government's ambitious multi-billion-dollar Saudi royal development projects; these projects have been launched with the goal of transforming Saudi Arabia into a knowledge-based society (Ministry of Economy and Planning, 2010). The driving force for this transformation is composed of highly qualified professionals who have been equipped with 21st-century skills primarily at institutions of higher learning. In order to ensure the quality of the Saudi higher education system, the Ministry of Higher Education (MoHE) established the National Center for Assessment in Higher Education (NCAHE). The NCAHE is an administratively and financially independent centre based on an initiative that had been supported by a Royal Decree in 2001 to support MoHE standardizing Saudi students' admission for higher education. It was decided then that the NCAHE testing would be among the college admission requirements testing that would result in a standard used along with high school GPA. The test would be performed according to the following criteria:

A. Tests to measure students' abilities, skills, and aptitudes.

B. Tests to measure educational attainment. These tests are standardized and inclusive of all disciplines that fall under one category, such as math and science, linguistics, and social studies.

C. Students will be allowed to repeat the admission test more than once in a single year.

D. There would be some fees commensurate with the costs of holding these tests, to cover the operating expenses of the centre, and to develop and carry out the necessary research to do so (NCAHE, 2013).

Almost all higher education institutions have begun responding to the call to improve the quality of graduates by ensuring that only those who have high GAT, TA, and high school test scores are accepted into their programs. Given that these admission tests are used to make important decisions about students' future career, it is crucial to investigate their appropriateness and soundness to ensure fair admission practices.

LITERATURE REVIEW

High school GPAs are used in the admission process to indicate a student's potential for success in college, and standardized test scores measure a student's general cognitive skills. Aseeri and Aseeri (1996) and Alshehri (1992) found that there were significance, but low to medium, correlation between a student's high school GPA and their college performance. They also reached the same conclusion that it would be unfair to use high school GPA as the only admission criteria and that another measure should accompany it. In 2002, the National Center of Evaluation and Measurement at the Ministry of Higher Education developed the General Aptitude Test (GAT). The GAT has been implemented since 2004 with high school GPA to make important decisions about students' readiness for higher education (NCAHE, 2013).

One study stated that "University entrance examination scores play an important and often understated role in the college admissions process, regularly influencing decisions regarding university admission and scholarship award offers" (Arenson, 2006; Beller, 2001; Löfgren, 2005; Morgan & Michaelides, 2005, as cited in Paul & Lily, 2012). Previous studies—including Zwick and Himelfarb (2011) and Cimetta, D'Agostino, and Levin (2010)—also indicated that Scholastic Aptitude Test (SAT) results could be used to predict students' competency levels. For instance, Zwick and Himelfarb (2011) indicated that "[r]esearch has often found that, when high school grades and SAT scores are used to predict first-year college grade point average (FGPA) via regression analysis, African-American and Latino students are, on average, predicted to earn higher FGPAs than they actually do. Under various plausible models, this phenomenon can be explained in terms of the unreliability of predictor variables" (p. 59).

A rich body of literature worldwide has argued that high school GPA and standardized test scores are generally significant predictors of students' academic achievement in post-secondary institutions (Ramist, Lewis, McCamley-Jenkins, 1994; Snyder, Hackett, Stewart, & Smith, 2003; Kim, 2002; Al-Hattami, 2012). Other researchers, however, have indicated that college admission is significantly related to the academic preparation students receive in schools. Geiser, & Studley (2002) state "aptitude-type tests, exemplified by the SAT, are intended to assess students' capacity for future learning, whereas achievement-type tests are designed to assess students' current mastery of college-preparatory subjects" (p. 8). While it seems that the test used by the NCAHE is intended to assess students' capacity for college entrance, this study will explore whether it assesses students' abilities for future learning and readiness for college preparatory subjects.

Standardized tests are also intended to provide a fair tool that shows no bias in favor of any gender (Reynolds & Ramsay, 2003). The literature consistently shows differences in students' achievement on high school GPA and standardized tests across gender. Wilder and Powell (1989) concluded that females performed better than males on achievement tests. Maccoby and Jacklin (1974) stated that females always outperform males on verbal subjects. Azen, Bronner and Gafni (2002), on the other hand, showed contradictory findings. Male and female students in Saudi Arabia are educated in separate classrooms and investigating any gender bias in the admission process is very important.

Post-secondary institutions in Saudi Arabia select their promising students based on high school test scores and their scores on admission tests (GAT and AT). The prediction of the admission measures ought to be examined to ensure accurate

admission decisions. The purpose of this study is to examine whether the admission tests (HSGPA, GAT, and AT) used in Saudi Arabia for the past three years for male and female students as college admission criteria serve as useful predictors of student success in higher education. In addition, high school GPA and college admission test scores were examined to find out whether there is a differential prediction in academic achievement across gender in Saudi universities? Making inaccurate decisions about students' readiness for college or selecting unqualified students will add a burden to colleges. This study tried to answer the following research questions:

1. Are high school GPA and college admission test scores (GAT and AT) significant predictors of third-year GPA across three different colleges?

2. Do high school GPA and college admission test scores (GAT and AT) have differential prediction across gender?

METHODOLOGY

Participants

Four hundred and seventeen Saudi male and female students from three colleges (College of Education, College of Applied Sciences, and College of Medical Sciences) at the University of Dammam participated in this study. All the information about all students in these colleges who completed third-year in college was collected from the registrar's office. The three colleges were the only ones which had the data completed at the time of conducting the study.

Study Design

A quantitative methodology was used to answer the research questions. The students' scores in high school GPA, GAT, AT, and third-year GPA were obtained from the admission registrar's office. The

study examined if the admission test scores indicated students' achievements by regressing them on students' university GPAs.

Study Variables

Independent Variables: High school GPA, General Aptitude Test, Achievement Test, Gender, College.

Dependent Variables: Students' academic scores in third-year, which are thought to be more representative of their academic achievements since students at this level have completed more than half of their program.

Measurement

High School GPA

High school GPA is the average score over all subjects taken in grades 11 and 12. Students in Saudi Arabia would be entering final exams students would complete final exams at the end of each semester in grades 11 and 12expecting that their GPA would count for one third of their university admission grade.

General Aptitude Test (GAT)

The General Aptitude Test is not a subject-oriented test but a general skills test that measures students' future academic success. The test is not developed based on specific standards related to particular subject materials but on cognitive skills (The National Centre of Evaluation and Measurement's website, 2005). The General Aptitude Test consists of 150 multiple-choice items and is administered twice a year.

Achievement Test (AT)

High school graduates of the science section are requested to take the Achievement Test if they plan to join colleges or universities, including health education colleges. The test is divided into six sections: two sections dedicated to

general aptitude questions and four questions dedicated to educational achievement.

College Achievement Score

The college achievement score is a GPA of the college at which the student has been studying for the past three years. The student's GPA is usually obtained from the office of the registrar.

Procedure

The researchers started collecting data in June 2013 based on the high school GPA, GAT, and AT results of students who were accepted in three colleges in 2010—the College of Education, the College of Applied Studies , and the College of Applied Medical Sciences. Baseline measurements of GAT, AT scores, high school GPA, and university GPAs were collected to evaluate the predictive validity of these measurements used as college admission criteria. Students' scores on standardized GAT, AT, and high school GPA were examined to explore if they correlate with students' university GPAs.

RESULTS

Descriptive and inferential statistics were included in this study. Descriptive statistics were obtained for high school GPA, GAT, and AT and for the criterion variable (third-year GPA). Multiple linear regression analyses were used to answer the research questions. The analyses evaluated whether admission criteria are accurate predictors of college academic achievement and whether differential predictions across gender exist. The hypotheses in the current study were tested at the .05 level of significance.

Third-year GPA scores were regressed separately on high school GPA, GAT, and AT. Multiple regression analysis gives the proportion of explained variance (R^2) in the criterion variable (college success) that is accounted for or explained by the predictor variables (high school GPA, GAT, and AT). It also shows which of these variables are significant predictors of student academic performance. The procedure used by Gulliksen & Wilks (1950) tested for differential prediction of high school GPA, GAT, and AT across gender. This technique involved a test of equality of standard errors of estimate, followed by a test of equality of regression slopes, and finally a test of equality of regression intercepts across gender.

Descriptive Analysis

The use of any predictor variable should be examined to ensure making accurate decisions. In the field of education it is expect that students who score high on the admission tests will also succeed in college. Saudi universities use admission scores from three tests to make their selection of students who want to pursue higher education in their colleges. The authors collected data from three colleges at one university in the eastern part of the Saudi Kingdom: College of Education, College of Applied Studies, and College of Applied Medical Sciences. The sample consisted of 417 students from the three colleges, 113, 145, and 159, respectively. The number of female students was 299 and the number of male students was 118.

Table 1.
Descriptive Statistics of the Variables in the Study (n = 417)

Variable	Mean	SD	Min.	Max.
High School GPA	95.56	4.807	73	100
General Aptitude Test	79.90	6.872	58	98
Achievement Test	78.59	8.854	57	100
Third-year Cumulative	80.05	11.47	44	100
Weighted score	84.07	6.07	65	97

The descriptive statistics are presented in Table 1. The overall mean percentage score

for high school GPA across all colleges was 95.56 (*SD* = 4.807), for the General Aptitude Test it was 79.90 (*SD* = 6.872), and for the Achievement Test scores the mean was 78.59 (*SD* = 8.854), whereas the mean of the weighted scores was 84.07 (*SD* = 6.065). The criterion variable (i.e., third-year cumulative GPA) mean for the students across all the colleges was 80.046 (*SD* = 11.46832). The mean and standard deviations for all the variables in the study are presented in the table below.

Table 2.
Descriptive Statistics of the Variables in the Study by Gender (n= 118 males , 299 females)

Variable	Gender	Mean	SD	Min	Max
High School GPA	F	96.99	3.42	80	100
	M	91.92	5.81	73	100
General Aptitude Test	F	81.48	5.60	62	98
	M	75.87	8.07	58	93
Achievement Test	F	81.03	7.26	62	100
	M	72.39	9.51	57	92
Third-Year Cumulative	F	81.98	11.38	44	100
	M	75.12	10.20	45	97
Weighted score	F	85.96	4.46	75	97
	M	79.29	6.93	65	94

Analyzing the data by gender clearly shows that female students performed better in all the admission tests as well as the third-year cumulative GPA. The mean percentage score for female students in high school was 82.24 (*SD* = 6.37), while it was 91.92 (*SD* = 5.81) for male students. The mean percentage score of GAT for female students was 81.48 (*SD* = 5.60) and for male students was 75.87 (*SD* = 8.07). For AT the mean percentage score for female students was 81.03 (*SD* = 7.26), while it was 72.39 (*SD* = 9.51) for male students. The weighted scores were also high for

female students, with a mean of 85.96 (*SD* = 4.46), while male students scored a mean of 85.96 (*SD* = 6.93). In college, female students' score of 81.98 (*SD* = 11.38) was higher than male students' score of 75.12 (*SD* = 10.20) in third-year cumulative GPA.

Table 3 shows the correlation coefficient between the criterion variable (third-year cumulative GPA) and the predictor variables (GAT, AT, and weighted scores). There is a significant medium correlation between college GPA and admission test scores that range from .37–.59. The weighted scores are highly correlated with the other predictor variables, ranging from .70–.95. This is because these weighted scores are the average mean of the other predictor variables.

Table 3
. Correlation Matrix of Variables Included in the Study (n = 417)

	AT	HSGPA	W	3ʳᵈ-year
General Aptitude Test	.671*	.370*	.819*	.373*
Achievement Test		.579*	.950*	.472*
High School GPA			.702*	.592*
Weighted score				.543*

* Correlation is significant at the 0.01 level (2-tailed).

The authors analyzed the data in two ways. The first analysis was performed for the Humanities colleges (College of Education and College of Applied Studies), which use only high school GPA and GAT scores, whereas the College of Applied Medical Sciences uses the three predictor variables of high school GPA, GAT scores, and AT scores. In addition, the weighted scores for each group were analyzed separately to examine the predictive validity of the weighted score.

Predicting College GPA from HSGPA and GAT for Humanities Colleges

The multiple regression analysis showed that using both high school GPA and GAT scores accounted for 26% of the total variance of the criterion variable, third-year GPA. However, GAT scores were found to be not a significant predictor of third-year GPA, t = 1.949, p = .052. High school GPA was found to be a significant predictor of college performance, t = 8.742, p = .000.

Predicting College GPA from Weighted Scores (HSGPA and GAT) for Humanities Colleges

The weighted scores used as the actual predictor variable of college performance at the Humanities colleges were analyzed to find out whether it is a significant predictor of third-year GPA. The results showed that the weighted scores variable is a significant predictor of third-year GPA, t = 6.739, p = .000, explaining 14% of the total variance.

Predicting College GPA from HSGPA, GAT, and AT for Applied Medical Sciences College

The other set of analyses was performed to check the prediction validity of the three admission tests (HSGPA, GAT, and AT) used in the non-Humanities colleges. The results showed that these tests are significant predictors of college performance, explaining 49% of the total variance in third-year GPA. Each of the three predictor variables (HSGPA, GAT, and AT) was significant in predicting college performance; $t = 7.451$, $p = .000$, $t = 3.482$, $p = .001$, $t = 2.800$, $p = .006$, respectively.

Predicting College GPA from Weighted Scores (HSGPA, GAT, and AT) for Applied Medical Sciences College

The weighted scores used as the actual predictor variable of college performance at the non-Humanities colleges were analyzed to find out whether they are a significant predictor of third-year GPA. The results showed that weighted scores are a significant predictor of third-year GPA, $t = 8.876$, $p = .000$, explaining only 36% of the total variance.

Differential Prediction across Gender

The third research question asked if high school GPA and college entrance test scores are differentially predictive of academic performance across gender (male/female) and discipline (Humanities/non-Humanities). The Gulliksen and Wilks (1950) procedure was used to test whether different prediction equations should be used with different subgroups of students. This procedure involves a test of equality of standard errors of estimate, followed by a test of equality of regression slopes, and then a test of equality of regression intercepts across the different subgroups. The results showed that significant differences in regression slopes were found for female versus male students at the three colleges. This indicates that using common regression equations derived from a pooled sample of male and female students at those colleges to predict students' academic performance may result in predictive bias against certain subgroups.

CONCLUSION

Any test used to admit students to different disciplines in higher education should itself be tested. The test has to be reliable and valid to ensure that decision-makers can make as accurate decisions as possible. High school GPA, GAT, and AT are commonly used to predict students' academic achievements in higher education in Saudi Arabia. It is hypothesized that students who score high on admission tests will succeed in college. The results showed that high school GPA and entrance test scores are significant predictors of third-year cumulative GPA. However, the admission test scores seemed to be more valid predictors of college success in the Applied Medical Sciences College than in the Humanities College.

The findings of differential prediction of admission test scores across gender

revealed that there are differences between the performance of female and male students. The results of this study are in line with the findings of Young (2001) when he reviewed a number of studies of differential prediction by gender. He concluded, as this study did, that female students' performances are underpredicted.

In conclusion, based on the findings of this study there is a lot of variance in college success that is not yet explained. The predictive validity of the admission variables needs to be improved to catch more of the variance in the criterion variable. The current study investigated the predictive validity of the admission test scores (HSGPA, GAT, and AT) used as indications of students' success in college. It is important to do a study of this kind because the results will contribute to the knowledge concerning the predictive validity of admission tests.

The proposed research is also aligned with the MoHE's vision, which emphasizes the commitment to producing highly qualified university graduates. The findings of this research shall have many applications and implications at different levels.

First, it might help the admission personnel in Saudi universities identify whether high school GPA and admission test scores (GAT and AT) are valid indicators of student academic achievement in institutions of higher education. It might also help them in the development of future admission plans and policies. Second, the NCAHE might revise some of the test contents and focus on accommodating students' competencies and expectations. Third, this study might serve as motivation for future investigation and research in the area of admission to higher education, as it is currently amongst the very few research projects tackling the role admission tests play as a gateway for students entering institutions of higher education in Saudi

Arabia since the establishment of the NCAHE. High school GPA, GAT, and AT scores have been shown to be very important criteria for admission to colleges and universities and may have serious consequences for students' careers. Therefore, continually evaluating admission processes is highly recommended.

RECOMMENDATIONS

The unexplained variance in the criterion variable (third-year cumulative GPA) should encourage admission committees to conduct other studies examining variables that may have some correlation with the criterion variable. They may consider nonacademic factors since many researchers contend that they are good predictors of students' achievement in college.

This study examined three colleges at one university in the eastern region of the Kingdom of Saudi Arabia. Future studies need to focus on more colleges and across a larger population. Lastly, college entrance exams are designed to measure what students have learned in high school and other general skills; however, it would be helpful if they also focused on soft skills like problem solving, reasoning, communication, and interpersonal skills. These are the kinds of skills worth developing because succeeding in college requires students to have high levels of content knowledge as well as soft skills.

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دقة التنبؤ بالنجاح الأكاديمي لدى طلاب الجامعات السعودية

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المستخلص: يكثر الجدل حول الاستخدام الحالي لاختبار القدرات العامة (GAT) والاختبار التحصيلي (AT) وكذلك المعدل التراكمي لدرجات الثانوية العامة (HSGPA) في جميع جامعات المملكة العربية السعودية كمعايير للقبول. وعلى الرغم من استخدام هذه الاختبارات عالية التقدير المشابهة لاختبار السات "SAT" واختبار الكلية الأمريكية "ACT" في الولايات المتحدة والأمريكية وغيرها، إلا أن استخدام هذه الاختبارات عالية التقدير قد تحول دون استكمال العديد من الطلاب لتعليمهم الجامعي. لذا من المهم التحقق من صدقها التنبؤي لمساعدة مسؤولي القبول و التسجيل على قبول الطلاب المؤهلين للدراسة في كلياتهم. قليل من الدراسات العلمية ناقشت هذه المشكلة في المملكة العربية السعودية. في هذا البحث قام الباحثان بدراسة تجريبية للتأكد من الصلاحية التنبؤية لاختبارات القبول تلك في أحد الجامعات الحكومية بالمملكة العربية السعودية و هي جامعة الدمام. تتألف عينة الدراسة من ٤١٧ طالب وطالبة من ثلاث كليات مختلفة. وتم تطبيق تحليلات الانحدار اللوجستي والمتعدد لدراسة الصلاحية التنبؤية للمتغيرات المستقلة. بينت النتائج أن معدل الثانوية العامة أكثر مصداقية من اختبار القدرات في التنبؤ بنجاح الطلاب في الجامعة و لكن وجد ايضاً أن النسبة الموزونة ذات دلالة احصائية في التنبؤ بمستوى الطلاب في الكليات النظرية. بالنسبة للكليات الغير نظرية، فقد وجد أن المتغيرات المستخدمة كمعايير لقبول الطلاب في الكلية (HSGP،AT،GAT) لها دلالة احصائية سواءً منفردة كانت أو بإستخدام النسبة الموزونة. لذا ينصح مسؤولي القبول و التسجيل اعطاء نسبة أقل لاختبار القدرات عند قبول الطلاب.

الكلمات المفتاحية: اختبار القدرات، الاختبار التحليلي، المملكة العربية السعودية، الاختبارات، نجاح الطلاب في الجامعات