

An Examination of Criterion-Related  
Bias in the Testing of  
Hebrew- and Russian-Speaking  
Examinees in Israel

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# **An Examination of Criterion-Related Bias for Hebrew- and Russian-Speaking Examinees in Israel**

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## **Abstract**

This paper focused on the question of whether scores on measures used to make decisions regarding admissions to universities in Israel have equal predictive meaning for both Russian-speaking and Hebrew-speaking examinees. An examination of bias was conducted using the two “contrasting” definitions suggested by Darlington (1971). Two criteria were used to check for bias: first-year grade point average and third-year grade point average. The results indicated that the Hebrew-speaking examinees performed better than the Russian-speaking examinees on both predictor and criterion measures. The difference between the groups decreased from the first year to the third year of studies. The number of cases for which bias in favor of Russian-speaking examinees was detected was similar to the number of cases for which bias against them was detected. The hypothesis of absence of bias could be confidently rejected, for only a small number of departments. It was also found that mastery of Hebrew is, as expected, of great importance in determining academic success, both in the first year and in the third year of studies.

## **An Examination of Criterion-Related Bias for Hebrew- and Russian-speaking Examinees in Israel**

This paper describes attempts that have been made by Israel's National Institute for Testing and Evaluation (NITE) to address the issue of selecting, in a fair and valid manner, applicants to universities in Israel who are not in full command of the Hebrew language.

The Psychometric Entrance Test (PET) is a scholastic aptitude test constructed and administered by NITE. It is used in the procedure of admissions to all Israeli universities, in conjunction with a matriculation certificate that is based on both school assessment and external nation-wide achievement tests. For students of foreign origin, the school-based component is either missing or, more often, cannot be compared to the Israeli matriculation scores. Therefore, these candidates are rank-ordered on the basis of their PET score alone. In some universities, admissions decisions are based on a composite score, comprised of the PET score and on the mean score achieved in preparatory courses that the non-Hebrew-speaking candidates are required to take before they are admitted to the university.

The variety of different native languages spoken by applicants to Israeli universities is a result of Israel's foremost national characteristic - its status as the destination of immigrants from all over the world, including, in recent years, a large number of Russian-speaking immigrants. In addition, Israel has a large Arabic-speaking minority. In establishing an admissions policy for the universities in Israel, policy-makers and psychometricians have been faced with the problem of finding the best method for predicting the academic success of non-Hebrew-speaking

applicants (along with that of the Hebrew speakers) in the institutions of higher education, where the language of instruction is Hebrew. It was decided to administer the general scholastic aptitude test in the language with which the applicant is most familiar, because it was believed that this would provide all applicants with the opportunity to demonstrate optimal performance. Therefore, PET is currently translated into the languages spoken by the majority of non-Hebrew-speaking applicants: Arabic, Russian, English, French and Spanish. Of the total number of examinees (62,867 in 1996) around 26% chose to take PET in one of these languages (14% in Arabic, 10% in Russian, and 2% in other foreign languages). The examinees who choose to take PET in a foreign language are required by some institutions to take an additional Hebrew Proficiency Test (HP), which is scored separately.

Recently, much attention has focused on the Russian version of PET, due to the most recent wave of immigration from the former Soviet Union (beginning early in the 1990s), which has dramatically increased the number of applicants tested. Most of the examinees tested in the Russian version of PET have graduated from systems of secondary education in their home countries. The test performance of these examinees might, therefore, be affected by two potential factors: cultural background and educational experience on the one hand, and the quality of translation on the other. The question addressed in this paper is whether scores on PET have equal predictive validity for both Russian-speaking and of Hebrew-speaking examinees. The question is, in essence, one of test bias.

### **Test Bias**

Millsap (1995) and Meredith and Millsap (1992) showed that measurement invariance (lack of bias) is inconsistent with predictive invariance for the linear case under

realistic conditions. This phenomenon may necessitate caution in interpretation of empirical findings of test-criterion regression slope invariance and of invariance in test validity. The implication is that confidence in such findings may derive from either extreme cases or from an aggregation of results indicating consistent patterns of bias. Linn (1984) showed that the degree of uncertainty is quite large but that studies of predictive bias are nevertheless worthwhile, if only as a safeguard against extreme conditions.

The absence of bias against members of a particular group may be presented using a regression model (Linn, 1984). Given  $G$ , a dichotomous variable representing group membership;  $X$ , a test or a composite of predictors;  $Y$ , the criterion measure; and  $Q$ , the idealized latent qualifications, then the partial regression coefficients of the test,  $X$ , or the criterion measure,  $Y$ , on the dichotomous variable,  $G$ , should be zero where  $Q$  is held constant. In other words, the following equations regarding two partial regression coefficients should be satisfied:

$$\begin{aligned}\beta_{XG.Q} &= 0, \\ \beta_{YG.Q} &= 0\end{aligned}$$

Unfortunately,  $Q$  is unobserved. However, some constraints on coefficients involving only observable variables are implied. Assuming parallel within-group slopes, the coefficient  $\beta_{YG.X}$  which is proportional to the difference between the within-group intercepts, should equal zero for the regression model definition of unbiasedness to be satisfied (This definition is translated into Cleary's (1968) definition). However, this coefficient equals zero only in unrealistic or uninteresting cases such as when  $X$  is a perfectly valid and realistic measure of  $Q$  or when there is no relationship between  $G$  and  $Q$  and between  $Q$  and  $Y$ . Assuming a positive relationship between  $G$  and  $Q$  and between  $Q$  and  $Y$ , the regression coefficient  $\beta_{YG.X}$  is greater than zero ( $G$  is coded

such that the relationship between X and G is positive). It also follows that the intercept of the regression line for the higher scoring group will be above the one for the lower-scoring group. This is the commonly-observed result in studies comparing the regressions for majority and minority groups like whites and blacks. Linn (1984) showed that the common overprediction result is not necessarily an indication of bias in favor of the minority group; but that it may simply be a consequence of imperfect measurement. He proposed using the formulation presented above in order to create boundary conditions. If the slope  $\beta_{YG.X}$  is negative, then bias is implied. A limit on how large the positive value of  $\beta_{YG.X}$  can be and still be considered unbiased can be obtained by considering the coefficient  $\beta_{XG.Y}$ . The latter regression coefficient is the one of concern in Darlington's (1971) third definition. Given the assumptions listed above (that the correlations between G and Q, X and Q, and Y and Q are positive and less than 1),  $\beta_{XG.Y}$  is also positive. A negative value of this coefficient provides another boundary condition for bias.

The overprediction finding is due to many factors, including both educationally relevant factors and statistical artifacts (Linn, 1984; Millsap, 1995; Deshon and Alexander, 1996). Linn (1984) pointed out that most of the results are based on freshman grades. He suggested that the transition to a predominantly majority college is more demanding for minority students than for majority students. Therefore one might expect the overprediction to disappear in the junior year. Lack of financial support and less adequate preparation in high school are among the more substantive reasons that are often suggested (Linn, 1990).

In addition to these and other sociological and psychological reasons for the resulting overprediction, there are other methodological reasons that could lead to this



result. The exclusion of relevant predictors from the equations, and between-group differences in the rules by which students are selected, are two statistical artifacts that may contribute to the overprediction finding (Linn, 1983a; Linn, 1983b; Linn and Werts, 1971).

The question of test bias was studied for the Hebrew-speaking and the Russian-speaking groups by Kennet-Cohen (1993) who, using Cleary's (1968) definition of test bias, demonstrated that PET tends to over-predict Russian-speakers' first-year grade point average (FGPA) in the Humanities, Social Sciences, and Nursing faculties. In Engineering no prediction bias was found, and in the Natural Sciences a slight under-prediction of the Russian-speakers' FGPA was detected. It was hypothesized that overprediction of Russian-speakers' FGPA is observed in fields of study that are verbally loaded and require a better mastery of Hebrew.

### **The purpose of this study**

The purpose of this study was to address the issue of selecting Russian-speaking applicants to universities in Israel who took the translated version of PET, in a fair and valid manner. Bias in selection was defined according to the conceptualization presented by Darlington (1971) and Linn (1984), using boundary conditions derived from the two regression equations presented above.

To overcome some of the difficulties listed above, several steps were employed to examine test bias in this study:

1. As was mentioned above, overprediction of criterion scores of minority groups is often found because the transition to a predominantly majority college is more demanding for minority students than for majority students. Therefore, one might expect the overprediction to disappear in the third year of college. To examine this

assumption, two different criteria were used to check for bias: first-year grade point average (FGPA) and third-year grade point average (TGPA). It was expected that the degree of bias will decrease from the first year to the third year of studies.

2. Among the major difficulties of minority students is their relatively low proficiency in the language they must employ during the course of their studies. It was expected that the Russian students' degree of proficiency in Hebrew will be related to the level of their achievements in college and that this relationship will be stronger in the first year than in the third year of studies. To examine this hypothesis, the predictive validity of the Hebrew Proficiency Test (HP) score was investigated for two criteria (FGPA and TGPA).
3. The main focus of the study is the fairness of using PET as part of the selection procedure to the various universities. However, selection for the universities is not based solely on PET, and it varies for the various universities and for the two language groups. An effort was made to investigate the fairness of the selection procedure by using the "admissions score" (Adm) provided by the various universities (a score which was based on different criteria for members of the two groups).

## **Method**

### **The predictors**

#### ***PET***

The main predictor of interest is the total score on PET. PET measures various cognitive and scholastic abilities, in an effort to estimate future success in academic studies. Similarly to the SAT, PET is intended to "measure aspects of

developed ability...It makes use of the kind of basic verbal and mathematical skills that develop over the years, both in and out of school. The content of the test does not reflect specific curriculums, although it is designed to be consistent with school-based learning” (Donlon, 1984, p. 58).

PET battery is comprised of three multiple-choice subtests:

1. Verbal Reasoning (V) - 60 items focusing on the verbal skills and abilities needed for academic studies: the ability to analyze and understand complex written material, the ability to think systematically and logically, and the ability to perceive fine distinctions in meaning among words and concepts. The verbal sections include items such as synonyms and antonyms, analogies, sentence completions, logic, and reading comprehension.
2. Quantitative Reasoning (Q) - 50 items focusing on the ability to use numbers and mathematical concepts (algebraic and geometrical), to solve quantitative problems, and the ability to analyze information presented in the form of graphs, tables, and charts. Solving problems in this area requires only basic knowledge of mathematics - the math level acquired in the ninth or tenth grades in most high schools in Israel. Formulae and explanations of mathematical terms that may be needed in the course of the exam appear in the test booklet.
3. English as a Foreign Language (E) - 54 items designed to test command of the English language (reading and understanding texts) at an academic level. The English subtest contains three types of items: sentence completions, restatements, and reading comprehension. This subtest serves a dual purpose: it is a component of the PET total score, and it is also used for placement of students in remedial English classes.

All items are given in multiple-choice format. Each subtest is scored separately, using number-right formula, and standardized on a scale which, on the original norming group (Hebrew-speaking examinees in 1984) had a mean of 100 and a standard deviation of 20. The total PET score is a weighted average of the scores on the three subtests (40% V, 40% Q, and 20% E). For a more detailed description of PET see Beller (1994).

The non-Hebrew versions of PET are essentially translations of the Hebrew form and thus have a similar structure. The English as a Foreign Language subtest is identical in all versions. The Quantitative subtest is translated and reviewed by bilingual experts. The Verbal subtest is only partially translated from the Hebrew. Most items are selected from the pool of Hebrew items, but others are specially constructed for the various language groups. For reasons of test validity, an effort is made to preserve the original meaning of the test directions and, as far as possible, of the items as well.

In this study, the scores on the three subtests will each be treated as a separate predictor.

#### *Equating the language versions*

Translation of a test from one language to another is risky and should be done using proper psychometric equating methods (Jensen, 1980; Angoff & Modu, 1973; Angoff & Cook, 1988). Words and concepts do not always retain their meaning, familiarity, connotation, or difficulty level when translated into the language of another culture. The cross-cultural equating of vocabulary and other translated verbal items is accomplished by retaining only those items that maintain the same rank order of difficulty, and have the same item-total score correlations in both cultures. The

purpose of this equating procedure is to provide comparable predictive validity for both language groups, rather than to make absolute comparisons of the groups in the construct measured by the tests.

The procedures used for equating the different language versions of PET to the Hebrew version are similar to the methods used by Angoff & Modu (1973) and Angoff and Cook (1988). These procedures are:

1. English (E): This subtest is administered to all examinees in the same language and format; there is therefore no need for calibration, and in scoring the E subtest the same parameters are applied for all language versions.
2. Quantitative Reasoning (Q): The general assumption for this subtest is that math items can, in general, be translated in a manner that makes them directly comparable. This assumption is partially checked by applying delta-plot techniques (Angoff and Modu, 1973). The few items that deviate extensively from the general trend of the plot are not included in the scoring procedure.
3. Verbal Reasoning (V): This is clearly the most problematic area, because the meanings of verbal items in Russian may be drastically altered by translation and may therefore not be comparable to their Hebrew counterparts. An equating procedure similar to the one described by Angoff and Modu (1973) is applied. An anchor is established by selecting items that are similar in their conventional psychometric indices and in their rank-order position among other items (using delta-plot techniques) for each two groups of examinees. Once an anchor is established, linear equating methods (Tucker or Levin) are applied.

### ***The Hebrew Proficiency Test***

The Hebrew Proficiency Test (HP) consists of two parts. The first part contains items in multiple-choice format of the following types: sentence completions, reading comprehension, and restatements. In the second part, examinees are required to write a composition. Each of the two parts is scored separately and standardized on a scale which, on the original norming group (all the examinees who took the test in 1986) had a mean of 100 and a standard deviation of 20. The total HP score is a weighted average of the scores on the two parts (67% for the first part and 33% for the composition).

### ***The admissions score***

Each university in Israel computes the admissions score differently. Generally, however, for examinees who graduated from the Israeli educational system, the admissions score is a weighted average of the score on PET and the average score of the matriculation certificate (which is a weighted average of internal high school scores provided by teachers and scores on external national exams). For non-Hebrew-speaking candidates, the admissions score is the score on PET alone or, in some universities, a weighted average of the score on PET and the scores on the preparatory courses these candidates are required to take before they are admitted to the university.

### **Subjects**

The subjects were first-year and third-year students in five universities in Israel in the school years 1992 - 1996. The subjects were divided into two groups, according to

the language in which they had taken PET: Hebrew-speaking examinees (H) and Russian-speaking examinees (R ). The sample of first-year students included students only from departments with at least five students in each group. This criterion was met by 463 departments. The sample consisted of 55,434 (88%) Hebrew-speaking students and 7,313 (12%) Russian-speaking students. Table 1 shows the number of departments and the number of students from the two groups in each of eight general areas of study. The 463 departments were clustered according to content and/or administrative considerations. The Social Sciences were divided into departments which could be characterized as relatively “verbal” (i.e., Sociology, Political Sciences, International Relations, Psychology, Education) in contrast to those which could be characterized as “quantitative” (Economics, Statistics, Business Administration). The frequencies in Table 1 are of students for whom scores on PET and FGPA were provided and who began their studies between 1991 and 1995.

[Insert Table 1 about here]

The table shows that relatively a higher proportion of Russian-speaking examinees are found in the Natural and Nursing and a lower proportion in the “verbal” Social Sciences.

The next three tables present frequencies related to various variables for which data were available only for sub-groups of the above sample. Table 2 shows the number of departments and number of first-year students from the two language groups in each of eight areas of study for whom admissions scores were provided.

[Insert Table 2 about here]

For 48% of the total group that is presented in Table 1, admissions scores were provided.

The frequencies in Table 3 are of students for whom scores on PET and TGPA were provided.

[Insert Table 3 about here]

Table 3 shows that TGPA was provided for only 12% of the students for whom FGPA was available. TGPA was provided only for students who began their studies in 1991 or 1992. Table 4 presents the number of departments and number of third-year students from the two language groups in each of eight areas of study for whom admissions scores were provided.

[Insert Table 4 about here ]

Table 4 shows that for 40% of the total group that is presented in Table 3, admissions scores were also provided.

To conclude, the sample referring to examinees who had FGPA and took PET and the sample referring to the examinees for whom admissions scores were also provided were quite similar. The two samples referring to examinees who had TGPA were relatively small and less similar to each other.



## **Criteria**

Two criteria were used to investigate test bias: FGPA and TGPA, as reported by the universities. Both FGPA and TGPA were measured on a scale of 0-100. It should be noted that TGPA, unlike FGPA, is based mostly on elective courses and therefore, is expected to be less reliable than FGPA.

## **Procedure**

The unit of analysis was a single department within a university within a cohort (this implies that for the data presented in Table 1, for instance, each of the analyses was conducted 463 times). However, the findings are reported by area of study and across all departments, universities and cohorts. Statistics reported at the group level are weighted averages of the statistics computed for the single departments (the weight was the number of students in each unit of analysis). Each analysis was conducted on the maximal number of subjects available for this analysis (i.e., the correlation between PET and FGPA was computed for all students having both PET and FGPA scores; the correlation between Adm and TGPA was computed for all subjects having both Adm and TGPA scores).

The following results will be reported:

### ***Descriptive statistics***

Means and standard deviations of the criterion, and of the predictors will be presented. In addition, an effect size (d) was computed for each of the predictors (Cohen, 1988).

The effect size was defined as the standardized difference between the means of the two language groups (using the pooled standard deviation across the two groups).

Pearson product-moment correlation coefficients between each of the two criteria and each section of PET and the admissions score, were computed separately for each language group.

### ***Examination of bias***

For each of the departments within a university and cohort, boundary conditions were determined by an examination of the regression equations for the two language groups. The hypothesis of *no bias against* the minority group (Russian-speaking examinees) was rejected if the difference between the intercepts of the two regression equations of the *criterion* (i.e., FGPA) on the *predictor* (i.e., PET) was negative. In other words, the equation of Hebrew-speaking examinees has a lower intercept and therefore underpredicts for Russian-speaking examinees.

The hypothesis of *no bias in favor* of Russian-speaking examinees was rejected if the difference between the intercepts of the two regression equations of the *predictor* (i.e., PET) on the *criterion* (i.e., FGPA) was negative. The two language groups' regression equations were compared for deviation scores (from the majority group's mean), thereby obtaining the difference between regression lines at the center of the distribution, a meaningful locus for this examination.

For each area of study and across all departments, the number of departments where clear evidence of bias was found as well as the number of departments where no evidence of bias was found is reported. The remaining departments are left with a great deal of uncertainty with respect to the existence of bias within them.

Regression equations were constructed for Adm, PET, V, Q, and E. HP was relevant only for the Russian-speaking examinees and, therefore, it was not included in any of the regression equations mentioned above. The level of type 1 error for all of the significance tests was determined to be 0.05.

### ***Comparing mean prediction error***

All of the above analyses were conducted in departments containing at least five students from each language group. To examine the assumption that this sample is representative of a larger population of the two language groups, it was decided to compare mean prediction error for this sample to mean prediction error based on a larger sample that included all the departments containing at least two students from each of the two language groups. Table 5 presents the number of departments and number of students from the two groups in each of the eight areas of study in this sample. These frequencies are presented for students who had both a PET score and FGPA.

[Insert Table 5 about here]

It can be seen that for students who had FGPA, the proportion of Hebrew-speaking examinees increased by 29%, while the proportion of Russian speaking examinees increased by only 11% (compared to Table 1). The distribution of these students across areas of study remained about the same for the two language groups in the two samples.

For each department, a common regression line for all students was employed and the prediction error for each of the students included was calculated. The means

of the prediction errors were compared for the two language groups. This analysis was conducted using both FGPA and TGPA as criteria.

## **Results**

### **Means, standard deviations, and effect size**

Table 6 presents the means and standard deviations of FGPA, the admissions score, PET, V, Q, E and HP, for Hebrew- and Russian-speaking examinees who had both PET scores and FGPA. This information is presented for departments with at least five students from each language group and for departments with at least two students from each group, by area of study. In addition Table 6 presents the effect size for each of these variables.

[Insert Table 6 about here]

It can be seen that the two samples (that which consists of departments with at least five students from each of the language groups and that which consists of departments with at least two students) are quite similar. Therefore, it seems reasonable to assume that analyses conducted on the more limited sample provide a good representation of the entire population of the two language groups.

Across all departments, the effect found for FGPA was in favor of the Hebrew-speaking examinees; it was larger than all the predictors' effects, except for that of E. It was particularly large for Law and the Social Sciences (Verbal); it was relatively small for Medicine, Engineering, and the Natural Sciences. Regarding the

predictors, the smallest effect was found for the admissions score. The effect of PET was found to be 0.57 across all departments. It seems that the main contribution to this effect derives from the English section of the PET battery.

It is worth noting that while the standard deviation of FGPA was substantially larger for the Russian-speaking group than for the Hebrew-speaking group, the standard deviation of PET scores was slightly smaller for the former than for the latter (within most areas of study and across all departments).

Table 7 presents the means and standard deviations of TGPA, FGPA, the admissions score, PET, V, Q, E and HP, for Hebrew- and Russian-speaking examinees who had both PET scores and TGPA. This information is presented by area of study for departments with at least five students from each language group as well as for departments with at least two students from each group. In addition, it presents the effect size for each of these variables.

[Insert Table 7 about here]

The table shows that the group for which TGPA was available differs somewhat from the larger group for which FGPA was available. The sub-group of students for whom TGPA was available included students from only two cohorts and the number of departments on which the analysis was based was relatively small.

Across all departments and for each of the faculties, TGPA was higher than the FGPA. The effect size for the TGPA was smaller than for the FGPA, except in Nursing. The FGPA of this sub-group was slightly higher than that of the total group (see Table 6), but the predictors' means were lower than those of the total group. No

difference in the admissions score was found between the two language groups for the two samples.

Table 1 in Appendix A presents the same data for the group for whom an admissions score was also available. This sub-group resembles the total group who had PET and FGPA (presented in Table 6), and, therefore, the results regarding validity and prediction bias will be presented only for the total group.

### **Validity coefficients**

Table 8 presents the correlations of the criterion FGPA with the following predictors: admissions score (Adm), HP, PET, V, Q and E for the two language groups.

[Insert Table 8 about here]

It was decided not to correct the correlations for range restriction because the full range of variability for the two language groups was not known (generally, the variance of PET scores was smaller for the Russian-speaking group than for the Hebrew-speaking group; in 1997 the standard deviation of PET scores was 87 for the Russian-speaking examinees and 99 for the Hebrew-speaking examinees). Therefore, these correlations are probably underestimations of the true validity coefficients.

Generally, The validity coefficients obtained for the admissions score and PET for the Hebrew-speaking group in this study resemble validity coefficients obtained in predictive validity studies conducted routinely at NITE . The mean observed validity of the admissions score across a total of 1861 departments was 0.37 and that of PET (across test languages) was 0.31 (Kennet-Cohen,1995, 1998).

The table shows that in this study, across all departments and faculties, the validity coefficient of the admissions score was about the same for the two language groups (.37 and .38 for the Hebrew- and Russian-speaking examinees, respectively). This was also true for the PET total score. However, the validity coefficients of the PET sub-tests were somewhat different for the two language groups: While the validity of E was highest for the Russian-speaking group, it was lowest for the Hebrew-speaking group. The validity of HP turned out to be comparable to the validity coefficients of PET sub-tests and, in some cases even higher (in the Social Sciences - Verbal, Social Sciences - Quantitative, Law, and Nursing). HP was generally more valid than V (although it should be noted that HP does not serve as a selection tool, and is therefore, less affected by the selection process).

The validity of the admissions score was relatively high for Humanities, Natural Sciences and Engineering, and relatively low for Social Sciences - Quantitative and for Nursing. The picture with respect to the validity of PET in the various areas of study was quite similar to that obtained for the admissions score. Note that the number of Russian-speaking examinees in Law and Medicine was fairly small; therefore, not much weight should be given to results concerning these faculties.

Table 9 presents correlations of the criterion TGPA with the following predictors: admissions score (Adm), HP, PET, V, Q, and E for the two language groups.

[Insert Table 9 about here]

The sample for which the correlations in Table 9 were computed was different from that for which the correlations presented in Table 8 were computed. To compare the two sets of correlations, it was necessary to compute the correlations between the predictor variables and FGPA for the sample for which TGPA was available. These correlations appear in Table 10.

[Insert Table 10 about here]

Inspection of Tables 8 and 10 reveals that the validity of Adm using FGPA as a criterion was about the same for the two language groups in the two samples (note that this validity was not available for the entire relevant group). However, the validity of PET was higher for the two language groups who had both FGPA and TGPA (Table 10) than for that of the group who had only FGPA. Comparing Table 9 with Tables 8 and 10 reveals that, generally, the validity of all predictors tended to decline when computed using TGPA, rather than FGPA, as a criterion, and that this was true for each of the two language groups. The decline in the validity of Adm was more pronounced for the Hebrew-speaking examinees than for the Russian-speaking examinees. The weighted average correlations between FGPA and TGPA across all departments were 0.53 and 0.46 for the Hebrew- and Russian-speaking examinees, respectively. These correlations are somewhat lower than the correlation of 0.60 between FGPA and TGPA, reported by Kenett-Cohen, Bronner & Oren (1998) for all students across language of examination (five groups), cohorts (1984-1994), and area of study.



## Examination of Bias

Tables 11 and 12 present results regarding bias as described in the Method section pertaining to FGPA and TGPA, respectively. The following statistics are presented for each of the predictors, by area of study and across all areas of study: the total number of departments within which an examination of bias was conducted, the number of departments for which a clear bias *against* the Russian-speaking examinees was detected (scores for this group were clearly under-predicted), the number of departments for which a clear bias *in favor* of Russian-speaking examinees was detected (scores for this group were clearly over-predicted), and the number of departments for which no evidence of bias was found (departments for which no differences in slope, and/or in intercept were found for each of the two regression equations used to determine boundary states for bias). For the remaining departments, a great deal of uncertainty exists with respect to the degree of bias and its direction.

To avoid overloading Tables 11 and 12, information is presented in Tables 1 and 2 in Appendix B pertaining to the total number of departments (i.e., not only those in which clear bias was detected) for which the first regression equation overpredicted the criterion scores for the Russian-speaking examinees and regarding the number of departments for which the scores of the Hebrew-speaking examinees were overpredicted by the second regression equation. This information will be discussed in the text where judged to be relevant.

[Insert Table 11 about here]

[ Insert Table 12 about here]

### ***Bias in prediction of FGPA***

#### *The admissions Score*

Inspection of Table 11 reveals that for 46% of the 259 departments for which an examination of test bias was conducted using FGPA as the criterion, no indication of bias in the admissions score was found. In less than 10% of the 259 departments, a clear indication of bias was detected, mostly in favor of Russian-speaking examinees. For the remaining departments the assumption of no bias could not be rejected. An examination of the results of the two separate analyses concerning the two regression equations showed that the admissions score tended to be biased more often in favor of the Russian-speaking group than in favor of the Hebrew-speaking group (see Table 1 in Appendix B). While for 106 of the departments the first regression equation overpredicted the criterion scores of Russian-speaking examinees, for only eight of the departments were the scores of the Hebrew-speaking examinees overpredicted by the second (reverse) regression equation.

#### *PET total score*

The results obtained with respect to prediction bias for PET scores were only slightly different from those obtained for the admissions scores. For 39% of the 463 departments, no indication of bias was found. For 3% a clear indication of bias was detected against the Russian-speaking examinees, and for 2% a bias was found in their favor. Examination of the two regression equations revealed that in 148 departments the scores of Russian-speaking examinees were overpredicted according to the first equation. In an almost equal number of departments (149) the scores of Hebrew-speaking examinees were overpredicted according to the second equation.

### *PET sub-test scores*

An inspection of bias with respect to PET sub-tests reveals that in general, using Q and V as predictors does not seem to lead to bias in predicting FGPA. In the case of E, the results are more complicated. No indication of bias was found in only 22% of the departments. This result is substantially lower than that found for Q and V, and might be an indication of bias against the Russian-speaking examinees. Indeed, in 144 departments criterion scores of the Russian-speaking examinees were overpredicted according to the first equation (vs. 170 and 189 for V and Q, respectively) and in 265 departments criterion scores of the Hebrew-speaking examinees were overpredicted according to the second equation (vs. 87 and 32 for V and Q, respectively). However, since V and Q scores tend to overpredict the criterion scores for Russian-speaking examinees, the total score on PET seems to be an unbiased predictor.

### *Differential prediction bias regarding the various areas of study*

An inspection of the distribution of bias across the various areas of study indicates that, in general, there was a tendency of the admissions scores to overpredict the FGPA of Russian-speaking examinees in all areas of study. Within Social Sciences-Verbal relatively more bias was found in favor of the Russian-speaking examinees, and a relatively small number of departments with no indication of bias were found. Within the Natural Sciences and Engineering as well, relatively more bias in favor of Russian-speaking examinees was found, but, in more than two thirds of the departments, of both faculties, no indication of bias was found.

With respect to PET, Table 11 indicates that in the Humanities, Social Sciences - Verbal and in Nursing, there was a tendency to overpredict the FGPA of Russian-speaking examinees. In 45, 56, and 13 of the departments for the three faculties, respectively, a bias in favor of Russian-speaking examinees was detected based on the first equation; in 22, 7, and 2 of the departments, respectively, a bias against Russian-speaking examinees was detected based on the second equation. In Social Sciences-Quantitative, Natural Sciences and Engineering, there was a tendency to underpredict FGPA scores for Russian-speaking examinees. In 18, 8, and 3 of the departments in the three faculties, respectively, a bias in favor of Russian-speaking examinees was detected based on the first equation; in 29, 58, and 27 of the departments, respectively, a bias against Russian-speaking examinees was detected based on the second equation.

### ***Bias in predicting TGPA***

To be able to compare the degree of bias when FGPA was used as a criterion to the degree of bias when TGPA was used (see Table 12 and Table 2 in Appendix B), it was necessary to conduct the analyses on the same sample of examinees. Results obtained for examinees who had both FGPA and TGPA appear in Table 13.

[Insert Table 13 about here]

### ***The admissions score***

Generally, the admissions scores tended to be slightly less biased in favor of Russian-speaking examinees when TGPA was used as a criterion than when FGPA was used. In a larger proportion of the departments no indication of bias was found when TGPA

as compared to FGPA, was used as a criterion (68% of the departments for TGPA vs. 57% for FGPA). While in 16 out of the 37 departments a bias was found in favor of Russian-speaking examinees according to the first regression equation (the regression of FGPA on Adm), no bias was detected in any of the 37 departments according to the second equation (the regression of Adm on FGPA). When TGPA was used as the criterion, the relevant results were 10 and 0 for each equation respectively.

*PET total score and its sub-test scores*

Generally, PET scores tended to be slightly more biased against Russian-speaking examinees regarding TGPA than regarding FGPA. An examination of the results indicated that this phenomenon derived mainly from the English section of the battery. For FGPA, a bias in favor of Russian-speaking examinees based on the first equation was found in 21 departments, and a bias against this group was found in 48 departments; for TGPA, a bias in favor of Russian-speaking examinees was found in 16 departments, and a bias against this group was found in 55 departments. This phenomenon was not evident for the verbal and quantitative sections of PET although, to some degree, a tendency in the same direction was revealed: for FGPA, the number of departments where a bias was detected in favor of Russian-speaking examinees was 31 and 37 for V and Q respectively, and the number of departments in which a bias was detected against this group was 15 and 9 for the two sub-tests respectively. For TGPA, the number of departments in which a bias was detected in favor of Russian-speaking examinees was 22 and 17 for V and Q respectively, and the number of departments where a bias was detected against this group was 17 and 8 for the two sub-tests respectively. It can be concluded that there was less tendency for the PET

total score and its sub-test scores to be biased in favor of Russian-speaking examinees when TGPA was used as a criterion than when FGPA was used as a criterion.

#### *Differential prediction bias regarding the various areas of study*

An examination of the differential prediction of the various predictors, using TGPA as a criterion was limited because the number of departments involved was too small, especially with respect to the admissions score. However, it appears that the same pattern of bias found for FGPA was repeated for TGPA. Regarding the PET total score, bias in favor of Russian-speaking examinees was more prominent for Social Sciences - Verbal and Nursing: in Social Sciences-Verbal, bias in favor of Russian-speaking examinees was detected in five departments according to the first equation, and bias against this group was found in two departments according to the second equation. In all six departments in Nursing, bias was found in favor of Russian-speaking examinees. Bias against Russian-speaking examinees was more prominent within Social Sciences- Quantitative and Natural Sciences: while within only one department within Social Sciences-Q was bias in favor of the Russian speaking examinees detected based on the first equation, bias against this group was detected in eight of them based on the second equation. In Natural Sciences, bias in favor of the Russian-speaking examinees was detected in two departments, while bias against them was detected in 11 departments.

#### *Comparing mean prediction error*

Tables 14 and 15 present the mean prediction error (when FGPA was used as the criterion) for Hebrew- and Russian-speaking examinees in two samples, respectively: the first consisted of all the departments containing at least five students from each

language group (the sample on which previous analyses were conducted) and the second consisted of all the departments containing at least two students from each language group.

[Insert Table 14 about here]

[Insert Table 15 about here]

An examination of the two tables reveals a great deal of similarity between them within each of the areas of study as well as across all departments. These results support the previous generalization of results based on the more limited sample to the whole population of students from the two language groups. In both tables, results indicated overprediction of FGPA for Russian-speaking examinees based on all predictors. A larger bias in favor of the Russian-speaking group was found when the admissions score was used as a predictor than when PET alone was used as a predictor.

Tables 16 and 17 present the mean prediction error for members of the two language groups in the two samples as defined above when TGPA was used as a criterion.

[Insert Table 16 about here]

[Insert Table 17 about here]

The results in the two tables confirm the results reported above regarding the reduced bias with TGPA as a criterion as opposed to when FGPA was used.

### ***The contribution of HP in predicting FGPA and TGPA***

Table 18 presents the standardized regression coefficients of HP in addition to that of the admissions score or PET in the prediction equations of FGPA and TGPA, across all departments. The table also presents the number of departments (with at least five students from each language group that had taken HP) included in the analysis, the number of students, the squared multiple correlation ( $R^2$ ) of the predictor and HP, the adjusted squared multiple correlation. To make comparisons between the two criteria more accurate, the last row for each of the two predictors presents the same data, using FGPA as a criterion, but only for the sample of students who had TGPA in addition to FGPA. Results regarding the various areas of study are difficult to interpret because the sample sizes are too small; they are presented in Tables 1-6 in Appendix C for each of the predictors and criteria separately.

An inspection of the Table 18 reveals that the mean number of observations per department is fairly small. Therefore, the adjusted squared multiple correlation is a more accurate estimate of the true value. A comparison of the contribution of HP to the prediction of FGPA and TGPA with that of the other predictors indicates a substantial marginal contribution of this language proficiency test. As expected, its relative contribution to the prediction of FGPA is greater than its contribution to the prediction of TGPA.



## Discussion

Translating the Hebrew version of PET and adapting it to other languages has been a common practice in Israel for almost 30 years. Using an adapted version of a test requires that reliability and validity studies be conducted in the second language group as well as in the first language group. However, as was pointed out by Hambleton (1995) with respect to DIF studies, predictive validity studies are statistical studies, and therefore can only assist in identifying those areas which may contain problems of one kind or another. The matter of identifying the source of the problem or problems in these areas is left to further investigations.

This paper focused on the question of whether scores on measures used to make decisions regarding admissions to universities in Israel have equal predictive meaning for both Russian-speaking and Hebrew-speaking examinees. Specifically, predictive bias was examined in relation to the admissions score, PET and its components, and the Hebrew Proficiency Test score.

The findings of this study were affected by many factors, including both educationally relevant factors and statistical artifacts. Some of these factors were: (a) different criteria were used to determine admissions for members of the two groups; (b) while admissions are generally not determined based solely on one predictor, bias was examined for each of the predictors separately; (c) the groups on which analyses were conducted differed in composition depending on the predictors and criteria chosen, making comparisons more difficult; (d) the samples differed substantially in their size, and in many cases were quite small; (e) the two criteria, FGPA and TGPA, probably differ in their reliability, and (f) Although PET, the main predictor of

interest, is assumed to measure the same abilities within the two groups, measurement bias was not investigated in this study.

To control more efficiently for some of the factors affecting the current investigation and to reduce the degree of uncertainty, bias was examined by using more than one definition of bias and by using both freshman and junior year grades as criteria. In addition, the role of Hebrew proficiency in determining future academic success was examined. A relatively large sample that contained a fairly large number of departments was used to run the analyses, thereby increasing the degree of confidence in the results.

The results indicated that the Hebrew-speaking examinees performed better than the Russian-speaking examinees on both predictor and criterion measures. As expected, the difference between the groups decreased from the first year to the third year of studies. An overall impression of fairness in the admissions process is obtained by inspecting the means of the different variables. In general, the standardized effects related to the admissions score were much smaller than those related to the two criteria, indicating absence of bias against the minority group (which was our main concern). The same picture emerged in the examination of PET total score in conjunction with FGPA. However, results were less clear in the examination of PET total score in conjunction with TGPA.

In light of findings often reported in the literature that indicate overprediction of criterion scores for members of the minority group, an examination of bias was conducted using the two “contrasting” definitions suggested by Darlington (1971). Using those two definitions to determine boundary states for bias helped to balance the probability of detecting bias in favor of and against the minority group. Indeed, the number of cases for which bias in favor of Russian-speaking examinees was

detected was similar to the number of cases for which bias against them was detected. The hypothesis of absence of bias could be confidently rejected, for only a small number of departments, but even in these extreme cases, the picture was balanced: Bias was detected in favor of Russian-speaking examinees as often as against them. In general, if the predictors were to be ranked from the bottom to top, based on the degree of suspected bias involved in using them, the admissions score would be the least biased against Russian-speaking examinees while PET would be suspected to be more biased against them. Of the PET subtests, Q would be the least biased against Russian-speaking examinees and E would be the most biased.

As test constructors, our main interest lies in the fairness of using PET. The results consistently indicated that the Hebrew-speaking examinees out-performed Russian-speaking examinees on all three PET subtests. An inspection of the two groups' performance level indicated that, while the effect size for the quantitative section was relatively small and much smaller than the effect size for the criteria, the effect size for the English section was much larger than the effect size for the criteria. This finding implies that if bias in prediction against Russian-speaking examinees is suspected, one main factor contributing to it is the English section. However, the predictive validity of the English section for the Russian-speaking examinees turned out to be quite high, both in comparison to the validity of the other two sections and as compared to the validity among the Hebrew-speaking examinees.

The relatively high validity of the English section for the Russian-speaking group may be attributed to moderating variables not investigated in this study. For example, those students who immigrated to Israel from a major city with a good education system may have had a greater opportunity to learn English, as well as other students, than did immigrants who came from a remote town without a well

developed and modernized education system. It is also possible that some of the Russian-speaking examinees immigrated to Israel several years ago and have had the opportunity to become acquainted with the Israeli education system. This may be reflected in both their English score and in their criterion score. However, the relatively high validity of English for the Russian-speaking group could also be attributed to general language proficiency that is reflected both in the ability to master English and in the students' performance in universities, where instruction is exclusively in Hebrew. These examples imply that the relationship between English and the criteria within the minority group does not necessarily reflect the importance of English proficiency as a necessary ability for success in academic studies.

The achievement of the Russian-speaking examinees on the quantitative section was almost as high as that of the Hebrew-speaking examinees, and was relatively higher than their achievement on the verbal section. This could be attributed to their relative strength in the exact sciences. This inference is confirmed by the fact that a greater proportion of Russian-speaking examinees compared to Hebrew-speaking examinees study in the natural sciences and in the quantitative departments of the social sciences, areas which require a high level of quantitative ability. In addition, the quantitative section is less verbally loaded and therefore less affected by the translation process and by differences in cultural background.

Instruction in Israeli universities is conducted in Hebrew. The current study's findings indicate that mastery of Hebrew is, as expected, of great importance in determining academic success, both in the first year and in the third year of studies. Making causal inferences from this relationship is quite risky; it is possible that better mastery of Hebrew reflects higher motivation, which is also reflected by higher achievement in university studies.

In conclusion, no strong evidence of bias was found, either in favor of or against Russian-speaking examinees. However, as Linn (1984, p. 45) stated: “Models and empirical results are important for informing discussions of test use and interpretation, but cannot be expected to resolve the issues of values and social policy that are involved...Empirical results can provide persuasive evidence of bias in extreme cases; more often they will leave considerable room for judgment and debate.”

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**Table 1**  
**The Number of Departments and the Number of Hebrew-Speaking and Russian-Speaking Examinees by Area of Study Across Universities and Cohorts**  
**(in parentheses: percentages within each group)**

<b>Area of Study</b>	<b>No. of Departments</b>	<b>Hebrew</b>	<b>Russian</b>
<b>Humanities</b>	127	18,138 (33%)	2139 (29%)
<b>Social Sciences-Verbal</b>	82	13,044 (24%)	963 (13%)
<b>Social Sciences-Quantitative</b>	53	9,029 (16%)	1,074 (15%)
<b>Natural Sciences</b>	109	7,590 (14%)	1,783 (24%)
<b>Engineering</b>	46	3,842 (7%)	517 (7%)
<b>Law</b>	7	1,986 (4%)	52 (1%)
<b>Medicine</b>	9	588 (1%)	72 (1%)
<b>Nursing</b>	30	1,217 (2%)	713 (10%)
<b>All Departments</b>	463	55,434	7,313

**Table 2**  
**The Number of Departments and the Number of Hebrew-Speaking and Russian-Speaking Examinees by Area of Study Across Universities and Cohorts for Whom an Admissions Score Was Provided**

<b>Area of Study</b>	<b>No. of Departments</b>	<b>Hebrew</b>	<b>Russian</b>
<b>Humanities</b>	76	6,785 (25%)	899 (26%)
<b>Social Sciences-Verbal</b>	47	7,395 (28%)	539 (15%)
<b>Social Sciences-Quantitative</b>	36	5,361 (20%)	836 (24%)
<b>Natural Sciences</b>	55	4,031 (15%)	661 (19%)
<b>Engineering</b>	21	1,674 (6%)	234 (7%)
<b>Law</b>	4	958 (4%)	33 (1%)
<b>Medicine</b>	6	410 (2%)	54 (2%)
<b>Nursing</b>	14	171 (1%)	222 (6%)
<b>All Departments</b>	259	26,875	3,478

**Table 3**  
**The Number of Departments, Hebrew-Speaking and Russian-Speaking**  
**Examinees by Area of Study Across Universities and Cohorts for Whom a TGPA**  
**Score Was Provided (in parentheses: percentages within each group)**

<b>Area of Study</b>	<b>No. of Departments</b>	<b>Hebrew</b>	<b>Russian</b>
<b>Humanities</b>	23	1812 (27%)	268 (27%)
<b>Social Sciences- Verbal</b>	19	1843 (28%)	175 (17%)
<b>Social Sciences - Quantitative</b>	11	1373 (21%)	148 (15%)
<b>Natural Sciences</b>	20	943 (14%)	246 (24%)
<b>Engineering</b>	2	187 (3%)	12 (1%)
<b>Law</b>	-	-	-
<b>Medicine</b>	2	128 (2%)	10 (1%)
<b>Nursing</b>	6	326 (5%)	152 (15%)
<b>All Departments</b>	83	6612	1011

**Table 4**  
**Number of Departments, Hebrew-Speaking and Russian-Speaking Third Year**  
**Examinees by Area of Study Across Universities and Cohorts**  
**for Whom an Admissions Score Was Provided**

<b>Area of Study</b>	<b>No. of Departments</b>	<b>Hebrew</b>	<b>Russian</b>
<b>Humanities</b>	10	496 (18%)	100 (30%)
<b>Social Sciences- Verbal</b>	9	926 (34%)	78 (23%)
<b>Social Sciences- Quantitative</b>	7	650 (24%)	94 (28%)
<b>Natural Sciences</b>	6	287 (11%)	41 (12%)
<b>Engineering</b>	2	186 (7%)	10 (3%)
<b>Law</b>	-	-	-
<b>Medicine</b>	2	128 (5%)	10 (3%)
<b>Nursing</b>	1	14 (1%)	5 (1%)
<b>All Departments</b>	37	2687	338

**Table 5**  
**Number of Departments, Hebrew-Speaking (H) and Russian-Speaking (R ) First**  
**Year Students by Area of Study Across Universities and Cohorts**  
**for All Departments Containing At Least Two Examinees from Each Language**  
**Group (in parentheses: percentages within each group)**

<b>Area of Study</b>	<b>No. of Depts.</b>	<b>H</b>	<b>R</b>
<b>Humanities</b>	224	22,152 (31%)	2,434 (30%)
<b>Social Sciences - Verbal</b>	140	18,764 (26%)	1,136 (14%)
<b>Social Sciences - Quantitative</b>	63	9,924 (14%)	1,106 (14%)
<b>Natural Sciences</b>	151	8,998 (13%)	1,918 (24%)
<b>Engineering</b>	74	5,346 (7%)	605 (7%)
<b>Law</b>	13	3,544 (5%)	72 (1%)
<b>Medicine</b>	19	1,285 (2%)	98 (1%)
<b>Nursing</b>	42	1,489 (2%)	752 (9%)
<b>All Departments</b>	726	71,502	8,121

**Table 6**  
**Means, Standard Deviations (in parentheses), and Effect Size (d) of the Criterion (FGPA), Admissions Score (Adm), PET, V, Q, E and HP, for Hebrew Speaking- (H) and Russian Speaking- (R) Examinees Who Had Both PET Scores and FGPA, by Area of Study for Departments with at Least Five Students from Each Language Group and for Departments with at Least Two Students from Each Group**

Faculty	Var	Mean, SD, and d for Departments with N≥5*			Mean, SD, and d for Departments with N≥2		
		H	R	d	H	R	d
<b>Humanities</b>	FGPA	81.43 ( 8.13)	75.12 ( 9.83)	0.83	81.18 ( 8.13)	75.24 ( 9.93)	0.83
	Adm	93.69 ( 8.73)	92.61 ( 7.40)	0.13	93.70 ( 8.80)	92.36 ( 7.48)	0.16
	PET	552.81 (77.01)	514.23 (60.31)	0.43	551.81 (75.52)	515.20 (60.63)	0.42
	V	111.15 (15.23)	104.60 (13.18)	0.39	111.15 (15.07)	104.95 (13.16)	0.36
	Q	106.05 (16.54)	103.51 (13.69)	0.02	105.69 (16.27)	103.53 (13.85)	0.03
	E	111.62 (18.22)	95.76 (15.69)	0.88	111.45 (17.93)	95.88 (15.78)	0.90
	HP		90.63 (15.83)			90.90 (15.64)	
<b>Social Sciences - Verbal</b>	FGPA	82.21 ( 6.67)	74.71 ( 9.74)	1.16	82.34 ( 6.67)	74.88 ( 9.83)	1.11
	Adm	98.31 ( 6.35)	98.12 ( 5.47)	-0.05	98.92 ( 6.13)	98.60 ( 5.43)	-0.06
	PET	574.23 (56.37)	546.98 (47.02)	0.34	577.81 (55.62)	550.29 (46.59)	0.33
	V	115.08 (12.31)	110.08 (11.17)	0.28	115.74 (12.17)	110.70 (11.03)	0.28
	Q	110.55 (13.20)	110.44 (11.20)	-0.10	111.20 (13.08)	111.00 (11.46)	-0.12
	E	113.69 (15.95)	99.85 (16.44)	0.75	114.25 (15.73)	100.39 (16.07)	0.76
	HP		95.40 (15.50)			96.12 (15.64)	
<b>Social Sciences - Quantitative</b>	FGPA	77.38 (10.49)	68.07 (14.30)	0.57	77.35 (10.49)	68.16 (14.22)	0.60
	Adm	106.04 ( 5.09)	101.99 ( 5.01)	0.16	106.07 ( 5.03)	102.15 ( 4.97)	0.07
	PET	649.50 (43.70)	587.91 (42.57)	0.76	650.65 (43.22)	588.71 (42.53)	0.75
	V	124.26 (10.72)	113.92 (10.81)	0.50	124.42 (10.62)	114.10 (10.83)	0.48
	Q	129.55 ( 9.68)	122.76 ( 9.65)	0.28	129.77 ( 9.61)	122.89 ( 9.61)	0.27
	E	123.76 (13.69)	103.73 (15.36)	0.96	123.99 (13.55)	103.77 (15.39)	1.00
	HP		95.36 (15.67)			95.60 (15.65)	

\*Number of departments and examinees appear in Table 1 (for Adm see Table 2)

**Table 6 - Continued**

Faculty	Var	Mean, SD, and d for Departments with N≥5			Mean, SD, and d for Departments with N≥2		
		H	R	d	H	R	d
<b>Natural Sciences</b>	FGPA	76.74 (12.76)	71.33 (15.24)	0.33	76.56 (12.76)	71.36 (15.08)	0.31
	Adm	104.60 ( 6.76)	104.00 ( 6.94)	0.04	103.26 ( 6.72)	102.96 ( 7.12)	0.01
	PET	645.78 (51.11)	595.23 (54.81)	0.91	642.84 (51.33)	594.77 (54.40)	0.88
	V	123.74 (12.20)	115.00 (12.75)	0.63	123.28 (12.24)	114.95 (12.71)	0.60
	Q	127.87 (10.26)	125.61 (10.66)	0.33	127.26 (10.34)	125.51 (10.58)	0.31
	E	124.80 (14.84)	102.29 (17.51)	1.24	124.34 (14.86)	102.18 (17.45)	1.23
	HP		91.54 (15.91)			91.88 (15.78)	
<b>Engineering</b>	FGPA	77.76 ( 8.89)	75.63 (10.00)	0.26	77.44 ( 8.89)	75.48 (10.05)	0.25
	Adm	105.25 ( 6.45)	105.16 ( 6.85)	-0.15	101.90 ( 6.36)	103.84 ( 7.19)	-0.24
	PET	650.08 (46.67)	606.70 (48.90)	0.98	646.47 (47.02)	603.91 (49.62)	0.98
	V	122.06 (11.80)	116.20 (11.94)	0.53	121.62 (11.81)	115.75 (12.26)	0.57
	Q	131.88 ( 9.17)	129.38 ( 8.88)	0.30	131.16 ( 9.23)	128.86 ( 9.06)	0.30
	E	123.99 (14.39)	102.44 (17.89)	1.46	123.14 (14.50)	101.89 (17.83)	1.43
	HP		94.12 (16.62)			94.35 (17.24)	
<b>Law</b>	FGPA	79.59 ( 5.45)	72.91 ( 6.55)	1.45	79.65 ( 5.45)	73.09 ( 6.40)	1.21
	Adm	112.61 ( 3.04)	112.91 ( 3.19)	-0.00	111.66 ( 3.39)	112.73 ( 3.19)	-0.16
	PET	703.56 (31.94)	679.08 (36.34)	0.75	688.52 (41.30)	676.07 (35.53)	0.47
	V	134.97 ( 8.18)	129.00 (11.82)	0.68	132.84 ( 9.30)	129.11 (11.74)	0.42
	Q	136.01 ( 8.33)	133.67 ( 7.63)	0.27	133.24 ( 9.97)	132.88 ( 8.27)	0.13
	E	136.97 ( 8.87)	132.27 (10.39)	0.53	133.57 (10.75)	130.89 (11.86)	0.43
	HP		113.72 (15.09)			110.98 (17.33)	

\*Number of departments and examinees appear in Table 1 (for Adm see Table 2)

**Table 6 - Continued**

Faculty	Var	Mean, SD, and d for Departments with N≥5			Mean ,SD, and d for Departments with N≥2		
		H	R	d	H	R	d
<b>Medicine</b>	FGPA	82.62 ( 6.56)	82.97 ( 6.62)	0.02	84.42 ( 6.56)	83.28 ( 6.27)	0.09
	Adm	109.68 ( 3.09)	109.63 ( 3.09)	-0.15	112.24 ( 3.51)	110.91 ( 3.59)	-0.02
	PET	678.81 (29.83)	661.14 (30.29)	0.59	694.50 (28.69)	667.76 (30.13)	0.69
	V	129.77 ( 8.58)	126.86 ( 7.93)	0.36	132.72 ( 8.03)	127.42 ( 7.98)	0.57
	Q	132.87 ( 8.12)	132.18 ( 7.69)	0.10	135.25 ( 7.67)	133.42 ( 7.80)	0.10
	E	132.01 (10.11)	123.76 (12.88)	0.78	135.06 ( 9.57)	125.96 (11.53)	0.67
	HP		103.56 (14.96)			106.85 (14.43)	
<b>Nursing</b>	FGPA	80.78 ( 5.97)	75.70 ( 7.99)	0.70	81.28 ( 5.97)	75.89 ( 7.93)	0.69
	Adm	93.05 ( 5.49)	93.12 ( 4.59)	0.00	95.51 ( 4.98)	93.00 ( 4.61)	0.01
	PET	539.64 (47.47)	543.73 (44.05)	-0.11	554.22 (46.39)	545.14 (43.87)	-0.01
	V	108.46 (11.82)	108.44 (10.99)	-0.02	110.97 (11.52)	108.72 (10.85)	0.06
	Q	104.61 (11.75)	112.00 (10.81)	-0.73	107.36 (11.56)	112.10 (10.84)	-0.60
	E	108.26 (14.11)	97.14 (15.22)	0.77	110.64 (13.85)	97.61 (15.11)	0.76
	HP		91.68 (14.83)			92.47 (14.68)	
<b>All Departments</b>	FGPA	79.99 ( 8.77)	73.26 (11.89)	0.75	80.08 ( 8.77)	73.47 (11.77)	0.75
	Adm	100.69 ( 6.77)	99.23 ( 6.21)	0.05	100.70 ( 6.67)	99.02 ( 6.34)	0.01
	PET	599.52 (60.03)	561.15 (52.25)	0.57	600.28 (58.98)	561.56 (52.29)	0.54
	V	117.68 (12.91)	110.81 (12.14)	0.42	117.96 (12.74)	111.00 (12.13)	0.40
	Q	117.04 (13.12)	115.79 (11.43)	0.09	117.03 (12.97)	115.70 (11.54)	0.07
	E	117.80 (15.87)	100.20 (16.27)	0.94	117.93 (15.65)	100.36 (16.20)	0.93
	HP		92.71 (15.72)			93.24 (15.69)	

\*Number of departments and examinees appear in Table 1 (for Adm see Table 2)



**Table 7**  
**Means, Standard Deviations (in parentheses), and Effect Size (d) of the Criterion FGPA, the Criterion TGPA, Admissions Score (Adm), PET, V, Q, E and HP, for Hebrew-Speaking- (H) and Russian-Speaking (R ) Examinees Who Had PET Scores, FGPA, and TGPA, by Area of Study, for Departments with at Least Five Students from Each Language Group and for Departments with at Least Two Students from Each Group (for frequencies see Tables 3 and 4)**

Faculty	Var	Mean, SD, and d for Departments with N≥5*			Mean, SD, and d for Departments with N≥2		
		H	R	d	H	R	d
<b>Humanities</b>	TGPA	83.09 ( 7.26)	80.03 ( 7.52)	0.60	83.55 ( 6.97)	80.42 ( 7.59)	0.61
	FGPA	81.12 ( 6.88)	76.95 ( 7.10)	0.69	81.52 ( 6.46)	77.32 ( 6.65)	0.73
	Adm	96.08 ( 8.49)	92.64 ( 7.01)	0.14	94.91 ( 8.18)	92.30 ( 6.84)	0.17
	PET	546.69 (76.36)	499.61 (61.63)	0.39	547.08 (72.68)	502.04 (62.41)	0.47
	V	109.83 (15.06)	102.25 (13.84)	0.38	110.08 (14.57)	102.74 (13.84)	0.41
	Q	104.61 (16.89)	100.84 (14.06)	-0.04	104.31 (16.21)	101.10 (14.24)	0.03
	E	111.76 (17.33)	92.91 (14.89)	0.91	112.20 (16.67)	93.53 (15.17)	1.01
	HP		86.08 (14.35)			85.95 (14.40)	
<b>Social Sciences - Verbal</b>	TGPA	86.26 ( 4.95)	82.16 ( 6.07)	0.75	86.46 ( 5.07)	82.38 ( 6.10)	0.73
	FGPA	82.53 ( 5.19)	75.70 ( 6.59)	1.32	82.68 ( 5.32)	76.13 ( 6.39)	1.21
	Adm	97.60 ( 6.12)	97.48 ( 5.83)	-0.02	98.95 ( 5.72)	98.21 ( 5.80)	-0.03
	PET	564.31 (50.92)	520.74 (48.96)	0.56	573.01 (51.21)	529.81 (47.77)	0.51
	V	113.41 (11.60)	106.18 (11.12)	0.40	114.89 (11.44)	107.91 (11.05)	0.35
	Q	108.97 (12.87)	105.24 (12.75)	0.08	110.56 (12.76)	106.70 (13.01)	0.03
	E	111.38 (14.57)	94.81 (14.02)	0.93	112.94 (14.43)	96.47 (14.37)	0.94
	HP		89.30 (12.88)			90.32 (13.29)	
<b>Social Sciences - Quantitative</b>	TGPA	83.27 ( 7.75)	80.13 ( 8.65)	0.29	82.88 ( 7.32)	80.14 ( 8.30)	0.30
	FGPA	80.00 ( 7.88)	72.42 (10.35)	0.69	80.26 ( 7.43)	72.86 (10.00)	0.68
	Adm	102.73 ( 5.56)	98.48 ( 5.60)	0.33	104.10 ( 4.99)	99.68 ( 5.33)	-0.10
	PET	633.41 (45.85)	554.15 (47.88)	1.30	640.14 (43.07)	562.28 (46.94)	1.09
	V	121.16 (10.97)	108.02 (11.97)	0.82	122.62 (10.55)	109.63 (12.10)	0.67
	Q	127.51 (10.03)	117.80 (11.19)	0.72	128.74 ( 9.70)	119.03 (10.95)	0.57
	E	119.82 (13.56)	95.72 (16.04)	1.38	120.38 (13.29)	97.17 (15.76)	1.26
	HP		89.07 (14.60)			91.21 (14.17)	

**Table 7 - continued**

		Mean, SD, and d for Departments with N≥5*			Mean, SD, and d for Departments with N≥2		
<b>Faculty</b>	<b>Var</b>	<b>H</b>	<b>R</b>	<b>d</b>	<b>H</b>	<b>R</b>	<b>d</b>
<b>Natural Sciences</b>	TGPA	84.73 ( 8.63)	78.48 (11.54)	0.40	85.32 ( 8.01)	78.86 (11.23)	0.55
	FGPA	82.03 ( 7.53)	76.73 (10.78)	0.54	81.55 ( 7.53)	76.77 (10.56)	0.55
	Adm	105.90 ( 5.89)	104.89 ( 6.24)	0.27	102.30 ( 5.50)	103.74 ( 5.88)	-0.23
	PET	637.68 (50.40)	574.62 (54.25)	1.03	632.98 (50.51)	575.63 (52.82)	0.98
	V	122.63 (12.11)	111.30 (13.14)	0.76	121.80 (12.26)	111.61 (12.88)	0.67
	Q	126.87 (10.08)	123.15 ( 9.71)	0.37	125.84 (10.26)	123.18 ( 9.77)	0.36
	E	121.88 (15.04)	96.52 (17.33)	1.35	121.44 (14.76)	96.68 (17.08)	1.40
	HP		87.46 (15.12)			87.33 (14.72)	
<b>Engineering</b>	TGPA	81.89 ( 6.74)	81.90 ( 7.79)	-0.06	81.11 ( 7.32)	81.08 ( 7.50)	-0.04
	FGPA	82.19 ( 7.78)	80.98 ( 9.38)	0.08	80.60 ( 7.24)	77.92 (11.94)	0.34
	Adm	109.30 ( 3.84)	109.98 ( 3.83)	-0.18	107.46 ( 3.73)	109.14 ( 4.61)	-0.34
	PET	687.86 (32.45)	645.00 (35.01)	1.35	676.93 (33.86)	637.00 (35.52)	1.22
	V	128.91 ( 9.30)	122.83 (11.52)	0.68	127.18 ( 9.46)	122.13 (11.51)	0.56
	Q	137.95 ( 7.33)	134.42 ( 6.58)	0.49	136.36 ( 7.53)	132.69 ( 6.69)	0.50
	E	131.35 (10.87)	112.75 (20.65)	1.58	128.46 (11.53)	110.63 (18.26)	1.48
	HP		101.17 (15.18)			99.06 (18.26)	
<b>Law</b>	TGPA	. ( . )	. ( . )	.	79.99 ( 5.23)	79.76 ( 5.80)	0.03
	FGPA	. ( . )	. ( . )	.	79.69 ( 4.86)	74.11 ( 4.83)	1.02
	Adm	. ( . )	. ( . )	.	109.39 ( 4.02)	111.55 ( 3.77)	-0.52
	PET	. ( . )	. ( . )	.	690.73 (35.33)	675.46 (35.57)	0.31
	V	. ( . )	. ( . )	.	132.87 ( 8.41)	128.62 (10.02)	0.38
	Q	. ( . )	. ( . )	.	133.91 ( 9.47)	132.77 (11.24)	0.04
	E	. ( . )	. ( . )	.	134.09 ( 9.12)	131.54 ( 9.16)	0.24
	HP		. ( . )			113.73 (16.03)	

**Table 7 - Continued**

Faculty	Var	Mean, SD, and d for Departments with N≥5*			Mean, SD, and d for Departments with N≥2		
		H	R	d	H	R	d
<b>Medicine</b>	TGPA	87.64 ( 5.08)	86.55 ( 4.06)	0.35	86.96 ( 4.91)	86.40 ( 4.05)	0.16
	FGPA	83.71 ( 6.46)	81.34 ( 5.22)	0.41	85.46 ( 5.84)	82.95 ( 6.48)	0.31
	Adm	111.15 ( 3.10)	112.94 ( 3.11)	-0.72	112.98 ( 2.90)	113.21 ( 2.91)	-0.24
	PET	686.30 (29.27)	665.00 (34.50)	0.69	695.69 (28.00)	669.93 (29.03)	0.87
	V	130.44 ( 8.46)	130.10 ( 9.25)	0.02	132.13 ( 7.99)	128.47 ( 7.80)	0.59
	Q	135.33 ( 8.25)	131.30 ( 9.39)	0.47	136.96 ( 7.63)	133.00 ( 8.38)	0.45
	E	132.43 ( 8.98)	122.90 ( 7.18)	1.07	133.99 ( 9.48)	127.07 ( 6.50)	0.56
	HP		104.80 (11.95)			107.80 (11.06)	
<b>Nursing</b>	TGPA	86.75 ( 3.84)	83.22 ( 4.00)	1.15	86.64 ( 3.67)	82.86 ( 3.94)	1.11
	FGPA	83.82 ( 4.73)	78.65 ( 4.95)	0.93	83.96 ( 4.59)	78.29 ( 5.16)	0.98
	Adm	88.31 ( 2.39)	92.55 ( 6.77)	-1.09	97.60 ( 3.80)	91.88 ( 4.67)	-0.39
	PET	559.73 (42.21)	548.03 (50.90)	0.06	570.09 (42.20)	547.33 (48.45)	0.20
	V	111.04 (10.54)	109.88 (11.25)	-0.08	113.48 (10.38)	110.08 (11.04)	0.09
	Q	108.94 (11.04)	113.05 (12.30)	-0.59	110.40 (11.09)	112.43 (11.88)	-0.46
	E	112.19 (12.37)	95.93 (15.63)	1.15	113.56 (12.27)	96.16 (15.06)	1.13
	HP		83.24 (14.88)			83.92 (14.11)	
<b>All Departments</b>	TGPA	84.48 ( 6.85)	80.60 ( 8.25)	0.56	84.28 ( 6.39)	80.84 ( 7.96)	0.53
	FGPA	81.63 ( 6.72)	76.36 ( 8.36)	0.83	81.63 ( 6.29)	76.55 ( 8.02)	0.85
	Adm	100.85 ( 6.24)	97.98 ( 6.10)	0.08	101.90 ( 5.68)	97.97 ( 5.85)	-0.11
	PET	589.92 (57.04)	540.15 (53.75)	0.73	601.81 (53.63)	543.87 (52.84)	0.65
	V	116.00 (12.44)	107.64 (12.52)	0.50	118.23 (11.83)	108.51 (12.37)	0.46
	Q	115.51 (12.98)	112.05 (12.08)	0.20	117.44 (12.44)	112.22 (12.17)	0.16
	E	115.75 (14.98)	95.52 (15.68)	1.11	117.92 (14.20)	96.70 (15.45)	1.02
	HP		87.36 (14.41)			88.23 (14.23)	

**Table 8**  
**Validity Coefficients for the Predictors: Admissions Score, HP, PET, V, Q, and E**  
**Using FGPA as the Criterion, for Hebrew- (H) and Russian-Speaking ( R)**  
**Examinees Who Had Both PET Scores and FGPA, by Area of Study for**  
**Departments with at Least Five Students from Each Language Group**

		Adm	HP	PET	V	Q	E
Humanities	H	0.43	.	0.33	0.31	0.27	0.24
	R	0.41	0.23	0.29	0.23	0.17	0.29
Social Sciences - Verbal	H	0.31	.	0.23	0.19	0.21	0.07
	R	0.38	0.31	0.25	0.12	0.15	0.25
Social Sciences - Quantitative	H	0.32	.	0.21	0.10	0.29	0.01
	R	0.29	0.21	0.19	0.05	0.19	0.15
Natural Sciences	H	0.43	.	0.28	0.18	0.31	0.12
	R	0.44	0.20	0.32	0.20	0.30	0.22
Engineering	H	0.40	.	0.24	0.14	0.30	0.08
	R	0.48	0.27	0.30	0.14	0.32	0.25
Law	H	0.34	.	0.15	0.13	0.11	0.02
	R	0.38	0.33	0.27	0.11	0.22	0.22
Medicine	H	0.30	.	0.07	-0.02	0.16	-0.05
	R	0.46	-0.14	0.28	0.06	-0.01	0.54
Nursing	H	0.33	.	0.28	0.21	0.26	0.04
	R	0.28	0.25	0.21	0.09	0.12	0.23
All Departments	H	0.37	.	0.26	0.21	0.26	0.12
	R	0.38	0.23	0.27	0.16	0.21	0.24

**Table 9**  
**Validity Coefficients for the Predictors: Admissions Score, HP, PET, V, Q, and E, Using TGPA as a Criterion for Hebrew - (H) and Russian-Speaking ( R) Examinees Who Had Both PET Scores and TGPA, by area of Study for Departments with at Least Five Students from Each Language Group**

		Adm	HP	PET	V	Q	E
Humanities	H	0.42	.	0.35	0.33	0.25	0.28
	R	0.36	0.19	0.31	0.26	0.17	0.35
Social Sciences - Verbal	H	0.21	.	0.18	0.14	0.15	0.07
	R	0.34	0.16	0.35	0.21	0.34	0.12
Social Sciences - Quantitative	H	0.23	.	0.08	0.05	0.10	0.04
	R	0.27	0.31	0.29	0.12	0.11	0.32
Natural Sciences	H	0.32	.	0.20	0.15	0.19	0.12
	R	0.12	0.15	0.17	0.13	0.11	0.13
Engineering	H	0.33	.	-0.01	-0.14	0.18	-0.04
	R	0.71	0.44	-0.13	-0.18	0.21	-0.00
Medicine	H	0.27	.	-0.02	-0.07	0.04	-0.01
	R	0.64	-0.57	0.32	-0.07	0.33	0.44
Nursing	H	0.34	.	0.17	0.18	0.08	0.07
	R	0.71	0.29	0.25	0.12	0.25	0.16
All Departments	H	0.28	.	0.20	0.16	0.17	0.12
	R	0.33	0.20	0.26	0.17	0.19	0.22

**Table 10**  
**Validity Coefficients for the Predictors: Admissions Score, HP, PET, V, Q, and E, Using FGPA as a Criterion for Hebrew - (H) and Russian-Speaking- ( R) Examinees Who Had Both PET Scores and TGPA, by Area of Study for Departments with at Least Five Students from Each Language Group**

		Adm	HP	PET	V	Q	E
Humanities	H	0.42	.	0.37	0.35	0.29	0.26
	R	0.38	0.20	0.33	0.27	0.22	0.30
Social Sciences - Verbal	H	0.39	.	0.28	0.20	0.24	0.13
	R	0.51	0.35	0.42	0.29	0.29	0.33
Social Sciences - Quantitative	H	0.28	.	0.23	0.12	0.28	0.08
	R	0.27	0.24	0.29	0.13	0.23	0.17
Natural Sciences	H	0.47	.	0.36	0.25	0.36	0.18
	R	0.29	0.18	0.34	0.22	0.30	0.25
Engineering	H	0.36	.	0.05	-0.09	0.22	-0.01
	R	0.58	0.46	-0.05	-0.38	0.44	0.30
Medicine	H	0.42	.	0.03	-0.02	0.06	0.01
	R	0.63	-0.72	0.60	0.26	0.30	0.82
Nursing	H	0.63	.	0.30	0.22	0.28	0.05
	R	0.96	0.33	0.37	0.21	0.31	0.26
All Departments	H	0.38	.	0.30	0.22	0.28	0.15
	R	0.39	0.24	0.35	0.22	0.27	0.27

**Table 11**  
**Total Number of Departments, Total Number of Students, Number of**  
**Departments where Bias was Found Against Russian-Speaking Examinees,**  
**Number of Departments Where Bias Was Found in Favor of Russian-Speaking**  
**Examinees, and Number of Departments Where no Indication of Bias Was**  
**Found, by Area of Study (using FGPA as a criterion)**

Faculty	Predictor	N of Depart	Total N	Against R	in favor of R	No Bias
<b>Humanities</b>	Adm	76	7774	0	4	33
	PET	127	20277	0	1	63
	V	127	20277	0	0	65
	Q	127	20277	1	10	61
	E	127	20277	0	0	38
<b>Social Sciences - Verbal</b>	Adm	47	7934	1	8	8
	PET	82	14007	0	2	21
	V	82	14007	0	3	19
	Q	82	14007	0	12	17
	E	82	14007	0	0	14
<b>Social Sciences - Quantitative</b>	Adm	36	6197	0	1	13
	PET	53	10103	0	2	11
	V	53	10103	0	0	18
	Q	53	10103	0	3	24
	E	53	10103	0	1	8
<b>Natural Sciences</b>	Adm	55	4692	0	5	43
	PET	109	9373	12	1	43
	V	109	9373	1	0	62
	Q	109	9373	2	1	69
	E	109	9373	6	0	22
<b>Engine</b>	Adm	21	1908	0	3	15
	PET	46	4359	2	0	19
	V	46	4359	0	0	29
	Q	46	4359	1	0	30
	E	46	4359	1	0	3
<b>Law</b>	Adm	4	991	0	0	2
	PET	7	2038	0	0	1
	V	7	2038	0	0	1
	Q	7	2038	0	0	1
	E	7	2038	0	0	2
<b>Medicine</b>	Adm	6	464	1	1	4
	PET	9	660	1	0	5
	V	9	660	1	0	5
	Q	9	660	1	0	8
	E	9	660	0	0	3
<b>Nursing</b>	Adm	14	393	0	1	2
	PET	30	1930	0	4	16
	V	30	1930	0	4	13
	Q	30	1930	0	7	8
	E	30	1930	0	0	12
<b>All Departments</b>	Adm	259	30353	2	23	120
	PET	463	62747	15	10	179
	V	463	62747	2	7	212
	Q	463	62747	5	33	218
	E	463	62747	7	1	102

**Table 12**  
**Total Number of Departments, Total Number of Students, Number of**  
**Departments Where Bias Was Found Against Russian-Speaking Examinees,**  
**Number of Departments Where Bias Was Found in Favor of Russian-Speaking**  
**Examinees, and Number of Departments Where no Indication of Bias Was**  
**Found, by Area of Study (using TGPA as the Criterion)**

<b>Faculty</b>	<b>Predictor</b>	<b>N of Depart</b>	<b>Total N</b>	<b>Against R</b>	<b>In favor of R</b>	<b>No Bias</b>
<b>Humanities</b>	Adm	10	596	1	0	7
	PET	23	2080	1	0	16
	V	23	2080	1	0	17
	Q	23	2080	0	0	16
	E	23	2080	2	0	8
<b>Social Sciences - Verbal</b>	Adm	9	1004	0	1	5
	PET	19	2018	1	0	10
	V	19	2018	0	0	10
	Q	19	2018	1	0	5
	E	19	2018	0	0	6
<b>Social Sciences - Quantitative</b>	Adm	7	744	0	0	5
	PET	11	1521	1	0	2
	V	11	1521	0	0	6
	Q	11	1521	0	0	7
	E	11	1521	1	0	3
<b>Natural Sciences</b>	Adm	6	328	0	0	5
	PET	20	1189	0	0	7
	V	20	1189	0	0	9
	Q	20	1189	0	0	12
	E	20	1189	1	0	3
<b>Engine</b>	Adm	2	196	0	0	2
	PET	2	199	0	0	0
	V	2	199	0	0	1
	Q	2	199	0	0	2
	E	2	199	0	0	0
<b>Med</b>	Adm	2	138	0	1	1
	PET	2	138	0	0	0
	V	2	138	0	0	1
	Q	2	138	0	0	0
	E	2	138	0	0	0
<b>Nursing</b>	Adm	1	19	0	1	0
	PET	6	478	0	2	0
	V	6	478	0	2	0
	Q	6	478	0	2	0
	E	6	478	0	0	0
<b>All Departments</b>	Adm	37	3025	1	3	25
	PET	83	7623	3	2	35
	V	83	7623	1	2	44
	Q	83	7623	1	2	42
	E	83	7623	4	0	20



**Table 13**  
**Total Number of Departments, Total Number of Students, Number of Departments Where Bias Was Found Against Russian-Speaking Examinees, Number of Departments Where Bias Was Found in Favor of Russian-Speaking Examinees, and Number of Departments Where no Indication of Bias Was Found, by Area of Study (FGPA was used as the Criterion for examinees having both FGPA and TGPA)**

Faculty	Predictor	N of Depart	Total N	Against R	in favor of R	No Bias
<b>Human</b>	Adm	10	596	0	0	6
	PET	23	2080	0	0	16
	V	23	2080	0	0	16
	Q	23	2080	0	0	11
	E	23	2080	0	0	11
<b>Social Sciences - Verbal</b>	Adm	9	1004	0	3	1
	PET	19	2018	0	1	4
	V	19	2018	0	1	4
	Q	19	2018	0	2	4
	E	19	2018	1	0	3
<b>Social Sciences - Quantitative</b>	Adm	7	744	0	0	5
	PET	11	1521	0	0	4
	V	11	1521	0	0	5
	Q	11	1521	0	0	5
	E	11	1521	0	0	2
<b>Natural Sciences</b>	Adm	6	328	0	0	6
	PET	20	1189	2	0	7
	V	20	1189	0	0	9
	Q	20	1189	1	0	12
	E	20	1189	0	0	3
<b>Engine</b>	Adm	2	196	0	0	2
	PET	2	199	0	0	0
	V	2	199	0	0	0
	Q	2	199	0	0	2
	E	2	199	0	0	0
<b>Med</b>	Adm	2	138	0	1	1
	PET	2	138	0	0	1
	V	2	138	0	0	1
	Q	2	138	0	0	2
	E	2	138	0	0	1
<b>Nursing</b>	Adm	1	19	0	1	0
	PET	6	478	0	3	1
	V	6	478	0	2	0
	Q	6	478	0	3	0
	E	6	478	0	0	1
<b>All Departments</b>	Adm	37	3025	0	5	21
	PET	83	7623	2	4	33
	V	83	7623	0	3	35
	Q	83	7623	1	5	36
	E	83	7623	1	0	21

**Table 14**  
**Mean Prediction Error of Hebrew- and Russian-Speaking Examinees for the**  
**Admissions Score (Adm), PET, V, Q, and E Using FGPA as a Criterion for**  
**Departments Containing at Least Five Examinees from Each Language Group**

		N of Depts.	N	Adm	PET	V	Q	E
<b>Humanities</b>	H	127	18138	0.05	0.05	0.05	0.06	0.04
	R	127	2139	-0.42	-0.42	-0.45	-0.54	-0.34
<b>Social Sciences - Verbal</b>	H	82	13044	0.07	0.07	0.07	0.07	0.07
	R	82	963	-1.10	-0.91	-0.94	-1.00	-0.88
<b>Social Sciences - Quantitative</b>	H	53	9029	0.05	0.04	0.05	0.05	0.04
	R	53	1074	-0.35	-0.30	-0.40	-0.38	-0.35
<b>Natural Sciences</b>	H	109	7590	0.02	0.00	0.02	0.03	0.01
	R	109	1783	-0.13	-0.00	-0.10	-0.13	-0.05
<b>Engineering</b>	H	46	3842	0.01	-0.00	0.02	0.02	0.01
	R	46	517	-0.09	0.01	-0.14	-0.13	-0.04
<b>Law</b>	H	7	1986	0.03	0.03	0.03	0.03	0.03
	R	7	52	-0.87	-1.03	-1.07	-1.12	-1.13
<b>Medicine</b>	H	9	588	-0.01	-0.00	0.00	0.00	0.00
	R	9	72	0.07	0.03	-0.00	-0.03	-0.00
<b>Nursing</b>	H	30	1217	0.40	0.21	0.21	0.22	0.16
	R	30	713	-0.35	-0.36	-0.35	-0.38	-0.27
<b>All Departments</b>	H	463	55434	0.05	0.04	0.05	0.06	0.04
	R	463	7313	-0.42	-0.33	-0.39	-0.43	-0.32

**Table 15**  
**Mean Prediction Error of Hebrew- and Russian-Speaking Examinees for the**  
**Admissions Score (Adm), PET, V, Q, and E Using FGPA as a Criterion for**  
**Departments Containing at Least Two Examinees from Each Language Group**

		N of Depts.	N	Adm	PET	V	Q	E
<b>Humanities</b>	H	224	22152	0.05	0.05	0.05	0.06	0.04
	R	224	2434	-0.42	-0.42	-0.45	-0.54	-0.33
<b>Social Sciences - Verbal</b>	H	140	18764	0.06	0.06	0.06	0.06	0.05
	R	140	1136	-1.06	-0.91	-0.93	-1.00	-0.88
<b>Social Sciences - Quantitative</b>	H	63	9924	0.05	0.03	0.05	0.04	0.04
	R	63	1106	-0.36	-0.31	-0.41	-0.39	-0.36
<b>Natural Sciences</b>	H	151	8998	0.01	-0.00	0.02	0.03	0.01
	R	151	1918	-0.12	0.00	-0.10	-0.13	-0.04
<b>Engineering</b>	H	74	5346	0.01	-0.00	0.01	0.01	0.00
	R	74	605	-0.07	0.02	-0.13	-0.13	-0.03
<b>Law</b>	H	13	3544	0.02	0.02	0.02	0.02	0.02
	R	13	72	-1.01	-1.00	-1.02	-1.08	-1.08
<b>Medicine</b>	H	19	1285	0.00	0.00	0.00	0.01	0.01
	R	19	98	-0.01	-0.02	-0.05	-0.09	-0.07
<b>Nursing</b>	H	42	1489	0.26	0.18	0.17	0.19	0.14
	R	42	752	-0.34	-0.35	-0.35	-0.37	-0.27
<b>All Departments</b>	H	726	71502	0.04	0.04	0.04	0.05	0.04
	R	726	8121	-0.41	-0.33	-0.39	-0.44	-0.32

**Table 16**  
**Mean Prediction Error of Hebrew- (H) and Russian-Speaking (R ) Examinees**  
**for the Admissions Score (Adm), PET, V, Q, and E Using TGPA as a Criterion**  
**for Departments Containing at Least Five Examinees from Each Language**  
**Group**

	Lang	N of Depts.	N	Adm	PET	V	Q	E
<b>Humanities</b>	H	23	1812	0.05	0.03	0.04	0.05	0.02
	R	23	268	-0.25	-0.23	-0.26	-0.37	-0.11
<b>Social Sciences - Verbal</b>	H	19	1843	0.05	0.04	0.05	0.05	0.04
	R	19	175	-0.58	-0.42	-0.49	-0.53	-0.46
<b>Social Sciences - Quantitative</b>	H	11	1373	0.03	0.01	0.01	0.01	0.01
	R	11	148	-0.18	-0.06	-0.13	-0.13	-0.08
<b>Natural Sciences</b>	H	20	943	0.04	0.03	0.04	0.06	0.03
	R	20	246	-0.29	-0.10	-0.17	-0.21	-0.11
<b>Engineering</b>	H	2	187	-0.01	-0.00	0.00	-0.01	-0.00
	R	2	12	0.27	0.02	-0.07	0.12	0.00
<b>Medicine</b>	H	2	128	0.02	0.02	0.02	0.01	0.01
	R	2	10	-0.24	-0.22	-0.22	-0.19	-0.17
<b>Nursing</b>	H	6	326	0.43	0.24	0.25	0.25	0.18
	R	6	152	-1.20	-0.51	-0.53	-0.53	-0.38
<b>All Departments</b>	H	83	6612	0.04	0.04	0.05	0.05	0.03
	R	83	1011	-0.31	-0.25	-0.30	-0.34	-0.21

**Table 17**  
**Mean Prediction Error of Hebrew- (H) and Russian-Speaking (R ) Examinees**  
**for the Admissions Score (Adm), PET, V, Q, and E Using TGPA as a Criterion**  
**for Departments Containing at Least Two Examinees from Each Language**  
**Group**

	Lang	N of Depts.	N	Adm	PET	V	Q	E
<b>Humanities</b>	H	49	2652	0.04	0.03	0.03	0.04	0.01
	R	49	335	-0.25	-0.21	-0.25	-0.36	-0.11
<b>Social Sciences - Verbal</b>	H	39	3182	0.04	0.03	0.04	0.04	0.03
	R	39	232	-0.60	-0.46	-0.52	-0.56	-0.47
<b>Social Sciences - Quantitative</b>	H	16	1986	0.02	0.01	0.01	0.01	0.01
	R	16	166	-0.18	-0.10	-0.17	-0.16	-0.10
<b>Natural Sciences</b>	H	26	1218	0.02	0.02	0.04	0.05	0.03
	R	26	268	-0.20	-0.11	-0.18	-0.23	-0.13
<b>Engineering</b>	H	3	250	-0.01	0.00	0.00	-0.00	0.00
	R	3	16	0.27	-0.04	-0.07	0.08	-0.06
<b>Law</b>	H	4	1036	0.00	-0.00	-0.00	0.00	0.00
	R	4	13	-0.50	0.03	0.04	-0.03	-0.00
<b>Medicine</b>	H	4	269	0.01	0.01	0.01	0.01	0.01
	R	4	15	-0.16	-0.14	-0.11	-0.14	-0.14
<b>Nursing</b>	H	10	425	0.19	0.20	0.21	0.21	0.16
	R	10	178	-0.53	-0.49	-0.51	-0.51	-0.38
<b>All Departments</b>	H	151	11018	0.03	0.03	0.03	0.04	0.02
	R	151	1223	-0.31	-0.26	-0.31	-0.35	-0.22

**Table 18**

**$R^2$ , Adjusted  $R^2$ , and the Regression Coefficients of HP, Adm and PET in the Prediction Equations of First- and Third-Year GPA for Departments Containing at Least Five Students With an HP Score**

<b>Criterion</b>	<b>N of Departments</b>	<b>Total N</b>	<b><math>R^2</math></b>	<b>Adj <math>R^2</math></b>	<b>beta Predict</b>	<b>beta HP</b>
<b>Adm</b>						
<b>FGPA</b>	219	2542	0.32	0.21	0.32	0.12
<b>TGPA</b>	36	324	0.30	0.16	0.32	0.03
<b>FGPA*</b>	36	324	0.36	0.21	0.33	0.11
<b>PET</b>						
<b>FGPA</b>	407	6009	0.26	0.16	0.24	0.17
<b>TGPA</b>	80	962	0.26	0.14	0.29	0.14
<b>FGPA*</b>	80	962	0.31	0.19	0.34	0.15

\* Data for the sample of students who also had TGPA

## Appendix A

**Table 1**  
**Means, Standard deviations (in parentheses), and Effect Size (d) of the Criterion (FGPA), Admissions Score (Adm), PET, V, Q, E and HP, for Hebrew Speaking- (H) and Russian-Speaking- (R ) Examinees Who Have Obtained PET Scores, an Admissions Score and FGPA, and Study in Departments With At Least Five Students from Both Language Groups or in Departments With At Least Two Students from Both Groups, by Area of Study**

Faculty	Var	Mean, SD, and d for Departments with N≥5*			Mean, SD, and d for Departments with N≥2		
		H	R	d	H	R	d
<b>Humanities</b>	FGPA	80.79 ( 7.99)	74.21 (10.06)	0.63	80.78 ( 7.99)	74.67 (10.03)	0.69
	Adm	93.69 ( 8.73)	92.61 ( 7.40)	0.13	93.70 ( 8.80)	92.36 ( 7.48)	0.16
	PET	561.54 (69.82)	522.65 (57.52)	0.37	561.75 (69.80)	524.21 (58.61)	0.38
	V	112.72 (14.47)	106.36 (12.78)	0.31	112.95 (14.40)	106.73 (12.81)	0.32
	Q	105.94 (15.37)	102.90 (13.28)	0.01	106.04 (15.35)	103.38 (13.55)	0.02
	E	116.39 (16.91)	100.92 (15.27)	0.73	115.92 (16.90)	100.62 (15.56)	0.77
	HP		91.97 (15.71)			92.66 (15.64)	
<b>Social Sciences - Verbal</b>	FGPA	81.81 ( 6.05)	74.27 ( 9.67)	1.25	82.20 ( 6.05)	74.88 ( 9.34)	1.14
	Adm	98.31 ( 6.35)	98.12 ( 5.47)	-0.05	98.92 ( 6.13)	98.60 ( 5.43)	-0.06
	PET	578.59 (55.99)	561.10 (46.41)	0.27	589.71 (54.02)	566.05 (46.15)	0.32
	V	116.07 (12.26)	112.76 (10.66)	0.23	117.81 (11.91)	113.52 (10.57)	0.28
	Q	110.83 (13.21)	111.37 (11.22)	-0.08	112.76 (12.91)	112.23 (11.36)	-0.06
	E	115.00 (15.88)	105.11 (16.99)	0.57	117.48 (15.24)	106.22 (16.64)	0.63
	HP		98.31 (15.01)			98.91 (15.70)	
<b>Social Sciences - Quantitative</b>	FGPA	77.32 (10.29)	67.45 (14.32)	0.52	77.69 (10.29)	67.66 (14.22)	0.49
	Adm	106.04 ( 5.09)	101.99 ( 5.01)	0.16	106.07 ( 5.03)	102.15 ( 4.97)	0.07
	PET	643.03 (45.24)	580.86 (41.71)	0.68	647.40 (44.25)	582.16 (41.56)	0.71
	V	122.94 (11.01)	112.74 (10.67)	0.45	123.73 (10.82)	112.95 (10.70)	0.46
	Q	128.53 ( 9.85)	121.60 ( 9.49)	0.28	129.19 ( 9.73)	121.79 ( 9.45)	0.33
	E	122.72 (14.02)	102.16 (14.67)	0.80	123.66 (13.68)	102.52 (14.59)	0.80
	HP		94.85 (15.11)			95.38 (15.39)	

\* Number of departments and examinees appears in Table 2

**Table 1 - Continues**

Faculty	Var	Mean, SD, and d for Departments with N≥5*			Mean, SD, and d for Departments with N≥2		
		H	R	d	H	R	d
Natural Sciences	FGPA	77.90 (12.56)	74.26 (12.69)	0.17	77.55 (12.56)	74.55 (12.95)	0.14
	Adm	104.60 ( 6.76)	104.00 ( 6.94)	0.04	103.26 ( 6.72)	102.96 ( 7.12)	0.01
	PET	663.23 (48.62)	627.22 (48.67)	0.75	655.88 (48.96)	622.07 (49.03)	0.74
	V	126.78 (11.77)	119.74 (11.79)	0.59	125.55 (11.82)	118.93 (11.82)	0.61
	Q	130.52 ( 9.72)	130.09 ( 9.42)	0.16	129.22 ( 9.98)	129.19 ( 9.57)	0.15
	E	128.77 (13.97)	112.06 (16.23)	1.00	127.36 (13.99)	110.93 (16.37)	0.97
	HP		95.93 (16.28)			94.69 (16.17)	
Engineering	FGPA	79.71 ( 8.49)	78.58 ( 9.15)	0.13	78.60 ( 8.49)	78.65 ( 8.66)	0.04
	Adm	105.25 ( 6.45)	105.16 ( 6.85)	-0.15	101.90 ( 6.36)	103.84 ( 7.19)	-0.24
	PET	674.15 (40.78)	627.33 (46.12)	1.09	661.32 (42.37)	621.98 (46.98)	1.04
	V	126.33 (11.02)	118.61 (11.77)	0.65	124.22 (11.15)	117.70 (11.65)	0.67
	Q	135.45 ( 8.04)	132.77 ( 7.69)	0.29	133.36 ( 8.64)	131.68 ( 8.08)	0.25
	E	129.52 (12.60)	109.09 (18.21)	1.51	126.61 (13.15)	108.35 (18.27)	1.38
	HP		99.83 (16.48)			96.73 (17.17)	
Law	FGPA	79.61 ( 5.52)	73.57 ( 6.57)	0.83	79.23 ( 5.52)	72.59 ( 6.42)	0.88
	Adm	112.61 ( 3.04)	112.91 ( 3.19)	-0.00	111.66 ( 3.39)	112.73 ( 3.19)	-0.16
	PET	704.31 (31.56)	678.07 (42.20)	0.79	698.31 (33.11)	678.41 (38.70)	0.53
	V	135.18 ( 8.36)	128.14 (13.71)	0.85	134.34 ( 8.26)	129.10 (12.63)	0.50
	Q	135.90 ( 8.27)	134.31 ( 8.17)	0.15	134.81 ( 8.76)	133.59 ( 8.70)	0.15
	E	137.45 ( 8.76)	131.76 (11.60)	0.57	136.06 ( 9.07)	131.51 (11.98)	0.42
	HP		113.72 (15.09)			110.15 (18.12)	

\* Number of departments and examinees appears in Table 2



**Table 1 - Continues**

		Mean, SD, and d for Departments with N≥5*			Mean, SD, and d for Departments with N≥2		
<b>Faculty</b>	<b>Var</b>	<b>H</b>	<b>R</b>	<b>d</b>	<b>H</b>	<b>R</b>	<b>d</b>
<b>Medicine</b>	FGPA	80.74 ( 6.66)	81.43 ( 7.30)	-0.10	84.51 ( 6.66)	82.89 ( 6.69)	-0.01
	Adm	109.68 ( 3.09)	109.63 ( 3.09)	-0.15	112.24 ( 3.51)	110.91 ( 3.59)	-0.02
	PET	679.05 (27.03)	665.98 (26.98)	0.51	695.85 (28.09)	670.51 (30.65)	0.70
	V	130.14 ( 8.20)	127.67 ( 7.18)	0.30	132.87 ( 7.94)	127.72 ( 7.63)	0.58
	Q	132.48 ( 7.99)	133.00 ( 6.78)	-0.03	135.66 ( 7.56)	133.82 ( 7.52)	0.17
	E	132.29 ( 9.33)	124.77 (10.19)	0.81	135.13 ( 9.39)	126.92 (10.07)	0.60
	HP		106.47 (13.93)			106.92 (14.43)	
<b>Other Health Sciences</b>	FGPA	81.41 ( 6.51)	72.65 (11.26)	1.05	81.90 ( 6.51)	73.22 (10.90)	0.95
	Adm	93.05 ( 5.49)	93.12 ( 4.59)	0.00	95.51 ( 4.98)	93.00 ( 4.61)	0.01
	PET	565.94 (41.26)	554.21 (35.54)	0.27	581.39 (40.35)	554.53 (35.94)	0.36
	V	114.61 (11.15)	110.97 (10.02)	0.28	116.54 (10.66)	111.11 ( 9.81)	0.26
	Q	107.57 (11.18)	113.22 (10.23)	-0.53	111.04 (10.82)	113.02 (10.28)	-0.33
	E	113.19 (15.80)	98.89 (14.76)	0.95	116.08 (14.44)	99.29 (14.47)	0.93
	HP		92.87 (14.31)			95.34 (14.54)	
<b>All Departments</b>	FGPA	79.84 ( 8.69)	72.84 (11.68)	0.67	80.07 ( 8.69)	73.52 (11.45)	0.63
	Adm	100.69 ( 6.77)	99.23 ( 6.21)	0.05	100.70 ( 6.67)	99.02 ( 6.34)	0.01
	PET	611.66 (55.08)	575.18 (47.99)	0.53	616.38 (53.87)	576.29 (48.62)	0.54
	V	119.71 (12.32)	113.07 (11.48)	0.40	120.52 (12.07)	113.28 (11.48)	0.42
	Q	118.80 (12.26)	117.33 (10.74)	0.08	119.67 (12.09)	117.47 (10.92)	0.09
	E	120.92 (15.05)	105.01 (15.67)	0.79	121.74 (14.69)	105.28 (15.72)	0.80
	HP		95.02 (15.57)			95.31 (15.78)	

\* Number of departments and examinees appears in Table 2

**Appendix B -Table 1**

**Total Number of Departments, Number of Students, Total Number of Departments in which Bias was Detected, Number of Departments in which Slopes Differ for the Two Language Groups, and Number of Departments in which Bias was Found in Favor of and Against Russian-Speaking Examinees According to Darlington 's First and Third Definitions  
( where FGPA is the criterion)**

Faculty	Predictor	N of Dep	N	1 <sup>st</sup> Def				3 <sup>rd</sup> Def			
				N of Bias	N of Slopes	in fav of R	Against R	N of Bias	N of Slopes	in fav of R	Against R
Human	Adm	76	7774	38	9	34	0	12	6	4	3
	PET	127	20277	50	8	45	0	27	9	1	22
	V	127	20277	52	7	48	0	21	8	0	14
	Q	127	20277	63	10	60	1	19	7	10	3
	E	127	20277	41	10	33	0	66	9	0	62
Social Sciences Verbal	Adm	47	7934	39	11	38	1	10	2	8	0
	PET	82	14007	59	13	56	0	14	6	2	7
	V	82	14007	60	14	58	0	13	6	3	7
	Q	82	14007	64	11	62	0	17	5	12	2
	E	82	14007	63	23	52	0	37	8	0	31
Social Sciences - Quant	Adm	36	6197	19	3	16	0	6	3	1	3
	PET	53	10103	22	6	18	0	32	9	2	29
	V	53	10103	24	4	23	0	18	4	0	17
	Q	53	10103	25	5	24	0	13	6	3	6
	E	53	10103	30	7	24	0	38	8	1	34
Natural Sciences	Adm	55	4692	7	1	6	0	8	3	5	2
	PET	109	9373	23	4	8	12	60	8	1	58
	V	109	9373	22	7	14	1	33	6	0	33
	Q	109	9373	26	8	16	2	22	8	1	17
	E	109	9373	26	9	13	6	82	13	0	81
Engine	Adm	21	1908	4	2	2	0	4	2	3	0
	PET	46	4359	7	3	3	2	27	2	0	27
	V	46	4359	9	3	8	0	9	0	0	9
	Q	46	4359	11	7	6	1	6	3	0	4
	E	46	4359	5	1	3	1	43	6	0	41
Law	Adm	4	991	2	1	2	0	0	0	0	0
	PET	7	2038	6	1	5	0	1	1	0	1
	V	7	2038	5	0	5	0	1	0	0	1
	Q	7	2038	6	1	5	0	1	1	0	0
	E	7	2038	5	0	5	0	1	1	0	0
Med	Adm	6	464	2	0	1	1	1	0	1	0
	PET	9	660	1	0	0	1	3	2	0	3
	V	9	660	1	0	0	1	3	1	0	2
	Q	9	660	1	0	0	1	0	0	0	0
	E	9	660	3	2	1	0	5	3	0	4
Nursing	Adm	14	393	10	3	7	0	2	1	1	0
	PET	30	1930	13	0	13	0	8	2	4	2
	V	30	1930	14	1	14	0	9	4	4	4
	Q	30	1930	17	1	16	0	9	3	7	0
	E	30	1930	14	3	13	0	13	1	0	12
All Departs	Adm	259	30353	121	30	106	2	43	17	23	8
	PET	463	62747	181	35	148	15	172	39	10	149
	V	463	62747	187	36	170	2	107	29	7	87
	Q	463	62747	213	43	189	5	87	33	33	32
	E	463	62747	187	55	144	7	285	49	1	265

**Appendix B - Table 2**

**Total Number of Departments, Number of Students, Total Number of Departments in which Bias was Detected, Number of Departments in which Slopes Differ for the Two Language Groups, and Number of Departments in which Bias was Found in Favor of and Against Russian-Speaking Examinees According to Darlington 's First and Third Definitions  
( where TGPA is the criterion)**

Faculty	Predictor	N of Dep	N	1 <sup>st</sup> Def				3 <sup>rd</sup> Def			
				N of Bias	N of Slopes	in fav of R	Against R	N of Bias	N of Slopes	in fav of R	Against R
<b>Human</b>	Adm	10	596	3	0	2	1	0	0	0	0
	PET	23	2080	3	0	2	1	5	0	0	4
	V	23	2080	4	1	3	1	2	0	0	2
	Q	23	2080	6	2	5	0	1	0	0	1
	E	23	2080	5	0	2	2	14	0	0	14
<b>Social Sciences Verbal</b>	Adm	9	1004	4	1	4	0	1	0	1	0
	PET	19	2018	6	2	5	1	3	1	0	2
	V	19	2018	9	2	7	0	2	1	0	1
	Q	19	2018	10	2	9	1	2	0	0	2
	E	19	2018	5	1	4	0	10	0	0	10
<b>Social Sciences - Quant</b>	Adm	7	744	1	0	1	0	1	0	0	0
	PET	11	1521	2	1	1	1	8	2	0	8
	V	11	1521	2	2	1	0	4	2	0	4
	Q	11	1521	1	0	1	0	3	0	0	3
	E	11	1521	3	1	1	1	8	3	0	8
<b>Natural Sciences</b>	Adm	6	328	1	0	1	0	0	0	0	0
	PET	20	1189	5	2	2	0	11	1	0	11
	V	20	1189	6	3	4	0	8	0	0	8
	Q	20	1189	5	1	4	0	3	0	0	2
	E	20	1189	3	0	2	1	17	1	0	17
<b>Engine</b>	Adm	2	196	0	0	0	0	0	0	0	0
	PET	2	199	0	0	0	0	2	0	0	2
	V	2	199	0	0	0	0	1	0	0	1
	Q	2	199	0	0	0	0	0	0	0	0
	E	2	199	0	0	0	0	2	0	0	2
<b>Med</b>	Adm	2	138	1	0	1	0	1	0	1	0
	PET	2	138	1	0	1	0	0	0	0	0
	V	2	138	1	0	1	0	0	0	0	0
	Q	2	138	1	0	1	0	0	0	0	0
	E	2	138	1	0	1	0	1	0	0	1
<b>Nursing</b>	Adm	1	19	1	0	1	0	1	1	1	0
	PET	6	478	6	0	6	0	2	0	2	0
	V	6	478	6	0	6	0	3	0	2	1
	Q	6	478	6	0	6	0	2	0	2	0
	E	6	478	6	1	6	0	3	1	0	3
<b>All Departs</b>	Adm	37	3025	11	1	10	1	4	1	3	0
	PET	83	7623	23	5	17	3	31	4	2	27
	V	83	7623	28	8	22	1	20	3	2	17
	Q	83	7623	29	5	26	1	11	0	2	8
	E	83	7623	23	3	16	4	55	5	0	55

## Appendix C

**Table 1**

**$R^2$ , Adjusted  $R^2$ , and the Regression Coefficients of HP and Adm in the Prediction Equation of First-Year GPA, by Area of Study, for Departments Containing at Least Five Students With an HP Score**

	N of Depart	N	$R^2$	Adj $R^2$	beta Adm	beta HP
<b>Humanities</b>	61	650	0.38	0.25	0.40	0.12
<b>Social Sciences - V</b>	43	416	0.39	0.25	0.32	0.22
<b>Social Sciences - Q</b>	33	662	0.19	0.11	0.22	0.14
<b>Natural Sciences</b>	45	465	0.37	0.24	0.40	0.11
<b>Engineering</b>	16	131	0.42	0.26	0.44	-0.03
<b>Law</b>	3	15	0.16	0.00	-0.06	-0.29
<b>Medicine</b>	5	38	0.47	0.34	0.34	-0.40
<b>Nursing</b>	13	165	0.24	0.12	0.17	0.10
<b>All Departments</b>	219	2542	0.32	0.21	0.32	0.12

**Table 2**  
 $R^2$ , Adjusted  $R^2$ , and the Regression Coefficients of HP and PET in the  
Prediction Equation of First-Year GPA, by Area of Study, for Departments  
Containing at Least Five Students With an HP Score

	N of Depart	N	$R^2$	Adj $R^2$	beta PET	beta HP
<b>Humanities</b>	109	1799	0.24	0.15	0.25	0.16
<b>Social Sciences - V</b>	76	807	0.36	0.23	0.23	0.22
<b>Social Sciences - Q</b>	49	900	0.19	0.11	0.15	0.18
<b>Natural Sciences</b>	97	1458	0.27	0.18	0.31	0.13
<b>Engineering</b>	37	367	0.33	0.20	0.27	0.20
<b>Law</b>	3	18	0.42	0.23	0.10	0.53
<b>Medicine</b>	7	55	0.45	0.27	0.50	-0.22
<b>Nursing</b>	29	605	0.21	0.14	0.19	0.19
<b>All Departments</b>	407	6009	0.26	0.16	0.24	0.17

**Table 3**  
 $R^2$ , Adjusted  $R^2$ , and the Regression Coefficients of HP and Adm in the  
Prediction Equation of Third-Year GPA, by Area of Study, for Departments  
Containing at Least Five Students With an HP Score

	N of Depart	N	$R^2$	Adj $R^2$	beta Adm	beta HP
<b>Humanities</b>	9	95	0.29	0.14	0.36	-0.01
<b>Social Sciences - V</b>	9	75	0.25	0.06	0.31	-0.06
<b>Social Sciences - Q</b>	7	90	0.24	0.17	0.25	0.17
<b>Natural Sciences</b>	6	39	0.28	0.20	0.13	0.05
<b>Engineering</b>	2	10	0.57	0.22	0.73	-0.07
<b>Medicine</b>	2	10	0.86	0.71	0.89	-0.35
<b>Nursing</b>	1	5	0.53	0.06	0.61	0.19
<b>All Departments</b>	36	324	0.30	0.16	0.32	0.03

**Table 4**  
 $R^2$ , Adjusted  $R^2$ , and the Regression Coefficients of HP and PET in the  
Prediction Equation of Third-Year GPA, by Area of Study, for Departments  
Containing at Least Five Students With an HP Score

	N of Depart	N	$R^2$	Adj $R^2$	beta PET	beta HP
<b>Humanities</b>	21	251	0.25	0.13	0.32	0.10
<b>Social Sciences - V</b>	18	165	0.26	0.10	0.32	0.11
<b>Social Sciences - Q</b>	11	142	0.30	0.19	0.31	0.21
<b>Natural Sciences</b>	20	236	0.23	0.14	0.19	0.15
<b>Engineering</b>	2	12	0.35	0.20	-0.01	0.34
<b>Medicine</b>	2	10	0.68	0.37	1.19	-0.06
<b>Nursing</b>	6	146	0.23	0.15	0.31	0.16
<b>All Departments</b>	80	962	0.26	0.14	0.29	0.14

**Table 5**

**$R^2$ , Adjusted  $R^2$ , and the Regression Coefficients of HP and Adm in the Prediction Equation of First-Year GPA, by Area of Study, for Departments Containing at Least Five Students With an HP Score for Students Who Have Acquired Third-Year GPA**

	N of Depart	N	$R^2$	Adj $R^2$	beta Adm	beta HP
<b>Humanities</b>	9	95	0.28	0.11	0.32	0.09
<b>Social Sciences - V</b>	9	75	0.38	0.25	0.40	0.23
<b>Social Sciences - Q</b>	7	90	0.32	0.22	0.26	0.11
<b>Natural Sciences</b>	6	39	0.31	0.11	0.22	0.19
<b>Engineering</b>	2	10	0.74	0.47	0.49	0.11
<b>Medicine</b>	2	10	0.81	0.61	0.48	-0.74
<b>Nursing</b>	1	5	0.92	0.85	1.02	-0.12
<b>All Departments</b>	36	324	0.36	0.21	0.33	0.11



**Table 6**  
 $R^2$ , Adjusted  $R^2$ , and the Regression Coefficients of HP and PET in the  
Prediction Equation of First-Year GPA, by Area of Study, for Departments  
Containing at Least Five Students With an HP Score  
for Students Who Have Acquired Third-Year GPA

	N of Depart	N	$R^2$	Adj $R^2$	beta PET	beta HP
<b>Humanities</b>	21	251	0.27	0.14	0.38	0.06
<b>Social Sciences - V</b>	18	165	0.41	0.24	0.39	0.29
<b>Social Sciences - Q</b>	11	142	0.28	0.15	0.25	0.15
<b>Natural Sciences</b>	20	236	0.29	0.18	0.34	0.12
<b>Engineering</b>	2	12	0.57	0.52	0.16	0.44
<b>Medicine</b>	2	10	0.84	0.67	0.75	-0.73
<b>Nursing</b>	6	146	0.23	0.20	0.30	0.22
<b>All Departments</b>	80	962	0.31	0.19	0.34	0.15

