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THE IMPACT OF GENDER AND HIGH SCHOOL GPA ON THE UNIVERSITY ENTRANCE EXAM

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ABSTRACT

Data from a university in a Gulf country is utilized to determine if gender and high school GPA predicted the university entrance exam score. Two separate one-way ANOVAs are used to determine the impact of gender on the two variables of high school GPA and university entrance exam score. This is followed by a hierarchical regression. The hierarchical regression examines whether gender and high school GPA are predictive of the university entrance exam score. The analysis indicates that gender and high school GPA explains 80% of the variability in the university entrance exam. Though it is generally perceived that females are not able to obtain an education similar to males in the Middle East, in particular, in the Gulf States, this study indicates that there are more females entering the university entrance exam than males. Moreover, females also obtain higher scores compared to males in both the university entrance exam and high school GPA.

Keywords: Gender issues, education, cross-cultural studies, assessment, measurement, performance appraisal.

INTRODUCTION

Many universities and colleges try to determine the students who will succeed in their schools. Researchers have focused on diverse variables that might contribute to success (Clercq, Galand, Dupont, & Frenay, 2012; Kappe & Flier, 2012). The SAT, a standardized test, has been utilized in the United States for many years; it has assisted individuals in securing positions in universities. There are numerous studies that focus on the SAT as a predictor of university success (Camara & Echternacht, 2000; Cohn et al., 2004; Barron & Norman, 1992) with some focusing on the ACT as a predictor (Lenning, 1975). Cohn et al. (2004) discuss the effectiveness of the SAT as a predictor of university success and indicate that the SAT should be used as a criteria for college entrance. While the SAT has been shown to be a predictor of university grades, studies have indicated that the addition of variables such as class rank as well as achievement test scores had a greater impact (Barron & Norman, 1992).

Moreover, when looking at school success, Fischer,

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Schult, & Hell (2013) discuss the importance of gender as a contributor to final grades. When looking at college GPA and its prediction, research has shown that females retain a higher GPA compared to males (Cohn et al., 2004; Bender & Garner, 2010). However, interestingly, females were shown to earn lower SAT scores compared to males (Benderr & Garner, 2010). Betts & Morell (1999) emphasize the importance of forming separate prediction formulas for males and females because of the higher GPAs earned by females.

There are many studies that utilize high school GPA as a predictor of college grades (Camara & Echternacht, 2000). While some have found that high school performance was not significant as a predictor (Ferrari & Parker, 1992), others have found that high school GPA significantly predicts grades in college (Betts & Morrell, 1999). Some researchers have noticed that high school GPA is in fact a better predictor of university success when compared to the SAT (Camara & Echternacht, 2000). Moreover, Jackson (1977) indicates that the correlation between the SAT and high school GPA has risen compared to the late 60s and early 70s. Kobrin, Glenn, Howard, & Ying (2003) also indicate the importance of various other variables and their impact

on the relationship between the SAT and high school scores.

The purpose of this paper is to address two issues. Firstly, the researchers assess whether gender and high school GPA are significant predictors of the university exam score in a Gulf country in the Middle East. For purposes of confidentiality, the specific name of the country is not specified. To the best of the researchers' knowledge, there have not been any studies conducted to determine the predictors of the university exam utilized in that area. The studies that do exist focus on college GPA as a criterion rather than looking at the university exam score. Secondly, the researchers determine whether females earn a higher high school GPA compared to males while earning a lower university exam score. While as mentioned, there have been studies that have found such a relationship in the United States, to the best of the researchers' knowledge, no such study has been conducted in the Middle East.

METHODOLOGY

Sample: Our sample consisted of about 2, 500 high school juniors and seniors who took the university entrance exam in the year 2009 in a Gulf country located in the Middle East. For purposes of confidentiality, the specific country is not named. A very small portion of the students were juniors, the vast majority were seniors. No missing data existed, however, there were a few outliers which were removed from the data set after an initial analyses. The total number of students before the removal of outliers was (N=2394) which was reduced to (N=2387) after the removal of the outliers.

Instruments and variables: No instruments were utilized. Students' information of high school GPA and gender were gathered during registration for the exam and subsequently the score of each student from the entrance exam was recorded.

The three variables that were addressed were: high school GPA, gender (male, female), and university entrance exam score. The high school GPA and university entrance exam were normalized on a scale from zero to one-hundred.

Models: Two main approaches were utilized. Firstly, two

separate univariate analyses were conducted in order to find out the effect of gender on high school GPA and university entrance exam separately. Secondly, hierarchical regression was conducted to determine the impact of gender and high school GPA on the university entrance exam, in other words, the criterion variable was university entrance exam and the predictor variables were high school GPA and gender. The hierarchical regression output provided two separate models with the first model only using gender as a predictor of the university entrance exam and the second model using both gender and high school GPA as predictors of the university entrance exam. The university entrance exam and high school GPA were both continuous and numerical variables while the variable gender was discrete categorical.

RESULTS

Two separate one-way ANOVAs were used to determine the impact of gender on the two variables of high school GPA and university entrance exam score. This was followed by a hierarchical regression. The hierarchical regression examined whether gender and high school GPA were predictive of the university entrance exam score.

One-way ANOVA: A one-way analysis of variance was used to analyze the data. The fixed categorical independent variable was gender with two levels (Male, Female). The continuous random dependent variable was the university entrance exam score. Examination for plots of normality and linearity indicated that the assumptions were met. The assumption of homogeneity (Levene's test of homogeneity: $F=22.998$; $df= 1, 2385$; $p<.05$) was also met. Presented in Table 1 is a summary of the means and standard deviations; a summary of the results of the analysis of variance may be found in Table 2.

Examination of Table 2 shows a significant difference in university entrance exam score by gender ($F=9.023$; $df= 1, 2385$; $p<.05$). Females had higher scores compared to males, however, the eta-squared strength of association indicated that overall, gender accounted for 0.4% of the variability in the university entrance exam score.

Table 1: Means and Standard Deviations for university entrance exam score.

	Females	Males
n	1593	794
\bar{x}	80.34	79.26
sd	8.779	7.295

Table 2: Analysis of Variance Summary for university entrance exam score by gender.

Source	SS	Df	MS	F
Between	623.80	1	623.80	9.023**
Within	164880.75	2385	69.13	
Total	165504.75	2386		

**p<.01

A second one-way analysis of variance was used to analyze the effect of the independent variable gender on the continuous random dependent variable of high school GPA. Examination for plots of normality and linearity indicated that the assumptions were met. The assumption of homogeneity (Levene's test of

homogeneity: $F=7.255$; $df= 1, 2385$; $p<.05$) was also met. Females had higher scores compared to males. Presented in Table 3 is a summary of the means and standard deviations; a summary of the results of the analysis of variance may be found in Table 4.

Table 3: Means and Standard Deviations for high school GPA.

	Females	Males
N	1593	794
\bar{x}	88.72	88.63
Sd	6.919	6.247

Table 4: Analysis of Variance Summary for high school GPA by gender.

Source	SS	Df	MS	F
Between	2305.451		2305.45	15.31**
Within	107158.44	2385	44.93	
Total	109463.89	2386		

**p<.01

Examination of Table 4 shows a significant difference in high school GPA by gender ($F=51.312$; $df= 1, 2385$; $p<.05$). Females had higher scores compared to males, however, the eta-squared strength of association indicated that overall, gender accounted for 2.1% of the variability in high school GPA.

Multiple Regression: The purpose of the hierarchical regression was to examine whether gender and high school GPA is predictive of university entrance exam score. The fixed continuous predictor variable was high school GPA and the fixed categorical predictor variable was gender. The continuous random dependent variable was university entrance exam score.

Data were first checked for possible violations of the assumptions. A power analysis at an alpha level of .01

for a hierarchical regression analysis with one predictor in the first set, and two predictors in the second set indicated that the sample size ($N=2387$) is sufficient for a desired power level of .95. The standardized predicted residual statistics ($M=0$, $SD=1$, $Min= -3.04$, $Max= 1.89$) indicated that the assumption of linearity has been met. The patterns shown on the standardized residual by standardized predicted scatterplot suggest normality and homoscedasticity of the residuals. Furthermore, all values on the scatterplot fall within the -3 and +3 after the removal of 7 extreme outliers. Tolerance levels for gender and high school GPA were both high (.98) indicating that multicollinearity was not an issue. Summary statistics and zero order correlations are presented in Table 5.

Table 5: Summary Statistics and Zero-Order Correlations for university exam score, gender, and high school GPA.

Mean and standard deviation	Correlation matrix					
	N	Mean	SD	University Exam	Gender	High school GPA
University Exam Score	2387	79.98	8.329	1.00	-0.06	0.892
Gender	2387	0.33	0.471		1.00	-0.145
High School GPA	2387	88.02	6.773			-

Examination of zero-order, part, and partial correlations revealed little shift between the three correlations for gender and high school GPA, therefore we can assume that they are equally important in predicting university entrance exam score. For gender, the zero order ($r=-0.61$) turned into a positive value for partial ($sr^2=0.152$) and part ($r^2=0.069$). The differences revealed in signs between the beta weight and zero-order correlation for gender suggested that gender

should be treated as a suppressor variable, since it relates negatively to university entrance exam score when taken as an individual variable, but contributes positively to university entrance exam score with high school GPA taken into account. In contrast, the zero order ($r=-0.892$), partial ($sr^2=0.894$) and part ($r^2=0.892$) for high school GPA remained constant. Presented in Table 6 are the results from the hierarchical regression analysis.

Table 6: Results of Hierarchical Regression of university exam score, gender, and high school GPA.

		Unstandardized Coefficients				
DV		IV	B	SE B	β	t
T	Model 1	Gender	-1.085	.361	-.061	-3.004**
	Model 2	Gender	1.228	.164	.069	7.509**
		High school GPA	1.109	.011	.902	97.449**

Gender was the first variable entered, followed by the addition of gender and high school GPA together. As shown, findings from the first model indicated gender to be a significant predictor of university entrance exam, $R^2=.004$, adjusted $R^2=.003$, $F(1, 2385) = 9.023$, $p<.01$. This suggests that 0.4% of the variance in the university entrance exam score is accounted for by students' gender. Results from the second model show

that adding high school GPA to the model with gender resulted in a significant increment in R^2 , R^2 change = 0.796, $F(1, 2384) = 9496.326$, $p<.01$, indicating that the students high school GPA added 79.6% to the variance in students' university entrance exam score. When combined, gender and high school GPA account for 80% of the variance in the university entrance exam score as seen in Table 7.

Table 7: Model Summary for university exam score, gender, and high school GPA.

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.061	.004	.003	8.315
2	.894	.800	.800	3.725

CONCLUSION

The results indicate that gender does have an impact both on the university entrance exam score and the high school GPA. The percentage of variability that it accounts for is 0.4% for the university entrance exam score and a percent variability of 2.1% for high school GPA.

Together gender and high school GPA explain 80.0% of the variance in the university entrance exam score indicating the importance of high school GPA as a predictor of the university exam.

Though it is generally perceived that females are not able to obtain an education similar to males in the Middle East, in particular, in the Gulf States, this study indicates that there are more females entering the university entrance exam. Moreover, females also obtain higher scores compared to males in both the university entrance exam and high school GPA. This indicates the high educational level of females.

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