The capability of selection tools to predict future academic performance of medical students

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Abstract. The strong competition allows medical schools to be highly selective in their admissions, with the aim of selecting only those students who are most likely to complete their medical education and presumably become good doctors; it also minimizes the number of poor performers or ‘strugglers’, who were reported in one study to account for academic. The validity of an admission criterion is defined as the degree to which it predicts an applicant’s performance during and after his or her undergraduate medical training, and reliability is defined as the reproducibility of the results obtained when a measurement is repeated on the same study sample. Several studies also show that several non-cognitive factors have a significant influence on academic success at university, additional to the influence of prior academic attainment. The purpose of this research is to assess the correlation between the selection tools and medical student’s academic performance through their Grade Points Average (GPA) over a four-year period. Pre-admission data were matched from students who entered Bandung Islamic University, Faculty of Medicine at the year 2012 – 2016 with their GPA. A cross-sectional study was conducted in 74 selected students who had completed the specific admission test. The variables examined were high school grades, Multiple Mini Interview (MMI), Minnesota Multiphasic Personality Inventory (MMPI) test and a total of admission test score. The statistical was used SPSS and Spearman correlation test analysis. The result shows there were significant correlation and a weak relationship between MMI with 1st year GPA, 2nd year GPA, and 3rd year GPA. There was also a significant correlation and a moderate relationship between the total of admission test score with 2nd year GPA and 3rd year GPA. The conclusion is MMI was found to be steady predictor of Grade Point Average (GPA) yet the predictability of academic success is weak and increase for the early years and drops towards the end of the medical under graduated program. Total of admission test score was weak predictor for academic performance especially in the second and third year medical students.

1. Introduction

The strong competition allows medical schools to be highly selective in their admissions, with the aim of selecting only those students who are most likely to complete their medical education and presumably become good doctors; it also minimizes the number of poor performers or ‘strugglers’, who were
reported in one study to account for academic [1]. The validity of an admission criterion is defined as the degree to which it predicts an applicant’s performance during and after his or her undergraduate medical training, and reliability is defined as the reproducibility of the results obtained when a measurement is repeated on the same study sample [2]. Several studies also show that several non-cognitive factors have a significant influence on academic success at university, additional to the influence of prior academic attainment [3]. Every medical education institutions want the best quality of a college student. Although seemingly simple, the word ‘best’ hides many subtleties and complexities. The quality of being good can be seen with the ability of students to follow all lessons, capable of being sociable and organized, and able to face all that appears psychological pressure. Increasingly, in the United States, medical schools are utilizing mission-based admissions [4]. The selection tools that medical school used depend on the generative competence of its graduate's doctor. Doctors probably cannot be too intelligent. Meta-analyses of selection in many different occupations show that general mental ability is the best predictor both job performance and of the ability to be trained [5]. Although claims are often made for some minimum threshold ability level which is ‘good enough’ systematic research suggests that ‘more is better’ [6].

The discriminatory capacity of the admission test could be improved by replicating the analysis presented at the end of the fourth and sixth years, investigating the relationship between admission test results and clinical skills [7].

Selection tools that are widely used around the world consider previous grades (GPA), aptitude or achievement tests, interviews (panel interview, Multiple Mini Interview), reference letters, simulations, situational judgement tests, psychological tests and personal essay [8-17]. Despite the plethora of research in this area, predicting performance in the medical program, including timely completion, remains a significant challenge12. Most schools employ a combination of weighted or unweighted scores to prepare a list from which the most highly ranked applicants are selected [11,17].

Bandung Islamic University Medical Faculty opened about 14 years ago. The selection test of the new students is divided into two paths, which are the regular path and specific academic path of admission tests (PMDK). The specific academic path policy of new medical students consist of previous High school grades, Multiple Mini Interview (MMI) and the Minnesota Multiphasic Personality Index (MMPI).

Applicants initially submit their certificates on completion of the final year of high school schools which have ‘A’ accreditation and the marks obtained in physics, biology, chemistry, and mathematics. Even though a minimum score is 80 in these subjects is a necessary prerequisite, about 550-650 students apply, and only fifty per cent of this total number (about 25) is eventually accepted each year.

The MMI is carried out by two or more Faculty members and lasts 15-20 minutes with each applicant. Conduct of the interview by a group rather than an individual allows for maximum objectivity in the selection process [18,19]. The interview focuses on the following non-cognitive criteria: personal awareness of the applicant of the significant health problems in the Indonesia community; expression, listening and communications skills of the applicant; and personal characteristics of the applicant as general interests, motivation, discipline, respect for others, self-respect, self-esteem, and ability to work in a team. The applicant who was not suited to our faculty medicine requirement result of Minnesota Multiphasic Personality Index (MMPI) was excluded from the list.

The total admission test score of the specific academic path of new medical students tests constitutes an academic score about 80% of the total evaluation score, and non-academic score approximately 20 per cent of the total evaluation score.

The purpose of this research is to assess the correlation between the selection tools and medical student’s academic performance through their Grade Points Average (GPA) over a four-year period.

2. Method

Students were identified by selecting students who had completed the specific academic path of admission tests, and it was because they already had complete selection tools (Previous High school
GPA, MMI, and MMPI). This process, conducted for students who entered Bandung Islamic University, Faculty of Medicine at the year 2012 – 2015, resulted in 101 students.

Pre-admission data collected included MMI score test, MMPI score test and previous GPA of physics, biology, chemistry, and mathematics. The high school must have ‘A’ school accreditation from state government standard. The variables examined were high school grades, Multiple Mini Interview (MMI), Minnesota Multiphasic Personality Inventory (MMPI) test and the total admission test score.

Measures of association were developed to understand the general relationship among all of the variables and specifically to measure the level of correlation among various selection tools and medical students’ academic performance through their Grade Points Average (GPA) over a four-year period. Matrices with Pearson’s correlation coefficients were used to describe the individual bivariate associations among selection tools and GPA. Multiple regression models using SPSS software were developed to predict the individual effects of the selection tools.

3. Results

The multiple correlation matrix in Table 1 shows there was no correlation between high school grades with 1st year GPA, 2nd year GPA, 3rd year GPA, and 4th year GPA with p-value<0.05.

In contrast, there was significant correlation and a weak relationship between MMI with 1st year GPA, 2nd year GPA and 3rd year GPA with p-value <0.001 (rs = 0.23). However, there was no correlation between MMI with 4th year GPA with p-value>0.05.

Similarly, with the high school grades, there was no correlation between MMPI with 1st year GPA, 2nd year GPA, 3rd year GPA, and 4th year GPA with p-value<0.05.

There was also a significant correlation and a moderate relationship between a total of admission test score with 2nd year GPA and 3rd year GPA with p-value<0.05 (rs = 0.36), while there was no correlation between total score of admission test with 1st year GPA and 4th year GPA with p>0.05.

Table 1. Correlation between selection tools with Grade Point Average (GPA).

| Correlation          | 1st year GPA | 2nd year GPA | 3rd year GPA | 4th year GPA |
|----------------------|--------------|--------------|--------------|--------------|
|                      | r  | p value\(a) | r  | p value\(a) | r  | p value\(a) | r  | p value\(a) |
| Math                 | 0.11| 0.348       | 0.02| 0.884       | 0.02| 0.884       | 0.23| 0.135       |
| Physics              | 0.13| 0.277       | 0.04| 0.766       | 0.02| 0.884       | 0.21| 0.177       |
| Chemistry            | 0.11| 0.345       | 0.04| 0.713       | 0.04| 0.766       | 0.23| 0.149       |
| Biology              | 0.14| 0.249       | 0.03| 0.781       | 0.03| 0.781       | 0.20| 0.194       |
| High school Mean     | 0.13| 0.272       | 0.04| 0.718       | 0.04| 0.718       | 0.22| 0.162       |
| grades               | MMI     | 0.23| 0.047       | 0.23| 0.048       | 0.23| 0.048       | 0.19| 0.206       |
| MMPI                 | 0.13| 0.266       | 0.18| 0.127       | 0.18| 0.127       | 0.02| 0.903       |
| Total admission test | 0.04| 0.786       | 0.36| 0.007       | 0.36| 0.007       | 0.18| 0.348       |

\(a)\) Pearson Correlation Test

4. Discussion

Our primary finding was that high school grades are not an accurate predictor of academic performance as measured by GPA in 1st year, 2nd year, 3rd year and 4th year. Our analysis demonstrates that maybe we should use the larger sample number and try to evaluate the medical student's performance at the graduation level and also combine high school GPA and a standardized test in the regular path of Bandung Islamic University Faculty of Medicine entrance test. There are quite a few evidence to show
that high school GPA is a significant predictor or performance at the graduation level. The same results were found by many researchers [20,21].

Many studies have empirically verified the relationship between future academic performance and the combination of both standardized test scores and high school GPA. Results show that the combination even outperformed either of the one in a consistent manner [22]. They concluded that a combination of both the scores was capable of making significant and accurate contributions to predict first-year GPA, cumulative college GPA, as well as graduation.

Mini Interview (MMI) was found to be a steady predictor of GPA, yet the predictability of academic success is stronger for the early years and drops towards the end of the undergraduate medical program. Students may pass an exam in year 1-3 by prodigious rote learning or a lot of repetition learning, but that becomes increasingly difficult at a higher level of achievements [4]. The correlation we determined between MMI and GPA were generally lower than reported by several investigator [23] but were similar to other investigator [24]. Zhou said that 1st year GPA was associated positively with academic self-concept [25]. A student’s first year of college is a vital time for establishing baseline knowledge, positive attitudes, self-confidence, and commitment to studying [26,27], which, in turn, lay the foundation for the student’s subsequent academic success and retention [28]. Interviews often are used as a means of evaluating communications skills, as well as the general fit of an applicant for a particular program [29]. Thus useful additional information that has predictive power for the outcome can probably be collected from an interview.

The ability of MMI to predict GPA is weak but consistent from first, second until the third year. Although there was no correlation between MMI with the fourth year GPA, the MMI as a predictor looks promising direction. In our curriculum, year four are quite full and consist of the gastrointestinal system, respiratory system, genitourinary system, community medicines, tropical medicines and also minor thesis. This condition could force students to struggle based on their inner manage stress ability. Findings from the study indicate that there is a relationship between stress and academics; they are inversely proportional to each other. Medical education is perceived as being stressful, and a high level of stress may have a negative effect on cognitive functioning and learning of medical students [30]. There was no correlation between MMPI with the GPA. Our finding is consistent with the investigator who found that personality type based on MMPI-2 does not have an association with academic performance [31]. This lack of association could be explained and influenced by many factors: not all medical students had the same and steady GPA from the first year until the fourth year as at the end of the pre-medical year. Besides, the intense competition for highly desirable specialties put students in a stressful situation resulting a student’s getting a different GPA according to their performance in the fourth year in the medical school.

This study showed there were a significant correlation and a moderate relationship between a total of admission test score with second-year GPA and third year GPA. While there was no correlation between total score of admission test with first-year GPA and fourth-year GPA, the first academic year is especially important for medical students, as they are faced with greater difficulties and more stress in their courses and are at higher risk of withdrawal than students with other majors. There is a need to identify specific characteristics that affect the first-year academic performance of medical students. Such studies can help medical faculty and administrations provide better support services to promote student success and increase student retention [25]. It has also been shown that students in final year of under graduated program has to deal with stressful of academic pressure and it is affected to their academic performance.

5. Conclusion
Our study has led us to the conclusions that Multiple Mini Interview (MMI) was found to be steady predictor of Grade Point Average (GPA) yet the predictability of academic success is weak and increase for the early years and drops towards the end of the medical under graduated program. Total of admission test score was weak predictor for academic performance especially in the second and third year medical students.
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