The Validity of GRE® Scores for Predicting Academic Performance at the University of Hawaii William S. Richardson School of Law

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Abstract

Educational Testing Service, working with the University of Hawaii's William S. Richardson School of Law (Hawaii Law), evaluated the predictive validity of the GRE General Test (GRE) using a sample of 81 current and former Hawaii Law students. Results indicated that the GRE predicts first-year grades and does so over and above undergraduate grade point average. The study also reiterated the reliability of the GRE General Test that had been shown in prior research.

The Validity of GRE® Scores for Predicting Academic Performance at the University of Hawaii Law School

The *GRE®* General Test provides decision makers with information about the verbal reasoning, quantitative reasoning, and analytical writing skills of applicants to graduate and professional school. Given the pervasive importance of these skills to success in graduate and professional education (Kuncel & Hezlett, 2007), previous research has demonstrated empirically that GRE scores are predictive of success in Ph.D., M.A., and M.S. programs across disciplines (Klieger, Cline, Holtzman, Minsky, & Lorenz, 2014; Kuncel, Hezlett, & Ones, 2001; Kuncel, Wee, Serafin, & Hezlett, 2010), in MBA programs (Young, Klieger, Bochenek, Li, & Cline, 2014), and in veterinary medical colleges (Powers, 2004). In order to determine the validity of the GRE General Test for forecasting success in law school, we partnered with law schools, including the University of Hawaii William S. Richardson School of Law (Hawaii Law), to gather data from enrolled and graduated law students.

The genesis of this predictive validity study is the GRE General Test potentially providing several benefits to law schools, their applicants, and the legal profession.[1] Verbal reasoning and analytical writing skills are fundamental to successful performance as a law student (and future lawyer). Law students are required to make sense of complex subject matter from ongoing and sizeable assigned readings. Furthermore, law students must express their understanding of legal issues on written examinations (the major or sole basis for course grades), in legal writing classes, and sometimes in clinical work representing clients. Moreover, experts on lawyers' performance have observed that attorneys require and utilize quantitative reasoning

[1] With analogous considerations in mind, business schools recently worked with the GRE program to conduct similar research (see Young et al., 2014). More than 1,100 business schools around the world now accept GRE scores.

skills in order to successfully represent clients in business transactional work (Gabaldon, 2014). In addition, a lawyer's lack of quantitative reasoning skills is becoming increasingly problematic as data-driven, scientific, and technological matters more frequently become the subject of litigation (Weiss, 2013).

The GRE General Test could also expand access to legal education. There are potential law school applicants who are considering the many nonlegal graduate and professional programs that require or recommend the GRE General Test. Prospective law students may lack the financial resources or time to prepare and take more than one admissions test, or they may be considering a dual degree that would already require the student to take the GRE General Test. In addition, the GRE General Test is administered by computer year-round in testing centers located across the United States and in many other countries. More people take the GRE General Test than any other graduate or professional school admissions test, with more than half of a million test takers per annum over the past few years (see Educational Testing Service, 2014b).

Given these potential benefits to applicants, institutions, and the legal profession, a remaining prerequisite to the use and interpretation of GRE scores for law school admissions is confirmation that the GRE General Test is reliable and predicts law school success. In addition to abiding by the professional validation standards in educational testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education [AERA, APA, & NCME], 2014; Educational Testing Service, 2014a), this GRE General Test validity research for law school also is responsive to the American Bar Association (ABA) Section of Legal Education Standard 503 (American Bar Association, 2014). Standard 503 requires that for a law school to be accredited by the ABA, it

must require its applicants to take "a valid and reliable admission test to assist the school and the applicant in assessing the applicant's capability of satisfactorily completing the school's program of legal education" (p. 33).

This validation study uses scores from the current version of the GRE General Test that was first launched in August 2011. The GRE General Test continues to provide test takers and institutions with three scores, one for each of three subtests: Verbal Reasoning (GRE-V), Quantitative Reasoning (GRE-Q), and Analytical Writing (GRE-AW). The measures were revised with the goal of more strongly emphasizing complex verbal and quantitative reasoning skills with more text-based materials, real-life scenarios, and data interpretation (Briel & Michel, 2014). Scaled scores on the multiple-choice GRE-V and the GRE-Q subtests are reported on a scale that ranges from 130 to 170, in 1-point increments. The score for the two GRE-AW writing tasks (analyze an issue and analyze an argument) ranges from 0 to 6, in half-point increments. The GRE General Test is the sole large-scale assessment that is used on a nationwide and worldwide basis for making admissions decisions for applicants to graduate school. It also is used in MBA and veterinary school admissions. At present, the applicants to ABA-accredited law schools submit scores from the Law School Admission Test (LSAT).

The primary research question in this study is the following: To what extent do scores on the GRE-V, GRE-Q, and GRE-AW subtests predict first-year law school grade point average (LGPA)? We examined predictive validity for each GRE subtest alone, when scores for the different GRE subtests were combined, and when GRE subtest scores were considered in conjunction with undergraduate grade point average (UGPA). The latter enabled us to investigate the extent to which the GRE subtests provided predictive value together with UGPA as well as in addition to UGPA. First-year law school GPA is a critical measure of success

because of the strong relationship between first-year law school grades with both law review selection and employment opportunities (American Bar Association, 2010).

Previous Research on the Validity of GRE Scores for Predicting Graduate and Professional School Performance

More than 1,500 studies have examined the validity of the GRE General Test for predicting performance in graduate and professional schools. Below are three particularly large-scale or pioneering studies that evidence GRE predictive validity across a range of graduate and professional school programs. Kuncel et al. (2001), who analyzed GRE predictive validity for more than 82,000 students across more than 1,700 samples, found that GRE-V and GRE-Q scores were correlated with several graduate school outcomes in general and for particular discipline areas (humanities, social sciences, life sciences, and mathematics/physical sciences). Overall and for specific discipline areas, GRE-V and GRE-Q almost always predicted graduate grade point average (GGPA) in general and first-year GGPA at least as strongly as did UGPA.

Klieger et al. (2014) studied the predictive validity of GRE scores for 25,356 students across dozens of graduate program areas in 10 Florida public universities. Overall, for both masters and Ph.D. students, and by discipline area (including business, management, and marketing), GRE-AW was often at least as strong as GRE-V and GRE-Q for predicting cumulative GGPA. It was not possible to determine the extent to which these business, management, and marketing students were enrolled in what would be considered professional (e.g., MBA) programs.

Young et al. (2014) validated the GRE General Test for use in MBA program admissions. Their study included data for 480 MBA students across 12 MBA programs. For predicting first

semester MBA GPA and cumulative MBA GPA, GRE-Q was most predictive, followed by GRE-V and then GRE-AW. Only GRE-AW was less predictive than was UGPA. Additional analyses revealed that the three GRE sections added a great deal of predictive value over and above the use of just UGPA, and UGPA added very little predictive value over and above the use of just GRE scores.

Research Methods

This report was prepared for the Hawaii Law using data that the law school provided to Educational Testing Service (ETS) as well as ETS internal data. The cohorts of students for this report are those with GRE General Test scores who matriculated in the 2013–2014, 2014–2015, or 2015–2016 academic years or who already had graduated from the law school within the past few years. All of the data used in this study came from students who had consented to participate in the research study and to the sharing of their data in a de-identified form.

Due to the criticality of first-year LGPA to law students (as described previously) as well as to maximize the available sample size, in this report we used first-year LGPA as the achievement measure of students' academic performance. An LSAC research report indicates that the passage of time does not result in any practical difference in the predictive validity of the LSAT over the course of law school (see Wightman, 2000, pp. 2, 4, and 37-38). There was no basis to conclude that the different cohorts would systematically differ in any way relevant to the analyses, so data were combined across cohorts.

Hawaii Law provided LSAT scores and LGPA from its school files, and for the 10 student volunteers who had taken the GRE General Test prior to this study ETS supplied GRE scores from ETS records. For the remaining 71 student volunteers who had not already taken the

GRE General Test, 5 tested at a regional GRE test center while 66 tested at a special GRE test administration. Students were given a financial incentive of $100 to take the GRE General Test.

We employed standard statistical methods, including the calculation of summary statistics (means and standard deviations). Because GRE-Q and GRE-V are adaptive multistage tests (MSTs), we used an item response theory (IRT)-based method to calculate internal consistency reliability for those subtests. For GRE-AW, we used classical test theory to calculate internal consistency reliability. The GRE-AW reliability estimate is a lower bound on the actual reliability of GRE-AW for reasons more fully described in the notes to Table 1. To follow standard practice and to ensure comparability with LSAT, reliability was estimated based on the testing population more fully described in the notes to Table 1. To measure validity, we computed Pearson product moment correlation coefficients (i.e., *r* values), coefficients of determination (i.e., R^2 values) using ordinary least squares multiple regression, and frequencies for contingency tables. Because the correlation coefficients are based on data from students who were accepted and then enrolled, they reflect validity for enrolled students. To ascertain the GRE validity for the applicant pool for which the GRE General Test would be used to make admissions decisions, we corrected the correlation coefficients for range restriction so that they would more accurately reflect validity for the applicant pool. We calculated corrected correlation coefficients for the LSAT as well. These corrected correlation coefficients are estimates, because they assume that the variability in the scores of the applicants is known. Virtually everyone taking the GRE General Test is interested in a graduate field other than law, so the correction that relies on the variation of scores in the pool of GRE test takers is not fully clear. Nevertheless, adjusted correlations are likely to be more accurate than unadjusted ones (see Schmidt & Hunter, 2015).

Another approach to adjusting for the admission of applicants based on their LSAT scores, but not their GRE scores, is to apply an explicit selection criterion to both tests. Specifically, we assumed that everyone enrolled in the law school could be thought of as an applicant pool to an even more selective institution. Under this assumption, we can set an explicit selection score by identifying the top three-quarters of this applicant pool based on LSAT scores, and separately, the top three-quarters based on GRE scores. Within each group of applicants, grade correlations can be computed and corrected for range restriction with the now known variance in the applicant population.

Because all students in our sample took the LSAT, which currently is the entrance examination for all ABA-accredited law schools, we reported findings for the LSAT in the tables in this paper in order to better contextualize GRE validities. Because LSAT reports only a single aggregate score that reflects performance on its Logical Reasoning, Reading Comprehension, and Analytical Reasoning subtests, we also reported validity for composites of the GRE subtests where each constituent GRE subtest is weighted the same. Because additional relevant information in a score generally leads to greater validity, one can better contextualize the GRE validities if they are combined to form a single score, just as LSAT utilizes a single score. In addition, when calculating the R^2 values by separately entering (i.e., using in regression) multiple test scores (for the GRE subtests) rather than just a single score (as with the LSAT), one risks further reducing the adjusted (i.e., true) R^2 value of focal interest (statistical shrinkage). Compositing GRE scores eliminates this risk and permits better contextualization of GRE validity.[2]

[2] The GRE guidelines regarding the use of GRE scores expressly discourages the compositing of GRE scores because each GRE subtest measures a different set of skills (Educational Testing Service, 2015). Given that there was no way to calculate separate subtest scores for LSAT, compositing of GRE scores in this study should be

Results and Discussion

Correlation-based validity results, reliability coefficients, and descriptive statistics are shown in Table 1. Collective and incremental validity for the GRE General Test when used together with UGPA are shown in Table 2. Table 3 is a contingency table that illustrates in a straightforward manner how different levels of performance on the GRE General Test relate to being in the top third versus bottom third of a law school class after the first year.

All results are based on a sample size of 81 individuals with GRE scores, LSAT scores, UGPAs, and first-year LGPAs. Hawaii Law means for the LSAT and GRE-V and GRE-AW subtests are higher than the respective testing population means, suggesting that enrolled Hawaii Law students are better prepared for law school than are LSAT and GRE test takers in general (see Table 1). Hawaii Law LSAT and GRE-Q and GRE-V standard deviations are smaller than the respective testing population standard deviations (i.e., are more tightly clustered), suggesting that there might be truncation of scores on both the lower and upper ends of the LSAT and GRE-Q and GRE-V score distributions. Low-scoring students are not being admitted, and higher scoring students might be electing to attend other even more selective schools. Of the 81 students in the sample, only one achieved LSAT scores greater than 166, and only eight had achieved LSAT scores below 150. The composite GRE mean and standard deviation values for Hawaii Law students and the testing population are based on standardized (*z*-scored) values, because compositing GRE-AW with the other subtests involves combining different score scales. Standardizing, which puts the GRE subtest scores on the same scales, prevents the GRE-Q and GRE-V with larger variance from overwhelming the GRE-AW scale with smaller variance. We standardized the components of the GRE V + Q composite for consistency.

viewed as an unavoidable necessity. It should not be interpreted as sanctioning the compositing of GRE scores for use in admissions or other decision making.

Table 1 clearly shows that scores for all GRE subtests, individually or composited, are highly reliable for use in law school admissions, with reliability coefficients for the GRE General Test composites ranging from .89 to .95. The GRE Q + V +AW composite is a statistically significant predictor ($p < .05$) of first-year LGPA, with a corrected composite correlation of .56.

For the additional analysis in which we created an explicit selection scenario by using the LSAT or GRE composite to select the top 75% from among the students in the study, the uncorrected correlation with LGPA for the LSAT was .32, and for the GRE General Test it was .26; this difference is not statistically significant ($p > .2$). Corrected for the range restriction, these correlations were .55 and .46 for the LSAT and GRE General Test, respectively.

GRE-V scores also are valid for Hawaii Law admissions when used in conjunction with UGPA, and they provide predictive value over and above UGPA. The most important results in Table 2 appear for the "+" rows for the R^2_{adj} values and the values for ΔR^2_{adj} *over UGPA*. (The unsquared values put the measure in a correlation metric, which some may wish to compare to other results reported as correlations). The "+" values indicate that the variable that follows the "+" is being added to UGPA in the process of predicting first-year LGPAs. As previously, the component GRE subtests in the composites were weighted the same when combined. We used regression analysis to optimally weight each predictor (UGPA, LSAT, and/or GRE composite), and then we adjusted the resulting validity values to eliminate the risk that the regression capitalized on idiosyncrasies of our data.[3] The R^2_{adj} values for all GRE composites (ranging from .07 to .11) are greater than 0, indicating that when combined with UGPA, the GRE General Test predicts first-year LGPA. In addition, the R^2_{adj} values for all GRE composites are greater

[3] As more fully described in the notes to Table 2, we did not report results based on separately entering each GRE subtest into the regression: Separate entry of each GRE subtest led to results that were essentially identical to the results for the equally weighted GRE composites.

than the R^2_{adj} value for UGPA (.04), indicating that the GRE General Test adds to the prediction of first-year LGPA over and above UGPA. GRE scores also provide additional predictive information over and above UGPA. This is evidenced by GRE values for ΔR^2_{adj} *over UGPA* that all are greater than 0, ranging from .03 to .07. The GRE General Test's R^2_{adj} values show that GRE scores are predictors of first-year LGPA beyond any predictive value that UGPA provides.

Reporting validity numbers as correlations or coefficients of determination as in Tables 1 and 2 is standard test validation practice, and it provides information that Table 3 does not. However, we include Table 3 to provide predictive validity evidence in a more straightforward format. Table 3 is an adaptation of the approach of Bridgeman, Burton, and Cline (2009) to present the contingency tables. It shows the percentage of students in the top and bottom thirds of GRE composite scores who are in the top or bottom thirds of first-year LGPA. For students in the top third of GRE composite scores, 44% were in the LGPA top third and 22% were in the bottom third. In other words, students with relatively high GRE scores were twice as likely to be in the top third of law school grades as in the bottom third. For students in the bottom third of GRE scores, 26% were in the top third of the class, while 37% were in the bottom third. In other words, students with relatively low GRE scores were almost 1½ times as likely to be in the bottom third of law school grades as in the top third. Clearly, these findings indicates validity of the GRE General Test for predicting who is and who is not going to be in the top or bottom third of the class.

Conclusion

The results from our correlation, regression, and contingency table analyses empirically support the claims of reliability and predictive validity of the GRE General Test for

use in admissions at Hawaii Law. Not only do these findings satisfy professional validation standards in educational testing (AERA, APA, & NCME, 2014; Educational Testing Service, 2014a), they also meet the requirements of ABA Section of Legal Education Standard 503 (American Bar Association, 2014).

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Table 1

Validity (Correlation) for Predicting First-Year Law School GPA—With Descriptives and Corrected for Range Restriction (N = 81)

	Correlations with first-year LGPA			Reliability [c]	Hawaii Law students		Testing population	
	r		Corrected *r* [b]		Mean	*SD*	Mean	*SD*
LGPA first year	--		--	--	3.13	0.44	--	--
GRE Q + V + AW composite [a]	.25	*	.56	.94	0.6	2.0	0.0	2.5
GRE Q + V composite [a]	.26	*	.56	.95	0.1	1.4	0.0	1.8
GRE V + AW composite [a]	.24	*	.54	.90	0.8	1.5	0.0	1.8
GRE Q + AW composite [a]	.18		.49	.89	0.3	1.4	0.0	1.7
GRE V	.27	*	.57	.91	155.4	6.0	153.1	7.2
GRE Q	.17		.46	.92	149.1	6.1	150.6	7.6
GRE AW	.12		.37	.76	4.2	0.7	3.9	0.7
UGPA	.22	*	--	--	3.33	0.40	--	--
LSAT	.41	**	.66	.90-.95	156.1	5.4	151.1	10.6

Note. *r* = Validity as Pearson product moment (zero-order) correlation; LGPA = law school grade point average; UGPA = undergraduate grade point average; LSAT = Law School Admission Test; GRE V = GRE Verbal Reasoning; GRE Q = GRE Quantitative Reasoning; GRE AW = GRE Analytical Writing; *SD* = standard deviation.

[a] GRE composite scores were created by standardizing (i.e. *z*-scoring) the GRE Q, V, and AW scores and by adding the *z*-scores with each measure weighted equally. The standardization was determined based on the 2015 GRE testing population sample of 1,161 U.S. citizens who tested in Hawaii in 2015 and indicated in the GRE Background Information Questionnaire (BIQ) that they intended to apply to graduate schools in western U.S. states (the most specific response option in the BIQ that included the State of Hawaii; "GRE State of Hawaii Test Takers"). The values of the composite means and *SD*s therefore reflect standardization. [b] LSAT was corrected for direct range restriction via procedures for Thorndike Case II, and GRE for indirect range restriction via procedures for Thorndike Case III (Thorndike, 1949). Since Hawaii Law applicants largely come from the State of Hawaii, the corrections used GRE testing population *SD*s available for GRE State of Hawaii Test Takers. Since our efforts to locate LSAT testing population information specifically for the State of Hawaii were unsuccessful, the LSAT testing population means and *SD*s are for 10,383 LSAT test takers in LSAC's U.S. Far West region and are as reported in Dalessandro, Anthony, & Reese (2014). Presumably, these population values reflect data for test takers from the more populous states in LSAC's U.S. Far West region (Nevada and especially California) far more than they reflect data for test takers from the State of Hawaii, wherever they intended to apply for law school. Note that the majority of applicants to and enrolled students at Hawaii Law are not Native Hawaiian or Pacific Islander in self-reported race/ethnicity, so using population information for Native Hawaiian or Pacific Islander test takers was not a reasonable alternative to using values for the Far West region. [c] The reliability estimates for the LSAT were reported at http://www.lsac.org/jd/lsat/your-score/law-school-performance (retrieved February 11, 2016). We assume that they represent U.S. national test taker populations. The reported reliability values for the GRE subtests and composites are based on 314,829 U.S. domestic test takers who took the GRE General Test in 2015 ("GRE National Test Takers"). Note that when we previously computed reliability for 53,392 GRE test takers who took the GRE Test in 2015 in the GRE U.S. Southwest region, the values were within .01 of the reliability estimates for the GRE National Test Takers (see Klieger, Bridgeman, Tannenbaum, & Cline, 2016). Furthermore, we note that the reliability for GRE-AW is estimated from the correlation between two writing tasks (analyze an issue and analyze an argument) that are intended to measure slightly different aspects of analytical writing skills. Therefore, the reliability estimate provided for GRE-AW scores is a lower bound on the actual reliability of the scores on the combined tasks, and it should not be directly compared to the reliability estimates for the GRE-V and GRE-Q scores. * $p < .05$. ** $p < .01$.

Table 2

Validity (Multiple Regression) for Predicting First-Year Law School Grade Point Average When Combined With UGPA and Over-and-Above UGPA (N = 81)

	R	R^2	R_{adj}	R^2_{adj}	ΔR^2 over UGPA	ΔR^2_{adj} over UGPA
UGPA	.22	.05	.19	.04	--	--
+ GRE Q + V + AW composite	.35	.12	.32	.10	.08	.07
+ GRE Q + V composite	.36	.13	.33	.11	.08	.07
+ GRE V + AW composite	.34	.11	.30	.09	.07	.05
+ GRE Q + AW composite	.30	.09	.26	.07	.04	.03
+ LSAT	.47	.22	.44	.20	.17	.16

Note. In addition to reporting validity information for each composite (where the GRE subtests are entered together as a single score into a regression), we could have reported validity information where each GRE subtest was separately entered into the regression. With the regression allowing each separately entered subtest to maximize its predictive strength, one would expect a set of separately entered subtests to result in larger values for R, R^2, and ΔR^2 *over UGPA* than would a singly entered corresponding composite. Conversely, due to statistical shrinkage associated with an increasing number of separately entered subtests, one would expect a singly entered composite to result in larger values for R_{adj}, R^2_{adj}, and ΔR^2_{adj} *over UGPA* than would a corresponding set of separately entered subtests. Since the ΔR^2_{adj} (and R^2_{adj}) values for the composites versus their corresponding set of separately entered subtests were never greater than about .015, in the table we reported validity only for the composites in order to make the table easier to read and interpret.

Table 3

Contingency Table Describing the Relationship Between GRE General Test Scores and Law School Performance (N = 81)

	GRE Q + V + AW composite	
First-year LGPA	**Bottom 3rd**	**Top 3rd**
Top 3rd (3.40 to 3.90)	26%	44%
Bottom 3rd (2.01 to 2.91)	37%	22%

Note. Percentages are column percentages and do not add up to 100%, because the middle thirds are omitted to improve readability.