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Development of a Medical School Admissions Interview Phase 2: Predictive Validity of Cognitive and Non-Cognitive Attributes

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Background: Interest in improving medical school admissions processes led to the development of a structured admissions interview to eliminate potential bias and provide valid information for selection. This article reports on the degree to which this interview, along with other admissions variables, predicted later student performance during medical school.
Methods: All applicants considered for admission participated in the new interview. Interview scores and regular admissions data were compiled. Measures of performance in cognitive (e.g., written test scores) and non-cognitive (e.g., ratings of listening skills) domains were gathered during participants' enrollment in medical school and correlated with measures gathered during the admissions process.
Results: Cognitive predictors predicted later performance in cognitive domains but did not predict non-cognitive performance. Both written and interview-based measures of non-cognitive abilities predicted performance in non-cognitive domains. Both cognitive and non-cognitive predictors predicted grades in clinical rotations, which presumably reflect a mixture of cognitive and non-cognitive abilities.
Conclusions: Our results do not support the predictive validity of our interview-based measure above other cognitive and non-cognitive admissions variables more easily gathered. However, in some domains, interview-based variables did incrementally predict medical school performance.

Medical school admissions committees have the difficult task of evaluating a large group of highly achieving and motivated college graduates and trying to discern who among them hold the most promise of becoming good physicians. There is extensive information available about applicants' general cognitive abilities. Using undergraduate grade point average (GPA) and scores on the Medical College Admissions Test (MCAT), admissions committees may reasonably assess whether a given candidate can handle the academic rigors of medical training.[1] However, human qualities — such as ability to relate to patients, empathy, listening skills, and conscientiousness — strongly affect the success of a physician and are necessary for effective patient care.[2,3] Since there is a narrow range of cognitive ability among aspiring medical students, non-cognitive factors are becoming increasingly significant in the differentiation of potential medical students from one another.[4,5,6]

Reliable and valid assessment of non-cognitive factors is difficult. Scores on cognitive measures like the MCAT do not predict non-cognitive outcomes.[2,7] Measuring non-cognitive factors has historically been done with letters of recommendation and personal interviews.[8] Unfortunately, neither of these methods has demonstrated reliability or validity.[9] The majority of medical schools use traditional interviews, where the interviewer asks whatever questions he or she deems appropriate and then rates the applicant based on (usually implicit) criteria the interviewer believes are relevant to becoming a good physician.[8] Repeated empirical trials have shown these unstructured interviews fail to predict later performance in medical school.[10,11.12] This failure is likely due to the bias inherent in the process: each interviewer brings unique ideas about what is desirable in an applicant, and these shifting standards make reliable prediction of performance impossible.[13,14] Based on the strong

performance of structured interviews for personnel selection in other fields, researchers have called for the use of more structured interviews in medical student selection.[7,9]

The present project involved the validation of a structured interview designed to predict performance in non-cognitive areas. The development of this interview is described in an earlier paper.[15] In the current study, long-term prediction of cognitive and non-cognitive performance was investigated. Our expectation was that the interview would predict non-cognitive domains of performance, and that normally obtained cognitive predictor measures would predict cognitive domains of performance.

Methods

Participants - Participants were 175 students (106 male, 69 female) enrolled in medical school selected from 490 (289 male, 201 female) individuals who participated in an on-campus admissions interview during the '96-'97 school year. The ethnic composition of the applicant group /enrolled groups are as follows: White (73%/79%), Underrepresented Minority (e.g., Black/African-American) (14%/11%), Other Minority (e.g., Asian American) (6%/9%), and Unknown (3%/2%). Two hundred and eighty-six (58%) of the applicants, and 141 (81%) of the enrolled students, were in-state status.

Structured Interview - The College of Medicine developed a structured admissions interview through a process that included discussions about attributes the college wanted in its students, questions that would best assess these attributes, and appropriate scoring criteria for these questions. An iterative process was used, with feedback from multiple sources and repeated trial administrations with current medical students posing as applicants. The final interview consisted of nine questions, with accompanying scoring templates, asked of each interviewee by trained interviewers (see [15] for further details about the interview). Examples of the questions are "Thinking back over the past few years, what is one experience you have had that influenced or changed your life in a significant way," and "The practice of medicine is changing rapidly and, as a physician, you will be involved in this evolution. How do you see those changes affecting your role in the practice of medicine?"

Iowa Evaluation Form (IEF) - Each individual writing a letter of recommendation for an applicant also completed a 21-item questionnaire assessing non-cognitive attributes. The applicant was rated from 1 (marginal) to 6 (outstanding) on each item. Four subscales were defined: *Synthesis/Integration*, a measure of the applicant's ability to think quickly and clearly; *Interpersonal Skills*, a measure of the applicant's interactions with others; *Concern*, a measure of the applicant's altruism and interest in the well-being of others; and *Professionalism*, a measure of the applicant's ability to act with confidence while recognizing personal limits.

Cognitive Measures - Undergraduate grade point average (GPA) and scores on each of the objective subscales of the Medical College Admissions Test (MCAT; biological science, physical science, and verbal reasoning) assessed participants' cognitive abilities at the time of application.

Performance Measures - The medical school in the present study exposes students to clinical issues in the first two years via a four-semester course called Foundations of Clinical Practice (FCP). The course includes a human sexuality component, a series of bioethics discussions, and a case-based learning component where students study and present cases developed for learning purposes. Three specific scores from this sequence were obtained. First, the small-group facilitator's rating of each participant's active listening skills, group participation, and respect for others in the human sexuality component of the course served as a non-cognitive outcome. Facilitators are chosen and trained rigorously, and the ratings are made on a standardized scale. Second, a peer evaluation score, where other peer group members rated the extent to which the participant enhanced learning and group discussion, served as a non-cognitive outcome. (Since the peers use a standard scale, but are not as well trained to observe as the facilitators, this measure was presumed to be less rigorous). Third, the composite score from three general written exams served as a cognitive outcome. Each score was converted into standard z-scores and summed to create the composite scores.

Grades in clinical rotations completed in the final two years of medical school were obtained. Rotations were graded Honors, Near Honors, Pass, or Fail, yielding a 4-point scale. Grades from all clinical rotations were averaged, yielding a single mean score for each participant. Rotations varied greatly in their grading criteria, with some giving more weight to scores on written exams and others more heavily weighting subjective assessments of clinical performance. Thus, we considered rotation grades to be a combination of cognitive and non-cognitive domains.

Results

Prediction of FCP Performance -The first group of analyses examined cognitive and non-cognitive outcomes in the first two years of medical school. Regression analyses were conducted where GPA, MCAT scores, IEF scores, and interview scores predicted measures from the FCP course sequence. Three measures were outcome variables: composite score from three written exams (cognitive domain), peer evaluation score (non-cognitive domain), and facilitator's rating from the human sexuality component (non-cognitive domain). Significance levels were set at .05

GPA and MCAT scores significantly predicted the three written exams, a cognitive outcome, with 25% of the variability in written exams accounted for by GPA and MCAT scores. However, GPA and MCAT scores failed to predict peer evaluation scores or facilitator rating.

IEF scale scores did not predict written exam scores. They did predict peer evaluation, with 7% of those scores accounted for by IEF total score. While IEF total score did not predict facilitator rating, one scale (*Synthesis/Integration*) did predict the facilitator rating.

Finally, interview scores did not predict written exam scores, peer evaluations, or facilitator ratings. Two individual interview questions were significant predictors of the facilitator rating: describing a problematic characteristic of oneself, and discussing fears about being a physician.

Incremental Prediction of FCP Performance by Non-Cognitive Predictors - The second group of analyses determined whether IEF or interview scores (non-cognitive predictors) were more effective than cognitive scores at predicting performance in the FCP sequence. GPA and the MCAT subscales were entered as the first regression block, controlling for cognitive predictors, followed by the IEF subscales entered as a second block. The criterion variable was a composite of the three FCP scores described above with the addition of three case-specific exam scores and ratings in an ethics portion of the course. The first block of predictors was significant. The addition of the second block resulted in a significant increase in r^2 change of .122. A second hierarchical regression was conducted with scores on the nine interview questions entered as the second block, while the first block of predictors (GPA and MCAT) and the criterion variable (FCP composite) remained the same. The addition of the second block, although resulting in an r^2 change equal to .07, did not result in a significant increment in variance accounted for.

Prediction of Clinical Rotations - The third group of analyses predicted grades in clinical rotations. GPA and MCAT scores were entered as the first block, IEF scale scores as the second block, and interview scores as the third block. The first block, cognitive predictors, was significant, r^2=.15. Although the addition of the two subsequent blocks did increase the percentage of variance accounted for, this increment did not reach statistical significance on either step. Regressions were also conducted with non-cognitive variables as predictors and rotation scores as the criterion. IEF scores were entered as the first block followed by interview scores as the second block. The model was significant at both stages, r^2=.106 after the first block and r^2=.233 after the second block.

Conclusions

The present study was a longitudinal examination of selection processes at one medical school. Outcome variables were drawn from grades in a two-year course sequence that attempts to develop interpersonal, non-cognitive skills essential to good practice as a physician. Later clinical rotation grades were viewed as a combination of cognitive and non-cognitive skills, as grades were based on written exams and on subjective evaluations of performance with patients. It is difficult to evaluate how effective our measures of "performance" are. While much effort has been put into selection measures, less has been devoted to effective measure of performance as a student. It is important to remember that medical school is a combination of student work (e.g., grades, tests) and physician work (e.g., history gathering, synthesis of information, interpersonal skills). Thus, we believe that our measures of facilitator ratings, rotation grades, and the like are not as well validated as would be desired. However, virtually no research has established effective performance measures in medical school.

In line with previous research [17], we found that GPA and MCAT scores predicted the cognitive domain of written test scores during the first two years in medical school. These cognitive predictors did not, however, predict peer evaluation or facilitator ratings of listening skills and respect. IEF scores (an assessment of the applicant's ability in a variety of non-cognitive areas) did not predict the cognitive written exam scores, but did predict peer evaluation scores. Interview scores did not predict performance

on the written exams, facilitator ratings, or peer evaluation scores.

It is important to emphasize that accurate prediction of non-cognitive criteria requires carefully designed, well-validated assessment measures, be they interviews or paper-and-pencil instruments. Open-ended letters of recommendation given a numerical rating by an untrained rater using unspecified criteria are unlikely to accurately predict later performance, as are traditional interviews. A substantial investment of time, resources, and expertise is required for the development of measures assessing interpersonal factors, time that is disappointingly spent if no predictive validity is obtained.[18]

What domains of non-cognitive abilities should be measured and when? Our intent in this research was to demonstrate that an interview-based measure of non-cognitive abilities would distinguish among medical students' non-cognitive performance. While there were some promising results, they were not strong enough to suggest that all medical schools should develop such a measure. However, it is important to note that recent research [19] has demonstrated that non-cognitive abilities do not cluster within a single domain; rather, there appear to be a variety of non-cognitive abilities that are important. Thus, it is important to continue to develop multimodal measures of non-cognitive abilities. Interview-based ratings may hold promise as well as reference-based ratings. Performance-based measures (e.g., simulated patients, structured behavioral interviews) may also capture aspects of non-cognitive abilities essential to the practice of medicine.

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