

Exploring the Variability in the Validity of SAT Scores and High School GPA for Predicting First- Year College Grades at Different Colleges and Universities

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Background

- The SAT is one of the most researched tests, with hundreds of published validity studies.
- Vast majority of studies including samples at multiple institutions examine the relationship of SAT scores and HSGPA with college performance in aggregate.
- Studies show that the relationship of SAT scores and HSGPA with FYGPA varies at different institutions/different types of institutions.

Prior Research Exploring Variations in SAT Predictive Validity

- Baird (1983) used college characteristics as predictor variables to predict the size of the simple and multiple correlations of SAT and HSGPA with FYGPA (validity coefficients).
- A few studies have examined the validity of the SAT using a multilevel view:
 - Brown and Zwick (2006) – Validity of SAT and SAT Subject Tests for predicting FYGPA at Univ. of CA.
 - Culpepper and Davenport (2009) – Variability in differential prediction of FYGPA using SAT and HSGPA by racial/ethnic group.
 - Shen et al. (2010) – created factors of institutional characteristics and used these to predict variability in SAT validity after taking account of statistical artifacts.

Purpose of the Current Study

To demonstrate the utility of a multilevel model to understand the relationship of institutional characteristics to the validity of the SAT and HSGPA for predicting first-year college GPA (FYGPA).

Method

- Sample consisted of about 150,000 students from 109 colleges and universities across the U.S.
- SAT scores obtained from 2006 college-bound seniors cohort; HSGPA self-reported on SAT Questionnaire.
- First phase replicated Baird (1983) to identify variables to use in the multilevel modeling.

(Results from this phase will not be presented today)

- Second phase used Hierarchical Linear Modeling (HLM) to model the variability in the relationship of SAT scores and HSGPA with FYGPA across the 109 institutions.

HLM Specifics

- Analyses followed a step-wise approach, beginning with null model (one-way random effects ANOVA)
- Full maximum likelihood estimation used in all models.
- Random effects included for all student-level predictors.
- Student-level predictors (SAT, HSGPA) were centered within institution (group-mean centered) and institution-level predictors were grand-mean centered.

Model-Building Summary

- Model 1 – Null Model (ICC = 0.109)
- Model 2 – added student-level predictors (SAT/1000 and HSGPA)
- Model 3 – added average SAT/1000 and average HSGPA as Level 2 predictors.
- Models 4 and 5 – added Level 2 predictors one at a time according to approximate coefficients and t-values estimated by the HLM program.

Final Model

Level 1:

$$FYGPA_{ij} = \beta_{0j} + \beta_{1j} * (HSGPA)_{ij} + \beta_{2j} * (SAT \text{ total}/1000)_{ij} + r_{ij}.$$

Level 2:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{average SAT})_j + \gamma_{02}(\text{average HSGPA})_j + \gamma_{03}(\text{private})_j + \gamma_{04}(\text{small})_j + \gamma_{05}(\text{large})_j + \gamma_{06}(\text{very large})_j + \mu_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{average SAT})_j + \gamma_{12}(\text{average HSGPA})_j + \gamma_{13}(\text{average financial aid}) + \gamma_{14}(\% \text{ white}) + \mu_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}(\text{average SAT})_j + \gamma_{22}(\text{average HSGPA})_j + \gamma_{23}(\% \text{ submitting SAT})_j + \gamma_{24}(\text{small})_j + \gamma_{25}(\text{large})_j + \gamma_{26}(\text{very large})_j + \mu_{2j}.$$

Results: Final Estimation of Fixed Effects for Intercept (Average FYGPA)

Variable	Coefficient	Robust S.E.
<i>Intercept</i>	2.963	0.036
Average SAT/1000	0.912	0.151
Average HSGPA	0.027	0.129
Private Institution	0.105	0.039
Small Institution	-0.073	0.041
Large Institution	-0.009	0.030
Very large institution	-0.031	0.045

Results: Final Estimation of Fixed Effects for HSGPA Slope (Predictive Validity of HSGPA)

Variable	Coefficient	Robust S.E.
<i>HSGPA slope</i>	0.419	0.008
Average SAT/1000	-0.298	0.129
Average HSGPA	0.053	0.091
Average Financial Aid	-0.000	0.000
Percent of White first-year students	0.002	0.000

Results: Final Estimation of Fixed Effects for SAT Slope (Predictive Validity of SAT)

Variable	Coefficient	Robust S.E.
<i>SAT slope</i>	0.813	0.032
Average SAT/1000	-1.190	0.234
Average HSGPA	0.991	0.183
Percent submitting SAT	0.005	0.001
Small institution	0.177	0.066
Large institution	-0.032	0.046
Very large institution	-0.058	0.055

Results: Final Estimation of Variance Components

<i>Random Effect</i>	<i>Variance Component</i>	<i>df</i>	<i>Chi-square</i>	<i>p</i>
Intercept	0.016	86	6459.03	< .001
HSGPA slope	0.005	88	484.08	< .001
SAT slope	0.023	86	463.65	< .001
Student-Level	0.358			

Summary of Findings

Predictive validity of HSGPA (once SAT scores are considered):

- Stronger at institutions with higher percentage of white freshmen.
- Not as strong at institutions with higher mean SAT and at institutions with higher average financial aid package.

Predictive validity of SAT (once HSGPA is considered):

- Stronger at institutions with higher mean HSGPA, at institutions with higher percentage submitting SAT scores, and at smaller institutions.

Study Limitations

- Student-level model included only HSGPA and SAT scores; future research may include student demographic variables (gender, ethnicity, SES).
- Scores on the 3 SAT sections were combined.
- The criterion variable (FYGPA) may not be completely comparable across institutions.

Thank You!

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