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A Validation of Medical School Objectives Project Attributes: Altruistic, Knowledgeable, Skillful, and Dutiful Students

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Medical educators reached consensus through the Medical School Objectives Project (MSOP) deliberations that physicians must be altruistic, knowledgeable, skillful, and dutiful. However, these attributes are difficult to measure and have not been validated as predictive of student performance through quantitative research. The purpose of this study was to explore the effectiveness of personal characteristics in predicting students' class rank in the top or bottom quartile of their clerkship year class. Prior to medical school admission, the 129 students in this study completed four psychological instruments that measured 38 non-cognitive factors. As hypothesized, academics in combination with non-cognitive factors predicted students' class rank better than academics alone. The MSOP attributes share similarities in their definitions with the factors that were predictive: Conscientiousness, Tension, Science Skilled, and Expression. As a result, empirical evidence from this study lends validation to the four MSOP attributes with regard to student performance and identifies instruments that show promise in measuring these attributes.

Key words: personality assessment, medical students, education, professional

The Medical School Objectives Project (MSOP) urged medical schools to use non-cognitive variables in their selection process, particularly looking for candidates who are altruistic, knowledgeable, skillful, and dutiful.[1] Medical educators arrived at these necessary personal attributes for physicians by consensus, not by formal, quantitative research. In his 2001 AAMC Annual Meeting Address, Dr. Jordan Cohen called upon admissions deans to examine the preadmission characteristics of their best students to assist in identifying future stars. He also asked for "better tools for evaluating students' personal characteristics" (p. 5),[2] since the subjectivity of interviews restricts their reliability and validity.[3]

Studies predicting performance in medical school using a combination of academic and psychological variables have typically focused on a single personality trait or a single instrument rather than covering the broad spectrum of human assessment.[4-9] There is evidence that personality factors such as gregariousness, excitement-seeking, and extraversion correlate with pre-clinical coursework performance.[10] Researchers have begun to validate a structured law enforcement candidate interview, which draws its content from personality screening.[11] This literature suggests there is value in pursuing the study of personality instruments for use in other disciplines, such as medical student selection.

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The purpose of this study was to determine the effectiveness of preadmission academic variables and multiple instruments measuring personal characteristics, interests, and motivation in predicting clerkship performance as measured by class rank quartiles in the third year of medical school (M3).

Method

Subjects for this study were students who completed a battery of instruments during the years 1989 to 1992 prior to beginning their undergraduate premedical studies and who ultimately completed the third year of medical school. Students in this program are admitted after completing high school and are granted both their bachelor's and M.D. degrees in six to seven years. Subjects who participated in this study graduated from medical school between 1995 and 1999. The dependent variable of M3 quartile class rank was chosen for two reasons. The clerkship year is more similar to the activities of a physician when compared to the first two years of basic sciences course work (M1 & M2), and rank is not computed at this medical school for the fourth year (M4). To best distinguish student performance and the students who excel from those who were adequate, only the students in the top quartile and the students in the bottom quartile were studied. This decision resulted in a sample of 55 students in the top third-year quartile and 74 students in the bottom third-year quartile. Because students did not progress at the same rate through the six- or seven-year curriculum, the quartiles are not equal, reflecting more students in the lower quartile who repeated a year. The sample consisted of 67 men and 62 women with three African Americans, 64 Asians,

61 Caucasians, and one Mexican American. Demographic variables included in the analyses were gender, racial/ethnic classification, and undergraduate university attended.

Measures

The field of human assessment involves three domains: ability, motive, and personality.[12] Overall college grade-point average (GPA), college science-mathematics GPA, and the four MCAT subtest scores made up the academic predictor variables assessing ability.

The non-cognitive variables included attributes that define general human motivation, career motivation, normal personality, abnormal personality, and interests. Four instruments were administered in the psychological battery.

First, six Thematic Apperception Test (TAT)[13] cards were included in the test battery to measure students' motivations. Students' stories were scored for Achievement, Affiliation, and Power motives.[14-16] Research studies using the TAT provide sufficient support for the instrument's construct validity.[17] Second, the Sixteen Personality Factor Questionnaire (16PF)[18] measures 16 dimensions, with average test-retest reliabilities of .80 and .52 for short- and long-term intervals, respectively.[19] The nonredundant contributions of each of the 16 scales average almost 49%, demonstrating construct validity of the 16PF.[19] Third, to screen for abnormal personality, we administered Lanyon's Psychological Screening Inventory (PSI).[20] It provides scores in five psychopathological areas: Alienation, Social Nonconformity, Discomfort, Expression, and Defensiveness. The PSI's test-retest reliabilities average .83, and researchers have reported validity as high as 80%.[21] Fourth, the Career Occupational Preference System (COPS)[22] measures interest in job activities from 14 occupational clusters, including the Professional Science cluster that describes physicians. The COPS' technical manual reports a median test-retest reliability of .90, stability estimates of interest scores of .63, and construct validities ranging from .61 to .78.[23]

We hypothesized that the non-cognitive characteristics in combination with academic variables would predict quartile class rank better than the academic variables alone. Forward conditional logistic regression analysis was used to predict membership in the top or bottom quartile.

Results

Table 1 displays the results of the logistic regression that included demographic, academic, and non-cognitive variables to predict student membership in the third-year top or bottom quartile of class rank. As expected, the overall college grade-point average (GPA) was the strongest variable in determining quartile membership. About 80% of the students were correctly classified using college GPA alone. Adding five of the 38 non-cognitive variables, 16PF Conscientiousness, 16PF Tension, PSI Expression, COPS Skilled Science, and COPS Skilled Technology (correlated negatively) improved the predictions to 84%. The demographic variables were not statistically significantly correlated.

Table 2 displays the independent variables that were significant predictors of membership in the top quartile of the class and the means and standard deviations by quartile. When just non-cognitive variables were included in the logistic regression, 59% of the students were correctly classified and the only significant variable was TAT Achievement Motivation.

Discussion

Obviously, the college GPA is a measure of how knowledgeable an admissions candidate is, and no one would argue that there is a certain level of academic competency needed to complete medical school. However, variables similar to two of the other MSOP attributes added significantly to the prediction of top quartile membership: skillfulness and dutifulness. The increase of 4% in our ability to predict quartile membership using the non-cognitive measures was not overwhelming. However, the fact that these particular measures discriminated among the top and bottom quartiles is significant when searching for methods to validate the MSOP attributes and also in identifying tools to measure non-cognitive characteristics. A case can be made that a portion of altruism, as described in the MSOP

Table1
LOGISTIC REGRESSION WITH 84% PREDICTIVE VALUE FOR TOP OR BOTTOM QUARTILE CLASS RANK

Variable	*Step Entered*	*Beta*	*S.E.*	*p**
College Grade-Point Average	1	10.08	1.85	.000
Tension	2	.20	.07	.003
Expression	3	.25	.08	.001
Conscientiousness	4	.19	.09	.032
Skilled Technology	5	–.14	.05	.047
Skilled Science	6	.11	.06	.005
Constant		–45.36	8.26	

**significance level p<.05*

Table 2
MEANS AND STANDARD DEVIATIONS OF SIGNIFICANT VARIABLES IN LOGISTIC REGRESSIONS

Variable	*Top Quartile*		*Bottom Quartile*	
	Mean	*S.D.*	*Mean*	*S.D.*
College Grade-Point Average	3.75	.18	3.47	.20
Tension	13.64	5.05	12.22	5.03
Expression	14.38	4.76	13.12	4.67
Conscientiousness	12.89	3.90	11.76	3.06
Skilled Science	18.91	6.52	17.50	6.52
Skilled Technology	11.18	6.83	13.55	9.12
Achievement Motivation	7.35	5.50	5.62	4.36

report, is also significantly adding to the prediction.

The MSOP report explains the attribute of skillfulness in physicians as the ability to take complete and accurate medical histories, conduct a physical examination, obtain and interpret information properly from laboratory tests, determine the best diagnosis, and evaluate treatment options.[1] In general, students in the top quartile of their M3 class were more interested than those in the bottom quartile in Skilled Science careers that "involve observation and classification of facts in assisting in laboratory research and its application in the fields of medicine and life and physical sciences" (p.4).[23] This study also showed that career interest in technology skills negatively predicted being in the top quartile of M3. The Skilled Technology occupations involve hands-on work in skilled trades, such as construction, electronics, and mechanics.[23] Therefore, an interest in the skill of manually completing scientific tasks was not as important as the skill of recognizing how the results of the tasks should be interpreted and used. It will be interesting to study larger samples to determine if students who choose certain careers, such as surgery, do have an interest in Skilled Technology careers.

Dutifulness as described in the MSOP report is a similar construct to the 16PF Conscientiousness factor. According to the MSOP section on dutifulness, "physicians must feel obliged . . . to use systematic approaches for promoting, maintaining, and improving the health of individuals and populations" (p.8).[1] The students in our top quartile were somewhat more likely to have a clearer sense of duty than those in the bottom quartile. People higher in the 16PF factor of Conscientiousness are defined as "exacting in character, dominated by sense of duty, persevering, responsible, planful, . . . and moralistic" (p.26).[12] The MSOP report includes compassionate, self-sacrificing, and ethical in its description of altruism and discusses the need for physicians to have "honesty and integrity" (p.5).[1] If those high in Conscientiousness are "moralistic," then a part of altruism as defined by the MSOP report is predictive of M3 class rank.

The two personal characteristics that are not direct qualities recommended by the MSOP report, but predicted membership in the top quartile, were Expression and Tension. Expression is a measure of extraversion-introversion, and people higher in extraversion are more likely to seek interaction with others.[21] In our study, the students higher in extraversion were more successful as measured by their third-year quartile class rank. The MSOP report under skillfulness and dutifulness discusses the importance of collaborating and consulting with other physicians and health care professionals.[1] These interactions are typically more rewarding, and therefore more often sought out, for extraverts as opposed to introverts. Therefore, PSI Expression could also be considered a portion of these two MSOP attributes.

Based on the 16PF descriptive scale, people higher in Tension tend to have high drive, whereas lower scores indicate lower motivation. According to norms for college students, the mean Tension score of the medical students in the top quartile of our study was in the sixth sten (out of ten), while the bottom quartile was in the fifth sten.[24] Perhaps the higher drive of the students in the top quartile was enough to give them an extra edge over the students in the bottom, but was not high enough to cause them frustration or impairment. Interestingly, another measure of motivation, Achievement, was the only non-cognitive factor to enter a logistic regression predicting class rank when the academic variables were omitted. The motivation to achieve excellence might be productive to study as another necessary attribute for physicians to have, unless it is considered to be subsumed under the knowledgeable attribute.

This study is a start in validating the physician attributes mandated in the MSOP report and in identifying tools to measure them. It provides empirical support for choosing

altruistic, knowledgeable, skillful, and dutiful candidates for our medical school classes. Additional studies using objective measures must be conducted at other medical schools to continue the validation process. A problem is that medical students are a fairly homogeneous group with regard to many of their non-cognitive characteristics as compared to the population as a whole, just as they are fairly homogeneous in their academic abilities. It is likely that most are strong compared to the general population in qualities of altruism, skillfulness, and dutifulness, but some are just a shade stronger. Being able to measure these small differences in medical school candidates poses a challenge to admissions committee members. Only after continued research will firm advice on interview questions and appropriate answers to identify star candidates be available.

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