ORIGINAL ARTICLE

Relationship of Academic Success of Medical Students with Motivation and Pre-admission Grades

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ABSTRACT

Objective: To determine predictive validity of pre-admission scores of medical students, evaluate correlation between level of motivation and later on academic success in a medical college.

Study Design: Analytical study.

Place and Duration of Study: Foundation University Medical College, Islamabad, from June to August 2011.

Methodology: A non-probability convenience sampling of students of 1st to final year MBBS classes was done after obtaining informed consent. These students filled out 'Strength of Motivation for Medical School' (SMMS) questionnaire. The data of pre-admission grades of these students along with academic success in college according to examination results in different years were collected. The correlation between the pre-admission grades and score of SMMS questionnaire with their academic success in medical college was found by applying Pearson co-efficient of correlation in order to determine the predictive validity.

Results: Only 46% students revealed strong motivation. A significant, moderate correlation was found between pre-admission scores and academic success in 1st year modular examination (0.52) which became weaker in various professional examinations in higher classes. However, no significant correlation was observed between motivation and academic success of medical students in college.

Conclusion: Selecting medical students by pre-admission scores or motivation level alone may not be desirable. A combination of measures of cognitive ability criteria (FSc/pre-admission test scores) and non-cognitive skills (personality traits) is recommended to be employed with the use of right tools for selection of students in medical schools.

Key words: Educational assessment. Graduate records. Medical students. Motivation. Admission criteria. Pre-admission score.

INTRODUCTION

The reasons for studying medicine may vary widely. A study in Australia revealed that only 52% of newly admitted students had interest in medicine while others joined due to reasons like interest in biology (19%), parental pressure (13%) and high marks or no idea of career (12%).[1] Different procedures are employed for selection in medical colleges. These admission procedures are frequently debated for their low reliability and predictive validity.[2] In selecting students for admission to medical institutions, the admission committees may make decisions depending on academic ability based on GPA (grade point average) for graduate entry programs (USA, Canada and Australia); high school (matric) examination, FSc/A-levels results combined with entrance test scores. A number of colleges have started employing other methods like reference letters, autobiographical assessments, aptitude tests and personal/group interviews for which predictive validity rarely rises above 0.10.[3,4]

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Different reports on predictive validity of pre-admission grades (achievement tests) and entry/aptitude tests describe widely variable results. Some studies report high positive predictive validity of written tests (GPA/ A-level and MCAT-Medical College Admission Test) while other authors present a less favourable view.[5-7] Koenig *et al.* concluded that MCAT was not a perfect predictor and other variables such as diligence, motivation and communication skills need further investigations.[8]

The efficacy of students selection based on judging their quality and strength of motivation as a future predictor of their academic and clinical performance has been emphasized as a secondary selection tool once these candidates have been screened for their intellectual ability.[8,9] Motivation is a psychological concept that refers to a person's willingness to put forth effort in order to achieve educational goals. Its strength is in balance with whatever energy the student is willing to invest, or the sacrifices the student is willing to make to meet those needs.[10] Active, independent and self-directed learning, which are important aspects of modern medical education, require high level of motivation.

A distinction should also be made between the quality and strength of motivation.[11] Most advocate that admission procedures should prefer students with genuine, intrinsic interest in medicine with altruistic,

care-directed motives above those who aim to gain personal status or high income.[11] A 'Strength of Motivation for Medical School' (SMMS) questionnaire has been proposed for this purpose and found to be a reliable and valid instrument for measuring the strength of motivation for students who have entered medical school.

In view of this, the present study was conducted to correlate the pre-medical grades and motivation level of students with their academic success in various examinations in a medical college in the country. The results of this study will provide us indigenous data whether intellectual ability is enough for entry to a medical college or additional tests for non-cognitive domain like motivation are also necessary for medical training. These findings may help make recommendations for bringing necessary changes in admission procedures in medical colleges of the country.

METHODOLOGY

It was an analytical study conducted at the Foundation University Medial College (FUMC). FUMC is a constituent college of Foundation University, Islamabad. The medical students in this college pursue a 5 years MBBS programme. It is presently undergoing phased transformation from traditional system into modular/ system-based integrated curriculum in which basic medical sciences including pathology and pharmacology, with vertically integrated clinical component will be covered in first 3 years while the 4th and final years will be dedicated to clinical clerkship.

Each year, the FUMC admits 100 students with 12 years of pre-MBBS education. Acceptance into college is based on academic achievements in high school, FSc/A-levels or equivalence carried out by the Inter Board Committee of Chairmen (IBCC), combined with the result of entry test. The students come from all parts of Pakistan; some from Middle East, Europe and North America (mostly drawn from Pakistani Diaspora).

The participants of the study were students of all the various year classes of FUMC. The total population of students in the college is 504 (31% males: 69% females) with the male to female ratio of 1:2.25. A non-probability, convenience sampling of students of all classes was done in class rooms irrespective of gender, age and pre-admission background.

The research was approved by the Ethics Review Committee of Foundation University Medical College, Islamabad.

The instrument used for determining the level of strength of motivation was the 'Strength of Motivation for Medical School' (SMMS) questionnaire.[11] This questionnaire contained 16 items that were scored on a Likert point scale of 1 – 5 ranging from 'strongly disagree' to 'strongly agree'. Most of the questions were indicative i.e. having

a positive relation with motivation while some others were counter-indicative i.e. having a negative relation with motivation. The minimum and maximum possible scores were 16 and 80 respectively. The higher the score, the greater was the strength of motivation of students for their studying in a medical school. The SMMS questionnaire has been reported to have favourable psychometric properties with Cronbach's alpha reliability of 0.79 and a test-retest reliability after 6 months period of 0.71.[11]

At the end of a teaching session, the participants were explained the purpose and method of this research project. An informed consent was obtained from them to join this research project. The participation in this study was voluntary. The participants were assured that non-participation would not cause them any harm or disadvantage and they could withdraw from study any time without giving any reason to do so. They were informed that confidentiality was guaranteed and data would be strictly kept anonymous. The participants were asked to fill out the SMMS questionnaire. They were given the liberty of seeking any clarification.

The names and class distribution of these students were forwarded to the student affairs department of the college to provide data about pre-admission grades of these students along with their academic success in college (marks of modular examination of 1st year MBBS class along with results of 1st professional part-I / II, 2nd and 3rd professional examinations).

Data entry and analysis were done using the Statistical Package for Social Sciences (SPSS) for windows version 16.0 (SPSS Inc, Chicago, IL, USA). Descriptive statistics were used to describe the data i.e. mean and standard deviation (SD) for quantitative variables like FSc marks, SMMS scores and academic success while frequency and percentages were employed for qualitative variables such as FSc grades and motivation grades. The correlation between the pre-admission grades and scores of SMMS questionnaire of students was carried out with their academic success in various examinations by applying Pearson co-efficient of correlation.[12] Analysis of variance (ANOVA) was applied to compare FSc marks and SMMS scores in different MBBS classes. A p-value of < 0.05 was considered as significant.

RESULTS

Out of the possible 504 students to whom the SMMS questionnaire was administered, 436 filled out the questionnaire with a response rate of 86.5%. In a population of medical students in the college where 31% were males and 69% were females; 122 males (28%) and 314 females (72%) participated in the study. The gender proportion of students filling out the SMMS questionnaire (M:F ratio 1:2.57) was not much different

from the study population of students (M:F ratio 1:2.25) in the college. The response rate of students present on the particular day was 100%. Most remaining subjects were not present on the day due to various reasons.

The students admitted in the college had pre-admission grade (original FSc score or equivalent) of A-1 grade in 43% of the students while A grade was obtained by 50% students and 7% students had achieved pre-admission grade B.

The motivation scores of medical students from 1st to final year classes, as shown in Table I, revealed a fairly uniform pattern of distribution of SMMS questionnaire scores across the various pre-admission FSc grades (A-1, A and B grades). The SMMS score and FSc marks revealed very weak and insignificant relationship between the two (Figure 1). The scores of SMMS questionnaire regarding the strength of motivation of students showed that only 46% of them had strong motivation for studying in the medical college (SMMS questionnaire score: 59-80). A small percentage (4%) revealed low motivation on SMMS questionnaire scale (SMMS score: 16 – 37).
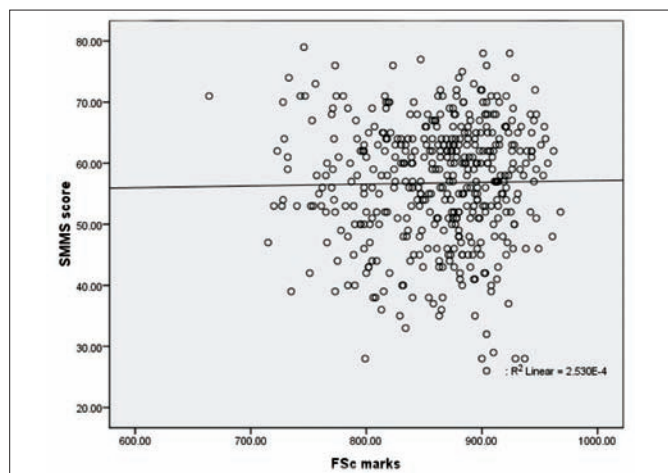

Figure 1: SMMS score and F.Sc. marks showing insignificant, very weak relationship.
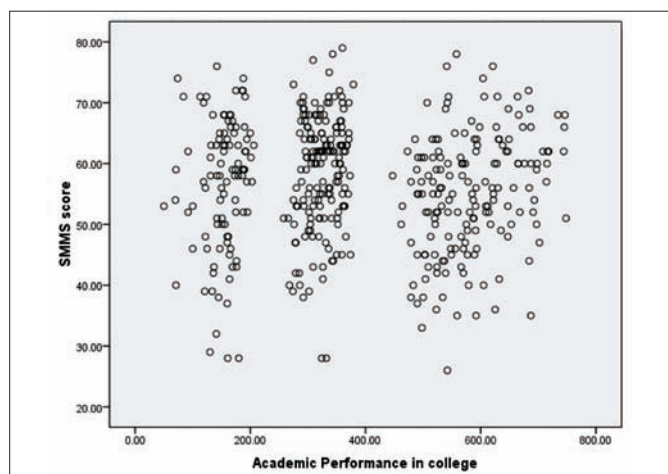

Figure 2: SMMS score and academic success of students in medical college showing no relationship between the two.

The comparison of FSc marks and SMMS score in all classes (first to final year) is shown in Table II. The 1st year MBBS class had FSc score of 886.4 ± 63.7 and final year had 840.1 ± 45.1. A moderate strength of motivation was observed from 1st year (56.6 ± 10.9) to final year class (58.1 ± 8.6). The SMMS score and FSc marks revealed a very weak relationship (Figure 1).

The Pearson co-efficient of correlation was applied in order to determine the relationship of pre-admission grades (FSc marks/equivalent score) and strength of motivation (scored on SMMS questionnaire) with academic success in medical college (Table III). The 1st year MBBS class revealed a significant, moderate correlation (0.52) between pre-admission marks and academic success in college which deteriorated to very weak relationship in the final year MBBS class (0.29). However, a very weak to no correlation was found between strength of motivation (SMMS score) in 1st year MBBS class (0.112) to final year (0.067) class (Figure 2).

Table I: Motivation level scores of all medical students from 1st to final year classes: overall and according to FSc/grades (n: 436).

Marks in FSc (grades)	Motivation level scores of students					
	16 – 37 (Low)		38 – 58 (Moderate)		59 – 80 (Strong)	
	Number	Percentage	Number	Percentage	Number	Percentage
> 880 (A-1)	9	5%	93	49%	88	46%
770 – 879 (A)	6	3%	110	50%	101	47%
660 – 769 (B)	1	3%	15	52%	13	45%
Total	16	4%	218	50%	202	46%

Table II: Comparison of FSc marks and SMMS scores in all classes (n = 436).

MBBS class	FSc marks	SMMS score
1st year	886.4 ± 63.7	56.6 ± 10.9
2nd year	876.1 ± 54.5	61.5 ± 7.8
3rd year	853.8 ± 50.4	56.5 ± 10
4th year	846.4 ± 43.7	53.0 ± 10
Final year	840.1 ± 45.1	58.1 ± 8.6
p-value	< 0.001**	< 0.001**

Values are expressed as mean ± SD
*** : Highly significant (p < 0.001)*

Table III: Pearson correlation of pre-admission grades (FSc / equivalent marks) and motivation score with academic success in college (n: 436).

MBBS class	FSc marks		SMMS score	
	Pearson correlation	p-value	Pearson correlation	p-value
1st year	0.520	< 0.001**	0.112	0.225
2nd year	0.418	< 0.001**	0.130	0.281
3rd year	0.333	0.001*	0.202	0.051
4th year	0.320	0.001*	0.100	0.313
Final year	0.290	0.015*	0.067	0.593

*** : Highly significant (p < 0.001); * : Significant (p < 0.05); NS : Insignificant (p > 0.05)*

DISCUSSION

For assessment of intellectual ability, the most commonly utilized criteria for acceptance to the study of medicine has been exceptionally high performance in pre-admission grades and various medical school entry examinations.[5] The pre-admission academic achievements like FSc/A-level result (or equivalent marks) and entry test score are the sole criteria for selection in the large majority of medical colleges in our country. In the present study, a moderate to weak correlation was found between the academic achievements of students based on their pre-admission grades and the future academic success in various examinations in our medical college. Many studies have indicated that the level of previously demonstrated academic ability is a good indicator of success at medical school,[5-7] while others have shown that there is only a modest correlation between prior academic achievements and medical school success.[13,14] On the other hand, many studies have failed to demonstrate any significant correlation.[15,16] Wingard and Williamson, in an evaluative literature review, described several possible explanations of this poor correlation as; deficiencies in the present grading system, inadequate selection procedures and the inherent inability of grades to indicate the transformation of potential and aptitude into accomplishments.[17] They concluded that pre-admission grades and examination scores reflect only the ability to memorize isolated facts and such students may be found quite incompetent in many vital areas essential for a medical doctor.

It was observed that as students progressed in classes in the medical college, the correlation between their pre-admission grades and academic success, as judged by results in various examinations, deteriorated from moderate to weak. The self-determination theory postulates that motivation for education can change from extrinsic to intrinsic and vice versa depending on various factors. In a review of literature, Kusurkar *et al*. described that motivation of medical students for study may be influenced by a variety of factors which may relate to individual students (age, gender, ethnicity, personality traits, teacher and parent support etc.), learning environment, curriculum structure (traditional/PBL-based), type of assessment, rewards and early patient contacts.[18]

To be a successful medical student; and ultimately an effective and competent doctor, a prospective student needs to possess a range of non-cognitive skills, qualities and positive attitudes along with the academic ability. The literature contains various reports of correlation between different non-cognitive criteria and success in medical studies and thereafter.[19] For assessment of these personal qualities many study methods have been employed which include question-naires, personal/group interviews and personality tests. A newly described method is Multiple Mini-Interview (MMI). The MMI, applying the principles of objective structured clinical examination (OSCE) to the interview context, is being used for assessment of non-cognitive personality traits. A good predictive validity and reliability (upto 0.78) has been reported for MMI in multiple studies.[20]

The present study was conducted to find out the strength of motivation of our medical students, by administering SMMS questionnaire. Its relationship with the academic performance in the college revealed no correlation between these two parameters. Higher motivation and specifically higher intrinsic motivation have been found to correlate with higher academic performance in both pre-clinical and clinical years.[21] However, there are other studies that failed to find any significant correlation between motivation and academic success in a medical school. A study from UK revealed no significant correlation between extrinsic or intrinsic motivation of medical students with their academic performance.[22]

In the present study, the students of our medical colleges were found to have moderate strength of motivation ratings in all classes. Moreover, the correlation of motivation scores with academic success in the college was observed to be poor. The reasons for this could be that ours being a private sector medical college admits poorly motivated students through the selection process who may be studying medicine due to factors other than their keen interest in medicine.[1] The students admitted to our private medical colleges belong to families of upper socioeconomic class who are able to afford the high expenditure of education here. A study in the UK highlighted that students belonging to higher socioeconomic status had more intrinsic motivation for seeking admission in a medical school encompassing challenge, achievement and sense of fulfillment in medicine. In contrast, the students from lower socio-economic class focused more on extrinsic rewards and higher expected income on becoming a doctor.[23]

As uncertainties remain in the selection of applicants for medical schools, a number of new approaches are being proposed and evaluated. There is a suggestion that selection process of applicants for medical schools be treated as 'assessment' and all the principles underlying assessment; like validity, reliability and feasibility, be applied to the process of selecting those to be admitted to medicine.[24] Besides, the achievement ratings, written tests and interview/MMI, the other measures include situational judgment test (SJT), investigation of emotional intelligence (EI) and personal qualities assessment (PQA).[24] Bore *et al*. have proposed a comprehensive model for selection of medical students based on: informed self-selection, academic achievements, cognitive ability and personality

tests.[25] There is also a suggestion for not using any non-cognitive admission criteria but rather assisting prospective applicants to make informed decision based on a reflective self-appraisal whether or not to apply to a medical school (informed self-selection).[25] It appears we are not any close to agree on a broad approach to student selection for medical school.

The limitations of this study are that this quantitative study employs a sample of students of different classes of one medical college in private sector of the country. It only uses a single questionnaire (SMMS) to judge the motivation level of students for studying medicine. It does not give any insight into reasons for low motivation of our students. Hence, caution must be exercised while making an attempt to generalize the results of this study.

It is recommended that further exploratory, mixed method studies, with focus group discussions or interviews, should be done to collect in-depth information for exploring the reasons of moderate to low motivation of our medical students. Such multi-centric studies carried out on students motivation in various medical colleges will help us to generalize the results. It is also suggested that further studies should be conducted in our country to develop evidence-based criteria for formulation of a national student selection policy for admission to medical schools. This policy should be based on application of principles of good assessment in defining the assessable domains and attributes, selecting appropriate formats and measurement methods based on evidence-based models. A focus on multi-method programmatic approach (cognitive and personality selection) is required. This will help the selection committees to adopt an admission policy which permits only those applicants to be admitted to medical colleges who possess the right cognitive ability and appropriate non-cognitive skills to become good medical students and ultimately competent doctors acceptable to their profession and community.

CONCLUSION

A moderate to weak correlation was found, in this study, between pre-admission achievement scores of students and their academic success later in medical school, although academic (cognitive) ability remains the sole criterion for admission in majority of medical schools in the country. Moreover, no correlation was determined between motivation levels and academic success of students in various examinations during their stay in college.

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