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## Chapter 7

# Predictors of university academic performance in Colombia

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### Abstract

This chapter describes the available information about the prediction of college performance in Colombia (South America). Before graduating from high school, students must take a national examination which includes 400 questions grouped into four major areas: sciences (biology, chemistry, and physics), social sciences, language (verbal aptitude and Spanish), and mathematics (mathematical attitude and mathematical knowledge). ICFES scores are used as a major criterion for university admission. Existing research suggests that the correlations between ICFES scores and GPAs tend to be quite small and vary widely from one academic program to another. Other variables (e.g., high school grades) are better predictors of college GPA, quite likely because the same set of personal and socio-cultural variables are needed for both high school and college success. © 2001 Elsevier Science Ltd. All rights reserved.

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Ransdell, Hawkins and Adams have challenged the exclusive use of cognitive measures to predict how well students will perform in college. They propose that family background and study behavior represent significant variables in predicting college success. Some of their findings are consistent with those obtained during studies of the Colombian national examination, the Instituto Colombiano para el Fomento de la Educación Superior (ICFES). This 400-question exam includes four major areas: sciences (biology, chemistry, and physics), social sciences, language (verbal aptitude and Spanish), and mathematics (mathematical attitude and mathematical knowledge). The total score on the ICFES is frequently used as the major criterion for university admission.

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The relationship between ICFES scores and GPA at the university level has been examined in several studies. The largest and most informative study was carried out by the Universidad de los Andes (Departamento de Admisiones de la Universidad de los Andes, 1998). (More will be said about this study in a later section of this chapter.) The correlations are highly variable, depending upon the ICFES subtest and the academic program to which the student is applying. In general, however, they are low to moderate. In addition, other variables (e.g., grades during high school) have been found to be more accurate predictors of university performance. The results have led to the conclusion that GPA is the result of a whole array of cognitive, socio-cultural, and personality variables.

The capability of standardized cognitive tests to predict school performance has been the subject of a long-lasting discussion in psychology (e.g., Anastasi, 1988; Ardila, 1999; Ceci, 1991; Ceci & Williams, 1997; Cronbach, 1990; Neisser et al., 1996). As a matter of fact, the initial purpose of intelligence tests when they were developed at the beginning of the 20th century was to predict school performance (Binet, 1908). Further developments, however, have demonstrated that there is a whole array of intervening variables potentially influencing the relationship between cognitive ability and successful school performance (e.g., Berry, Poortinga, Segall, & Dasen, 1992; Greenfield, 1997; Neisser et al., 1996).

## **1. The Colombian higher educational system**

Colombia is a Western country with a middle level of development and a total population of about 40 million. Currently, there are over 700,000 students enrolled in different universities. The number of university students and the diversity of university careers have been steadily growing during the past few decades.

The Colombian educational system has been adapted from Spain, and it is different from the US educational system in several ways. The primary difference is structural. In Colombia, for example, there are six years of primary education and six years of secondary education (high school). During secondary education, language (Spanish and foreign languages), literature, social sciences, biology, history, geography, mathematics, physics, chemistry, and philosophy are usually included in a student's academic program. After graduating from high school, the student can apply to a university. University education is devoted to a single and specific professional area (e.g., engineering, psychology, economics). Thus, admission to the university is synonymous with admission to an academic program within the university. In addition, laboratory, clinical, and/or field practices are required, as is a dissertation.

Once a student has completed all the requirements, a professional degree is conferred. Although it is very difficult to equate degrees obtained in different countries, a Colombian professional degree can be viewed as equivalent to a Master's degree obtained in a US university.

## 2. The Universidad de los Andes study

The Universidad de los Andes is situated in Bogotá. Even though it is a relatively small university with about 6000 students, it is regarded as one of the best Colombian universities from an academic point of view. There are about 27 different academic programs, which operate under the auspices of 12 faculties. Quite obviously, then, one faculty can have more than one academic program. In the Faculty of Engineering, for example, there are seven different academic programs (e.g., mechanical engineering, chemical engineering). The Universidad de los Andes, as in most Colombian universities, uses the ICFES score as a major admission criterion. Consequently, the relationship between ICFES scores and GPA has been investigated.

Two different analyses were carried out. The first focused on what was termed “probability of success at the university.” Probability of success was defined as the likelihood that a student would obtain a professional degree. The second analysis examined the correlation between ICFES scores and academic performance. Academic performance was defined in terms of (a) the student’s GPA during the first semester, and (b) the cumulative GPA over the student’s entire university career. For the first analysis, a sample of 23,261 students who attended the university during the time period from 1984 through 1997 was used. For the second analysis, the sample consisted of 11,847 students who attended the university during the time period from 1990 through 1997. The reason for including the 1990 through 1997 time period in the second analysis was that both total scores and subtest scores on the ICFES examination began to be reported in 1990. In addition to the total score, the following seven subtest scores were included in the second analysis: mathematics, biology, chemistry, physics, Spanish, verbal aptitude, and social sciences.

The probabilities of success and the correlations between ICFES and GPA were calculated for each of the 12 faculties: Engineering, Physics, Biology, Economy, Administration, Architecture, Law, Modern Languages, Psychology, Arts, Music, and Sociology. Although the minimal ICFES score required to enter to the Universidad de los Andes depends upon the individual faculty, it typically has been set at 290 (out of 400). The national mean score ranges from 270 to 280.

### 2.1. *Probability of success*

The probability of success was calculated for each ICFES subtest score range in the different university faculties (see Table 1). A positive relationship was found between total ICFES scores and the probability of graduating from the university. The probability of success was greater than 80% in every faculty when students obtained an ICFES score equal to or higher than 380 (out of 400). However, there were differences among the faculties. Table 1 shows the probability of success according to the ICFES score and faculty.

Students with fairly low ICFES scores (e.g., 290) have a minimal likelihood of graduating from some faculties (e.g., physics, music), but a high probability of graduating from others (e.g., psychology, sociology). This finding could be

Table 1  
Probability of success based on ICFES scores and faculty

Faculty	ICFES scores									
	290	300	310	320	330	340	350	360	370	380
Administration	0.54	0.59	0.64	0.69	0.74	0.78	0.81	0.81	0.87	0.89
Architecture	0.43	0.50	0.57	0.63	0.69	0.75	0.79	0.83	0.87	0.90
Arts	0.47	0.52	0.58	0.63	0.68	0.73	0.77	0.81	0.84	0.87
Biology	0.33	0.40	0.47	0.55	0.62	0.69	0.75	0.80	0.84	0.88
Economics	0.46	0.52	0.58	0.63	0.69	0.74	0.78	0.82	0.85	0.88
Engineering	0.12	0.16	0.22	0.29	0.38	0.47	0.57	0.66	0.74	0.81
Languages	0.54	0.60	0.65	0.71	0.75	0.80	0.83	0.86	0.89	0.91
Law	0.58	0.65	0.71	0.77	0.81	0.85	0.88	0.91	0.93	0.95
Music	0.16	0.22	0.29	0.38	0.48	0.58	0.67	0.75	0.82	0.87
Physics	0.04	0.07	0.11	0.19	0.30	0.43	0.58	0.71	0.82	0.89
Psychology	0.63	0.69	0.74	0.79	0.83	0.86	0.89	0.92	0.93	0.95
Sociology	0.62	0.66	0.70	0.73	0.77	0.80	0.82	0.85	0.87	0.89

interpreted in two different ways. First, the level of difficulty may be higher in physics and music than in sociology and psychology. Hence, students with lower ICFES scores have a higher probability of success in the less difficult subjects (e.g., psychology and sociology) than in the more difficult ones (e.g., physics and music). Alternatively, the contribution of cognitive ability to university success may be higher in physics and music than in sociology and psychology. That is, success in psychology and sociology may require abilities and dispositions not included on the entrance examination. Both explanations are plausible and not necessarily contradictory.

## 2.2. Correlation between ICFES scores and GPA

Correlations between ICFES scores and GPAs for all students, regardless of faculty, was computed. The correlation between ICFES scores and GPAs during the first semester was 0.39, whereas the correlation between ICFES scores and cumulative GPAs was 0.30. Additional correlations were calculated for the different ICFES subtests and the accumulated GPA for the 12 faculties (see Table 2). These correlations were quite variable, ranging from 0.00 to 0.48. For some faculties, correlations were particularly high (e.g., physics), whereas for other faculties correlations were notoriously weaker (e.g., psychology). Mathematics and chemistry, followed by Spanish, subtest scores were, on the whole, the best predictors of university performance in those academic programs.

Several conclusions can be drawn from the Universidad de los Andes study. First, there is a moderate positive, statistically significant correlation between ICFES scores and academic success. However, the predictive validity of the ICFES examination depends upon what faculties and what scores are included in the analysis. ICFES scores were relatively good predictors for engineering and physics, but poor predictors for psychology, languages, and arts. At best, ICFES scores

Table 2  
Correlations between ICFES and GPA

Faculty	ICFES subtests						
	Biology	Chemistry	Math	Physics	Social sciences	Spanish	Verbal aptitude
Engineering	0.28	0.41	0.35	0.34	0.26	0.28	0.26
Physics	0.34	0.48	0.48	0.38	0.47	0.39	0.36
Biology	0.28	0.34	0.34	0.33	0.31	0.30	0.25
Economics	0.22	0.30	0.29	0.26	0.21	0.26	0.23
Administration	0.06	0.17	0.15	0.10	0.00	0.10	0.05
Architecture	0.12	0.21	0.17	0.14	0.08	0.09	0.07
Law	0.18	0.27	0.29	0.29	0.23	0.27	0.22
Languages	0.15	0.23	0.17	0.23	0.08	0.20	0.18
Psychology	0.14	0.20	0.14	0.16	0.07	0.16	0.13
Arts	0.22	0.21	0.15	0.23	0.23	0.20	0.13
Music	0.14	0.32	0.23	0.18	0.07	0.19	0.08
Sociology	0.20	0.27	0.25	0.23	0.22	0.25	0.25

accounted for about 23% of the variance in GPAs. Second, total ICFES scores were less informative than scores on the different subtests. Whereas some subtest scores (e.g., mathematics) were good predictors in most faculties, others (e.g., biology) were weak predictors in virtually all academic areas.

### 3. Other predictors of university performance

Gutierrez, Cuervo, and Rosselli (1999) selected five medical schools in Colombia and analyzed the predictive validity of their admissions criteria. Among the criteria, four medical schools included their own written examination, four included semi-structured interviews, three included high school grades, and three included ICFES examination scores. Each medical school, however, used a different combination of the criteria. Their sample included data from 3277 students with an average age at admission of 18.8 ( $\pm 2.5$ ) years.

Correlations between standardized scores for the four different admission criteria and GPAs during the medical career were as follows:

- written examination, 0.27 ( $n = 1509$ );
- school grades, 0.17 ( $n = 1725$ ),
- interviews, 0.14 ( $n = 1206$ ), and
- ICFES scores, 0.05 ( $n = 2856$ ).

Although all of the correlations are statistically significant, they are quite small in magnitude. These results are quite consistent with Ransdell, Hawkins, and Adams' findings concerning the difficulty of predicting college GPA. Furthermore, the predictive validity of the ICFES was the lowest among the four criteria.

#### 4. Conclusions

ICFES scores can only account for a relatively modest percentage of the variance in GPAs. These results of the Colombia studies reported here are consistent with those of other similar studies conducted in other countries (Baron & Norman, 1992). As suggested by Ransdell, Hawkins, and Adams, additional variables need to be examined if we are to improve our ability to predict college grades (Crouse & Trusheim, 1988; Dickenson & O’Connell, 1990; Houston, 1987; McCabe, 1991). Locating these variables represents a most important endeavor in educational psychology.

Ransdell, Hawkins and Adams have given us a step in this direction. Study behaviors (e.g., amount and quality of study time), family background factors (e.g., parental support) and priorities (time spent on school relative to work) were all found to be significant predictors of college GPAs. These factors are related to students’ motivation, interests, and social support.

Noteworthy, Ransdell, Hawkins and Adams tested three different models to pinpoint the effects of family background, study behavior, verbal ability, and nonverbal ability on GPA. They concluded that the model for which family background (family SES, siblings, and parental support) components are related to college GPA by way of study behaviors was the best-fitting model. Study behaviors, in turn, are mediated by verbal and nonverbal ability. Their analysis suggests that predicting college GPA is a complex, multifaceted problem. Solving this problem requires us to step back and look for the contribution of family background and study behavior rather than rely exclusively on cognitive measures. It may be conjectured that those variables associated with reinforcing academic interests (e.g., parental support), and enhancing learning strategies (e.g., study habits) significantly predict college GPA in diverse cultural contexts. To empirically test this conjecture, we need more cross-national replications of this research.

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