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ABSTRACT

Researchers in the past have found discrepancies in the prediction of college grade point average (GPA) between genders with the use of standardized tests such as the Scholastic Achievement Test (SAT) and the American College Test (ACT). These differences were studied to determine if the potential differences could be attributed to differential course selection across gender. Subjects were selected from 1995 and 1996 graduating seniors at two large Tennessee universities. Johnson-Neyman (P. Johnson and J. Neyman, 1936) analyses and classical hypothesis testing procedures with the dummy-coding General Linear Model were performed for the total sample of 3,428 females and 3,068 males and for each of the five selected majors. Differences in the prediction of college GPA using ACT-Composite scores (ACT-C) across gender were found for the total group. However, these differences were essentially eliminated when course selection was controlled by analyzing data within majors. Findings support the position that differential prediction of college GPA across gender using ACT-C scores is an artifact of differential course selection. (Contains 5 tables and 29 references.) (Author/SLD)

Running Head: DIFFERENTIAL PREDICTION OF COLLEGE PERFORMANCE

Differential Prediction of College Performance between Gender

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Abstract

Researchers in the past have found discrepancies in the prediction of college grade point average (CGPA) between gender with the use of standardized tests such as the Scholastic Achievement Test (SAT) and the American College Test (ACT). The present study was designed to identify these differences and to determine if the potential differences could be attributed to differential course selection across gender. Subjects were selected from 1995 and 1996 graduating seniors at 2 large universities within Tennessee. Johnson-Neyman analyses and classical hypothesis testing procedures with the dummy-coding General Linear Model were performed for the total sample and for each of the five selected majors. Differences in the prediction of CGPA using ACT-Composite (ACT-C) scores across gender were found for the Total Group. However, these differences were essentially eliminated when course selection was controlled by analyzing data within majors. Findings from this study support the position that differential prediction of CGPA across gender using ACT-C is an artifact of differential course selection.

Differential Prediction of College Performance between Gender

Methods for accurately predicting students' abilities to succeed in college are fundamental at academic institutions and in their admission processes. High school rank and high school grade point average (HGPA) along with standardized tests such as the Scholastic Achievement Test (SAT) and the American College Test (ACT) have long been used to statistically determine the likelihood of success in college. Although these variables function adequately in predicting college success, they do not appear to be without error or biases. Biases between genders appear particularly evident.

Many studies have explored gender differences in predicting college performance using standardized test scores. Gender differences in ACT scores have been found to average from 1.97 to 2.6 points on the Mathematics section and 3.42 points on the Science section, with males obtaining the higher scores (American College Testing Program, 1988; Tegano & Faulkender, 1983). Similar results have been found with SAT scores as researchers have discovered that SAT total scores were an average of 19 points lower for females than males. SAT-Mathematics (SAT-M) scores of females were from 26 to 46 points lower than SAT-M scores of males, and SAT-Verbal (SAT-V) scores of females were an average of 4.27 points lower than males (College Board, 1989; Elliott & Strenta, 1988; Young, 1991). Numerous studies have shown, however, that these differences did not translate directly to college performance as females consistently obtained higher CGPAs than males. In many studies, females were found to have obtained significantly higher college GPAs than males even though their predictor scores (SAT or ACT) were significantly lower than those of men (Bridgeman & Wendler, 1991; Denmark & Paludi, 1993; Elliott & Strenta, 1988; Gamache & Novick, 1985; Hewitt & Goldman, 1975; Stricker, Rock, & Burton, 1993; Veldman, 1968; Young, 1991). Females' GPAs on average were found to be .13 grade points higher than that of males (on a 4 point scale; Elliott, 1988). ACT scores, specifically, tended to underpredict females' GPA by .17 to .27 grade points and overpredict males' GPA by .10 grade points when a common regression equation was used (American College Testing Program, 1973; Stricker et al., 1993).

Hewitt and Goldman (1975) proposed that the underprediction of females was a small-magnitude phenomena that could be explained as an artifact of college grading that was unrelated to a student's sex. They stated that the underprediction was essentially a function of females majoring in fields which graded more leniently, and reported findings which showed very little residual difference between the GPA prediction systems of males and females when the students' major fields were considered (Hewitt & Goldman, 1975). Other researchers have hypothesized similarly and come to related conclusions (Elliott & Strenta, 1988). Differences in tendencies for males and females to major in different fields do appear evident (Hewitt & Goldman, 1975; Young, 1991). However, some research suggests that this does not fully account for the underprediction of females' CGPA (Gamache & Novick, 1985; Stricker et al., 1993; Young, 1991).

Willingham (1985) found that some courses (major fields) demanded a relatively high level of ability in order to succeed in that area. Students with low abilities in those areas (especially mathematics and the sciences) tended to avoid entering into those classes or migrated out of those fields after achieving low grades or not experiencing success. Researchers have also concluded that instructors in those more demanding fields adapted to students with relatively higher degrees of talent. As a result, instructors gave more average grades to those students when, in fact, those students often obtained above average grades for courses in less demanding fields (Goldman & Hewitt, 1975; Goldman, Schmidt, Hewitt, & Fisher, 1974). Strenta and Elliot (1987) conducted research on differential grading standards. Although their focus was not on sex differences, they found that major fields that attracted students who scored higher on SATs employed stricter grading standards. It has also been identified that females and nonAsian minorities took fewer mathematics and science courses in high school than males and scored lower on achievement tests in those areas (Lee & Ekstrom, 1987; Ramist & Arbeiter, 1986; Smith, 1986). Etiologically, this could begin to account for differential major field selection between males and females.

Aside from differential major field selection and differential grading standards, another dilemma researchers have found in identifying the most accurate or divergent prediction lines of males and females was that GPA composites were rarely uniform among different students (Elliot & Strenta, 1988). Lack of complete homogeneity in GPA composites makes it difficult to establish accurate prediction lines and, therefore, distinguish differences between gender. However, homogeneity of GPA composites is much greater for students within the same major than for students within the same college, since the composition of courses for each student vary more greatly within college than major.

Researchers have devised two principal methods for dealing with this problem for reaching more accurate prediction lines. The first method involves statistically controlling for differential grading practices within-departments as well as between-departments (Elliott & Strenta, 1988). The second principal method for dealing with dissimilar GPA composites among the total population is to eliminate differences in course selection by only comparing and analyzing students of the same major field.

With consistent findings from past research that common (male and female combined) regression equations tend to overestimate CGPA for males and underestimate CGPA for females (Gamache &

Novick, 1985), researchers delved into the task of developing separate regression equations for the sexes. Gamache and Novick found that use of a gender differentiated equation increased the predicted criterion value for women in all major fields studied (Business, Liberal Arts, Pre-Medicine, Undecided) when ACT-C was used as the predictor variable. Gamache and Novick (1985) concluded that there was a bias against women when using a common regression equation for males and females to predict CGPA from ACT and that a large proportion of female students were generally affected by this underprediction.

Many colleges and universities use some type of a cut score to govern admissions in the selection process. The results of Gamache and Novick's (1985) study involving these cut scores and GPA prediction shed light on these sex biases previously mentioned. When cut scores for the ACT-C were selected on the basis of likelihood to obtain a 2.50 GPA using the combined (male and female) regression equation for business majors, 11.8% of males and 22.8% of females would have been falsely rejected from inclusion to the university when in fact they would have actually obtained GPAs of 2.50 or higher. When a similar cut score was derived for only males using the male regression line, 16.5% of males would have been falsely rejected from inclusion. Most importantly, for this study, the derivation of a cut score for females using the female equation yielded only 11.4% of females being falsely rejected from inclusion when they would have in fact earned a GPA of 2.50 or higher (Gamache & Novick, 1985). The negative effects of underprediction for women using a common regression equation are exemplified in that the proportion of false rejections for females was nearly double that of males when the combined equation was used in developing cut scores for the ACT. The data also showed that the percentage of females falsely rejected, in anticipation that their GPA would be below 2.50, was doubled when the combined equation was used as opposed to the female-only equation.

In the past, many researchers have used SAT scores to predict CGPA. Since the present study deals with the prediction of CGPA using ACT, a question arises as to whether the conclusions from those studies are applicable to ACT scores and their use in predicting CGPA. This question holds vice versa for past studies regarding CGPA prediction using ACT scores. Aleamoni and Oboler (1978) undertook a study to help resolve this dilemma. Their sample consisted of 4,283 entering freshman who had taken the SAT long form, ACT, or both. All subjects additionally took the SAT short form during the week of registration. SAT scores and ACT scores were used from each individual to develop correlations of each (ACT, SAT long form, SAT short form) with their first semester GPA. Overall, the results of this study indicated that SAT-total and ACT-composite worked equally well in predicting first semester GPA. Results also indicated that the mathematics subscale of ACT and the SAT long form correlated similarly with GPA. However, there were some differences between the predictions of GPA using ACT and SAT. The SAT-verbal correlated slightly higher with GPA than did ACT-English (Aleamoni & Oboler, 1978). Other researchers have also concluded through similar studies that ACT scores and SAT scores are equally capable of predicting college grades for freshmen (Boyce & Paxon, 1965; Lenning & Maxey, 1973; Lins, Abel, & Hutchins, 1966; Munday, 1965; Passons, 1967; Zimmerman & Michael, 1967).

This study sought to identify gender differences in the prediction lines for CGPA using ACT-C score as the predictor variable. The primary goal was to determine if there are gender differences in the prediction of CGPA using ACT-C. Another goal was to identify any region of significance where two groups are different in the prediction of CGPA using ACT. The design of this study was such that sample size was adequate to more accurately identify differences in prediction lines for each gender and to more accurately identify differences within various majors as differential course selection was largely controlled.

This study closely paralleled Gamache and Novick's 1985 study predicting CGPA from ACT scores. However, a 4-year cumulative GPA was used in the present study while a 2-year cumulative CGPA was used in the Gamache and Novick (1985) study. Additionally, discrete majors were selected for comparison in the present study while the Gamache and Novick (1985) study chose to use selected colleges within an institution. The shift in the present study to a 4-year cumulative GPA and to the use of discrete majors should have increased the amount of course selection control from that found in Gamache and Novick's 1985 study. Course selection should have been better controlled since diversity within each sample (per major) was reduced as students within a given major were likely to have taken a more homogenous set of courses than students within a given college. The addition of the 4-year cumulative GPA as a criterion variable helped to better ensure that the true diversity between majors was maximized for analytic purposes since many of the field specific courses become more prominent during the latter two years of a student's academic career. Previous studies which used Freshman or 2-year cumulative GPA were at a disadvantage with respect to this phenomenon since students' curricula are generally not as diverse during the initial portion of their education due to general requirements for all students. Therefore, true gender differences in academic ability and performance for prospective majors would be more evident in the latter portion of one's academic career. Lavender & Kim (1996) showed that the gender difference was an artifact, after controlling course selection. However, some major problems were detected from their study as the sample size was low resulting in inadequate power and all subjects were obtained from only one university. Therefore, the present study expanded from their study to include two relatively large universities that greatly increased the sample size and enhanced the representativeness of the present sample.

Johnson-Neyman analyses were used to identify differences between these prediction lines for each gender overall and within each major. The Johnson-Neyman test establishes the areas of a given predictor variable for which there are significant differences in an associated criterion variable for two groups (Pedhazur, 1982). These analyses were utilized in this study to determine regions of ACT for which males and females differ with respect to their predicted CGPA. Johnson-Neyman analyses facilitate the identification of regions of ACT that are particularly important such as very high and very low levels. These regions are of auxiliary importance in that they demarcate areas that determine admission at the lower level and scholarship at very high levels. Development of more precise and accurate methods to predict college success will yield more principled and fair decisions regarding admissions, placement, and scholarship, along with insight into any areas and sources of bias or dissimilarity between gender.

Method

Subjects

Subjects were selected from 1995 and 1996 graduating seniors at 2 different universities within the state of Tennessee (Middle Tennessee State University and University of Tennessee-Knoxville). Both are state funded, regional universities in the southeast. Middle Tennessee State University had an average undergraduate population of 15,653 for the years 1995 and 1996, while the University of Tennessee-Knoxville had an average undergraduate population of 18,780. Graduating seniors at the two universities for the years 1995 and 1996 ranged in age from 19 to 48 years (mean = 24.24, SD = 2.71). Graduating seniors at the two universities for the years 1995 and 1996 entered college with ACT-composite scores ranging from 11 to 35 (mean = 22.72) and reported HGPAs ranging from 1.6 to 4.0 (mean = 3.00). Table 1 is provided to display the sample size, means, and standard deviations for ACT and CGPA for each gender at each of the two universities.

Subjects with all required data were included in the initial analyses of the Total Group. In the latter portion of this study, only subjects with majors in Biology, English, Finance, Mathematics, and Psychology were chosen for further analyses. Biology and Mathematics were selected since gender differences in CGPA are generally attributed to courses in math and science (Elliott & Strenta, 1988; Young, 1991). Both of these majors deal with matters of an objective nature and require a high level of developed ability. Therefore, GPA is fair and stable within these majors since grading is more objective and developed ability largely contributes to grades and their stability. English was selected since language is the major medium through which general knowledge is communicated and general intellectual capacities are developed. Additionally, the selection of English was validated since ACT-verbal directly assesses this ability. Finance was selected since management of money affairs is essential and representative of operations in the business field. Furthermore, Finance subject matter is largely objective in nature which again leads to more fair grading. Psychology was selected since the subject matter seems to adequately represent the process of understanding about the mind and human behavior. Data concerning the number of subjects within each major are provided in Table 2.

Variables

Data for this study were obtained from archival databases at each of the participating universities' Institutional Research Office. The variables in this study were comprised of data concerning cumulative college grade point averages for 1995 and 1996 graduating seniors, ACT-C, college major, and gender.

Procedure

The data obtained from the two institutions contained no identifying information in order to ensure subject confidentiality. Subjects that had data for all required variables (ACT-C, CGPA, and sex) were utilized in the initial portion of this study and they were grouped according to gender. Data from these groups in the initial portion of the present study were used to determine if there were gender differences in the prediction of CGPA using ACT-C for the entire sample. A total number of 6,496 students (3428 females, 3068 males) were included for analyses of differential prediction of the sexes within the total group.

Analyses for the latter portion of this study included only those students who had ACT-C, CGPA, sex data, and had graduated with majors in Biology, English, Finance, Mathematics, or Psychology. The latter portion of the present study utilized the same variables as used with the Total Group except subjects were grouped according to gender and major. As a result of the division into majors, group sample sizes were significantly smaller than those of the Total Group and many subjects that were included in the Total Group were now excluded on the basis of major. The five majors chosen for inclusion and analysis in this portion of the study were deemed adequately representative of various colleges or fields of study (Biology, English, Finance, Mathematics, and Psychology).

Results

The means and standard deviations of ACT-C and CGPA for the total group and each university are provided in Table 1. The mean

ACT-C and CGPA for females in the Total group were 22.31 and 3.07, respectively, while the mean ACT-C and CGPA for males were 23.17 and 2.92.

A one-way Multivariate Analysis of Variance (MANOVA) showed a significant gender difference on the linear combination of CGPA and ACT-C for the Total Group, $F(2, 6493) = 216.30$, $p = 0.0001$ (Wilks' Lambda = 0.94). Subsequent Univariate Analyses of Variance (ANOVAs) were performed with the mean differences (meand) of ACT-C (meand = 0.86) and CGPA (meand = .15) between males and females of the Total Group which revealed significant differences between gender for both ACT-C and CGPA, $F(1, 6494) = 78.22$, $p = 0.0001$ and $F(1, 6494) = 160.48$, $p = 0.0001$, respectively.

The means and standard deviations for gender in the various majors are provided in Table 2. MANOVAs were performed for each major and showed a significant gender difference on the linear combination of CGPA and ACT-C for Psychology majors and English majors, $F(2, 427) = 16.34$, $p = 0.0001$ (Wilks' Lambda = 0.93) and $F(2, 251) = 3.87$, $p = 0.02$ (Wilks' Lambda = 0.97), respectively. The remaining majors did not exhibit a significant gender effect on the linear combination of CGPA and ACT-C; Biology, $F(2, 192) = 0.08$, $p > 0.05$ (Wilks' Lambda = 1.00); Finance, $F(2, 254) = 0.57$, $p > 0.05$ (Wilks' Lambda = 1.00), and Mathematics, $F(2, 57) = 2.14$, $p > 0.05$ (Wilks' Lambda = 0.93). There appeared to be a trend for male subjects to obtain higher ACT-C scores than females and for female subjects to obtain higher CGPAs than males in all groups except Biology where males were found to have a slightly higher mean CGPA and ACT-C. However, ANOVAs performed with the mean differences of CGPA and ACT-C between males and females for each major revealed no significant differences except for CGPA of Psychology, $F(1, 428) = 19.73$, $p = 0.0001$ (see Table 2). The mean difference between males and females for CGPA of Psychology majors was found to be 0.23 ($p = 0.0001$). Although a MANOVA showed a significant gender difference within English majors for the linear combination of ACT-C and CGPA, univariate ANOVAs showed no significant difference between gender on each dependent variable.

Regression lines for each gender for the prediction of CGPA using ACT-C scores are provided in Table 3 for the Total Group as well as for each major. All of the regression lines for the aforementioned groups were significant predictors of CGPA for their specified gender group at the alpha level of 0.05. Male and female regression equations for the Total Group explained 19% and 24% of the variance in CGPA, respectively (R^2 of other regression lines are provided in Table 3). Johnson-Neyman analysis was utilized to test differential prediction of CGPA using ACT-C between males and females for the Total Group. Differential prediction of CGPA was found for ACT-C scores of 4.18 and above. Analyses with Johnson-Neyman for differential prediction of CGPA within major revealed no significant regions for Biology, English, Finance, Mathematics, or Psychology. However, the Johnson-Neyman analyses contained anomalies within the majors of English and Psychology. Anomalies within English and Psychology presented as the intersections of male and female regression lines were outside of the regions of non-significance. Theoretically, this situation does not exist since the criterion variable cannot differ significantly between two regression lines where the two lines are crossing. This phenomenon was reported as type III error by Chou & Huberty (1992). Results from all Johnson-Neyman analyses are provided in Table 4. As a result of the anomalous findings with English and Psychology, the dummy-coding General Linear Model was used to test the regression lines of each gender for coincidence within these majors. These analyses revealed significant differences in the prediction of CGPA across gender, $F(2, 251) = 3.17$, $p < .05$ and $F(2, 427) = 16.41$, $p < .05$, for English and Psychology, respectively. However, these differences were due to intercept differences not slope differences. Analyses among the remaining majors revealed coincidence for male and female regression lines with Biology, $F(2, 192) = 0.02$, $p > .05$, Finance, $F(2, 254) = 0.59$, $p > .05$, and Math, $F(2, 57) = 1.91$, $p > .05$. Analysis of the Total Group confirmed that the male and female regression lines were not coincident, $F(2, 6493) = 177.10$, $p < .05$. Exploration of slope and intercept differences between gender within each major was performed with the dummy-coding General

Linear Model to determine the nature and factors leading to non-coincidence. The slopes and intercepts of all regression lines within majors were found to be not significantly different between gender, except the intercepts of English and Psychology which had demonstrated anomalies with the Johnson-Neyman test (see Table 5).

Discussion

Past studies have demonstrated that males tended to score significantly higher on ACT-C than females, while females tended to obtain significantly higher CGPAs than males (Elliot & Strenta, 1988; Gamache & Novick, 1985; Goldman & Hewitt, 1975; Tegano & Faulkender, 1983). Analyses in the present study indicated similar results for the Total Group with males scoring significantly higher than females on ACT-C and females obtaining significantly higher CGPAs than males. However when the same analyses were made within each major, significant differences between males and females were found only for CGPA within Psychology majors.

Consistent with prior studies (Elliot & Strenta, 1988; Gamache & Novick, 1985; Hewitt & Goldman, 1975; Lavender & Kim, 1996; Young, 1991) the present study found differential prediction of CGPA across gender for the Total Group. However, much differential prediction appeared to be eliminated as course selection was largely controlled by analyzing data within majors. All regression lines of males and females within the given majors were found to be coincident with the exception of English and

Psychology which differed significantly only with respect to their intercepts. The present study partially supports the conclusions of some of the past research (Elliot & Strenta, 1988; Lavender & Kim, 1996; Young, 1991) that differential prediction of male and female CGPA can be explained as an artifact of differential course selection across gender. However, differences between gender did remain for the intercepts within English and Psychology. Although the male and female regression lines of English and Psychology were not coincident, they varied only in that their intercepts were significantly different. The intercept is the value of Y when X is zero. This does not preclude the possibility that the lines are similar within the realm of the ACT-C.

Given the fact that significant differential prediction of male and female CGPA was not found in the majority of majors and that significant differences were found only for the intercepts of English and Psychology majors, the findings of the present study largely contradict the findings of many past studies (Bridgeman & Wendler, 1991; Gamache & Novick, 1985; Stricker, Rock, & Burton, 1993). Gamache & Novick (1985) is a study of particular importance since its methodology mainly varied from the present study only in that general fields of study were used to control differential course selection, instead of major as in the present study, and a cumulative two-year CGPA was used as the criterion variable instead of a cumulative four-year CGPA.

Both Gamache & Novick (1985) and the present study attempted to partially control differential course selection by selecting data from groups with similar academic curricula. However, the present study utilized specific majors to control for differential course selection while Gamache & Novick selected general fields of study (e.g. Business, Liberal Arts, Pre-Medicine, and Undecided). Use of major instead of general field of study allowed better control of course selection since the compositions of courses comprising the CGPA were more delineated and homogenous within majors. Additionally, the present study differed from Gamache & Novick with respect to the criterion variable. Gamache & Novick used the cumulative two-year CGPA while the present study used the cumulative four-year CGPA. Use of the cumulative four-year CGPA was justified in this study since identification of differential prediction was attempted within majors where the grades from major specific courses were determined during the final two years of study. Analyses performed with the cumulative two-year CGPA, as in Gamache & Novick's (1985) study, do not control course selection as much as the four-year CGPA since GPA composites are not as differentiated between majors during the first two years as the last two years. The final two years of study represent the bulk of core curricula which is fairly homogenous within specified majors. The greater course control within the present study may explain the dissimilar findings of the current study and those of Gamache & Novick.

The methodology of this study was similar to that of Lavender & Kim (1996). Differential prediction of CGPA between gender using ACT-C was analyzed within the same majors as the present study, however, their sample sizes within each major were small and only one school was used in the study. As a result, power may not have been sufficient for definitive conclusions and their sample may have lacked representativeness. The present study increased sample size significantly from Lavender & Kim's study and obtained its data from two large universities. Sample size was increased adequately enough to allow analyses of only graduating seniors with cumulative four-year CGPAs, while Lavender & Kim used juniors' CGPA in addition to seniors' CGPA. The analysis of only four-year CGPAs as in the present study allows for better course control than three-year CGPAs since a greater percentage of courses are homogenous within major during the final two years of study. The results of the present study and those of Lavender & Kim (1996) are comparable in that Lavender & Kim found no significant differential prediction within any major while the present study found gender differences only in the intercepts of English and Psychology majors.

Although the results of the present study strongly support the conclusion that differential prediction of CGPA across gender is an artifact of differential course selection, further research is required to determine the origin and validity of differences in intercepts for English and Psychology majors between gender. Furthermore, caution should be exercised when generalizing results from this study to other universities that are not large public universities as represented in this study. Also, the results of this study may be profoundly limited to traditional students since many older students and transfer students were not required to submit ACT scores to their respective universities, hence, they were not included in the present study. Future research could explore differential prediction between gender using CGPA from only the junior and senior years. The use of a cumulative GPA comprising only grades from the junior and senior years would result in a more homogenous group of courses which enables the researcher to further delineate possible differential prediction of CGPA within specific curricula. In addition, further studies are needed to determine the efficacy of using ACT scores of males and females to predict performance on outcome measures other than CGPA (e.g., Pre-Professional Skills Test, National Teachers Examinations, Graduate Records Examinations, etc.) when similar regression lines are being used for both gender. Also, research is required to ascertain any limitations of the Johnson-Neyman Technique that may account for the anomalous results within

English and Psychology majors in the present study and those found in the 1996 study of Lavender & Kim.

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Table 1

Descriptive Statistics for each University and Total Group

	ACT-C		CGPA		n
	Mean	SD	Mean	SD	
MTSU:					
Females	21.05	3.60	3.02	0.46	873
Males	21.31	3.49	2.77	0.44	597
UTK:					
Females	22.74	3.82	3.09	0.47	2555
Males	23.62	3.98	2.95	0.50	2471
Total:					
Females	22.31	3.84	3.07(1)	0.47	3428
Males	23.17(2)	4.00	2.92	0.50	3068

Note. Means and Standard deviations are derived from those students whose data included ACT-C and CGPA.

(1) indicates significant mean difference, $F(1, 6494) = 160.48$, $p = 0.0001$.

(2) indicates significant mean difference, $F(1, 6494) = 78.22$, $p = 0.0001$.

Table 2

Descriptive Statistics for Males and Females within Major

	ACT-C		CGPA		n
	Mean	SD	Mean	SD	
Biology:					
Females	24.32	3.73	3.06	0.46	96
Males	24.54	3.59	3.07	0.49	99
English:					
Females	24.17	3.57	3.12	0.50	171
Males	24.81	3.48	3.02	0.50	83
Finance:					
Females	23.05	3.81	3.03	0.46	87
Males	23.18	3.76	2.98	0.44	170
Mathematics:					
Females	24.19	3.67	3.22	0.53	31
Males	25.03	4.62	3.05	0.53	29
Psychology:					
Females	21.73	3.52	3.02(1)	0.49	292
Males	22.20	3.58	2.79	0.54	138

Note. Means and Standard deviations are derived from those students whose data included ACT-C, CGPA, and Major.

(1) indicates significant mean difference, $F(1, 428) = 19.73$, $p = 0.0001$.

Table 3

Prediction Models for each Gender

Total Group		
X = ACT-C	Females	Y' = 174.94 + 5.92(X)
		$F(1, 3426)=1059.10$, $p < .05$, R^2: 0.24
	Males	Y' = 167.08 + 5.38(X)
		$F(1, 3066)=702.96$, $p < .05$, R^2: 0.19
Biology		
X = ACT-C	Females	Y' = 166.57 + 5.73(X)
		$F(1, 94)=26.67$, $p < .05$, R^2: 0.22
	Males	Y' = 174.11 + 5.42(X)
		$F(1, 97)=18.08$, $p < .05$, R^2: 0.16
English		
X = ACT-C	Females	Y' = 129.32 + 7.54(X)
		$F(1, 169)=67.95$, $p < .05$, R^2: 0.29
	Males	Y' = 143.17 + 6.40(X)
		$F(1, 81)=19.86$, $p < .05$, R^2: 0.20
Finance		
X = ACT-C	Females	Y' = 178.14 + 5.40(X)
		$F(1, 85)=21.32$, $p < .05$, R^2: 0.20
	Males	Y' = 184.51 + 4.89(X)
		$F(1, 168)=35.54$, $p < .05$, R^2: 0.17
Math		
X = ACT-C	Females	Y' = 140.39 + 7.51(X)
		$F(1, 29)=11.03$, $p < .05$, R^2: 0.28
	Males	Y' = 153.04 + 6.08(X)
		$F(1, 27)=10.56$, $p < .05$, R^2: 0.28
Psychology		
X = ACT-C	Females	Y' = 153.63 + 6.84(X)
		$F(1, 290)=93.98$, $p < .05$, R^2: 0.24
	Males	Y' = 167.039 + 5.05(X)
		$F(1, 136)=17.48$, $p < .05$, R^2: 0.11

Table 4

Johnson-Neyman Regions for ACT-C

	Regions of Significance
Total Group	
X = ACT-C	x > 4.18
Biology	
X = ACT-C	No region
English[a]	
X = ACT-C	No region
Finance	
X = ACT-C	No region
Math	
X = ACT-C	No region
Psychology[a]	
X = ACT-C	No region

Note. Significant regions outside of the range of the ACT were not reported.

[a]Indicates majors where abnormalities were present (see text).

Table 5

Full Prediction Models for CGPA using Single Predictor

Total Group

X = ACT-C $Y' = 174.94 + 5.92(X) - 7.87(Z) - 0.54(XZ)$

Z: $F(1, 6494)=350.33$, $p < .05$ XZ: $F(1, 6494)=3.88$, $p < .05$

Biology

X = ACT-C $Y' = 166.57 + 5.73(X) + 7.54(Z) - 0.31(XZ)$

Z: $F(1, 193)=0.00$, $p > .05$ XZ: $F(1, 193)=0.03$, $p > .05$

English

X = ACT-C $Y' = 129.32 + 7.54(X) + 13.85(Z) - 1.14(XZ)$

Z: $F(1, 252)=5.88$, $p < .05$ XZ: $F(1, 252)=0.47$, $p > .05$

Finance

X = ACT-C $Y' = 178.14 + 5.40(X) + 6.36(Z) - 0.51(XZ)$

Z: $F(1, 255)=1.05$, $p > .05$ XZ: $F(1, 255)=0.13$, $p > .05$

Math

X = ACT-C $Y' = 140.39 + 7.51(X) + 12.65(Z) - 1.43(XZ)$

Z: $F(1, 58)=3.59$, $p > .05$ XZ: $F(1, 58)=0.24$, $p > .05$

Psychology

X = ACT-C $Y' = 153.63 + 6.84(X) + 13.40(Z) - 1.79(XZ)$

Z: $F(1, 428)=30.96$, $p < .05$ XZ: $F(1, 428)=1.85$, $p > .05$

Note. X=Predictor score; Z=Gender (1 if male, 0 if female); XZ= Interaction of Gender and Predictor. Gender specific equations may be determined by substituting 1 or 0 for Z as appropriate and combining like terms.

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